

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)



Autonomous Programme Bachelor of Engineering



Department Of Civil Engineering

**SCHEME and SYLLABUS
(2025 Admitted Batch)**

Academic Year 2026-27



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU,
Belagavi) DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavors

VISION OF THE DEPARTMENT

To establish excellence in Civil Engineering education through sustainable design and execution ethical innovation and applied research.

MISSION OF THE DEPARTMENT

1. To Impart education to design durable, resource-efficient structures using optimization design and lifecycle analysis to minimize environmental impact while maximizing service life.
2. To translate academic research into field-validated solutions through consultancy, training, structured testing programs and Institute industry partnerships.
3. To maintain uncompromising commitment to professional codes, public safety, and ethical practices in all design, innovation, and construction activities.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1: Graduates will thrive in civil engineering careers, leading construction, infrastructure, innovative technologies, and sustainable green building projects while advancing research and pursuing higher education.
- PEO 2: Graduates will demonstrate strong professional expertise in the broad spectrum of civil engineering knowledge and interdisciplinary areas.
- PEO 3: Graduates will be a team leader/effective team member with uncompromising commitment to professional codes, public safety, ethics and responsible innovation, achieving compliance with standards in practice.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).



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PROGRAM OUTCOMES (POs)

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.
9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies, and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

PSO1: Design and execute civil engineering systems, components or processes to meet project needs through sustainable design principles and lifecycle optimization.

PSO2: Apply professional civil engineering software tools to solve design challenges compliant with relevant codes and industry relevant outcomes.



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Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1 – conducted for 50 marks and reduced to 15 marks	15
CIE 2 – conducted for 50 marks and reduced to 15 marks	15
Activities as decided by course faculty	20
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20 (12+8)
SEE	50	20



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COURSE TYPES

Basic Science Course	BSC
Applied Science Course	ASC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Skill Development Course	SDC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC



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Ability Enhancement Course (Laboratory)	
25CVL307A	Skill Lab
25CVL307B	Sustainable Materials & Reinforcement Practices
25CVL307C	Python Programming for Civil Engineering
** The Ability Enhancement Course Laboratory can be offered either as a single compulsory course or as multiple elective options	
Note: Please refer to VTU scheme for different courses offered under AEC Laboratory	
TW & SL – Term Work and Self Learning	
TH/S - Total Hours per Semester	



FOURTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching & Learning Scheme					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	PCC	25CV401	Structural Analysis	42	0	0	48	90	50	50	100	3
2	IPCC	25CV402	Fluid Mechanics and Hydraulics	42	0	28	50	120	50	50	100	4
3	IPCC	25CV403	Concrete Technology	42	0	28	50	120	50	50	100	4
4	PCC	25CV404	Transportation Engineering	42	0	0	48	90	50	50	100	3
5	PCC	25CV405	Waste water Engineering	42	0	0	48	90	50	50	100	3
6	PCCL	25CV406	Highway Material Testing lab	0	0	28	2	30	50	50	100	1
7	AEC	25CV407X	Ability Enhancement Course Laboratory **	0	0	28	2	30	50	50	100	1
8	BSC	25CV408	Biology for Engineers	14	0	0	16	30	50	50	100	1
9	SDC	25EVS	Environmental Science Project	0	0	0	30	30	50	50	100	1
10	AEC	25PT2	Placement Training II	14	0	0	16	30	100	-	100	A
11	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	A
12	NCMC	25BCM301	Bridge Mathematics-I (Non-Credit Mandatory Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	A
Total												21

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Ability Enhancement Course (Laboratory)	
25CVL407A	Structural prototype Lab
25CVL407B	Water Distribution Network Modeling with EPANET Lab
25CVL407C	Total Station Application Lab
25CVL407D	Building Information Modelling Lab
** The Ability Enhancement Course Laboratory can be offered either as a single compulsory course or as multiple elective options	
Note: Please refer to VTU scheme for different courses offered under AEC Laboratory	
TW & SL – Term Work and Self Learning TH/S -	
Total Hours per Semester	



FIFTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching & Learning Scheme					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	IPCC	25CV501	Design and detailing of RC Structures	42	0	28	50	120	50	50	100	4
2	IPCC	25CV502	Geotechnical Engineering	42	0	28	50	120	50	50	100	4
3	PCC	25CV503	Advanced Structural Analysis	42	0	0	48	90	50	50	100	3
4	PCC	25CV504	Railway Harbour & Airport Engineering	42	0	0	48	90	50	50	100	3
5	PEC	25CV55X	Professional Elective Course - I	42	0	0	48	90	50	50	100	3
6	PCCL	25CV507	Environmental Engineering Laboratory	0	0	28	2	30	50	50	100	1
7	BSC	25RMIP	Research Methodology and IPR	42	0	0	48	90	50	50	100	3
8	AEC	25PT3	Placement Training III	14	0	0	16	30	50	50	100	1
9	SDC	25HBP	Hackathon-Based Project	0	0	0	30	30	50	50	100	1
Total												23

Total



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Professional Elective Course-I		
Course Code	Course Name	Vertical
25CV551	Repair and Rehabilitation of Structures	Construction Planning
25CV552	Structural dynamics	Structures
25CV553	Ground Improvement Techniques	Geotechnical
25CV554	Environmental Protection and Management	Environment
25CV555	Engineering Hydrology	Environment (Water Resources)
25CV556	Traffic Engineering and Road Safety Management	Traffic
25CV557	Remote Sensing and GIS	Traffic
25CV558	Life Cycle Assessment	Construction Planning
25CV559	Advanced Concrete technology and formwork systems	Construction Planning

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Professional Elective Course-II		
Course Code	Course Name	Vertical
25CV641	Numerical Methods in Civil Engineering	Structures
25CV642	Theory of Elasticity	Structures
25CV643	Occupational Safety and Health Assessment	Environment
25CV644	Solid Waste Management	Environment
25CV645	Green Buildings and Sustainable Development Goals	Environment
25CV646	Urban Design and Regeneration	Environment (Urban Planning)
25CV647	Groundwater Hydraulics, Development and Management	Environment (Water Resources)
25CV648	Transportation Economics and Intelligent Transport Systems	Traffic
25CV649	Modern Construction Methods and Mechanization	Construction Planning

Open Elective Course I		
Course Code	Course Name	Vertical
25OECV651	Composite and Smart Materials	Structures
25OECV652	Engineering optimization	Structures
25OECV653	Water Supply and Sanitation	Environment
25OECV654	Hazardous waste management	Environment
25OECV655	Water Resource Management	Environment (Water Resources)
25OECV656	Sustainability in Engineering System	Environment
25OECV657	Infrastructure Engineering	Traffic
25OECV658	Remote Sensing and GIS	Traffic
25OECV659	Urban Design and Regeneration	Environment (Urban Planning)

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Professional Elective Course - III		
Course Code	Course Name	Vertical
25CV741	Earthquake-Resistant Design of Structures	Structures
25CV742	Advanced Design of RC Structures	Structures
25CV743	Design of Bridges and Flyovers	Structures
25CV744	Reinforced Earth Structures	Geotechnical
25CV745	Air Pollution and Control	Environment
25CV746	Industrial Wastewater Treatment	Environment
25CV747	Pavement Analysis & Design	Traffic
25CV748	Urban Transportation Planning	Traffic
25CV749	Pre-Engineered Structures and Prefabrication	Construction Planning

Open Elective Course - IV		
Course Code	Course Name	Vertical
25OECV751	Engineering Optimization	Structures
25OECV752	Composite and Smart Materials	Structures
25OECV753	Sustainability in Engineering System	Environment
25OECV754	Water Supply & Sanitation	Environment
25OECV755	Environmental Impact Assessment	Environment
25OECV756	Hazardous waste management	Environment
25OECV757	Multimodal Transportation System	Traffic
25OECV758	Infrastructure Engineering	Traffic
25OECV759	Remote sensing and GIS	Traffic

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Community/Societal Project

A community is a social unit or group of people sharing socially significant characteristics, such as place, set of norms, culture, religion, values, customs or identity. A community project involves addressing issues or needs within such a community or a network of entities working towards a common purpose. These projects may cover a wide range of areas, including welfare, sustainability, technology integration, and social development. Examples include establishing and maintaining an orphanage, implementing solar power generation and its maintenance, or developing environmental improvement solutions, etc. A community project is an experiential learning activity that encourages students to identify, analyze, and address real-life problems of the community using engineering knowledge. It aims to promote social responsibility and civic engagement, interdisciplinary thinking and collaboration and practical application of theoretical concepts, thereby enabling students to contribute meaningfully to community welfare and sustainable development. Students can take up projects individually or in a group not exceeding 4 students.

Environmental Science Project

The Environmental Science Project is an applied learning component designed to develop students' awareness, understanding, and responsibility toward the environment. It provides an opportunity to study real-world environmental issues and apply scientific and engineering principles to design feasible and sustainable solutions. The topics under environment include, but not limited to, climate change, biodiversity, air and water pollution, land use, excess use of natural resources, earthquakes, rise in the earth's temperature, power generation, soil erosion, environment issues related programme, etc. The project involves problem identification, field surveys, case studies, data collection, environmental audits, analysis, and proposal of remedial or preventive measures aimed at improving biodiversity, air quality, and thermal comfort, etc. Students can take up projects individually or in a group not exceeding 4 students. Students can opt for Interdisciplinary Project based on their interest.

Hackathon Based Project

The term hackathon is derived from the combination of hack (referring to clever problem-solving, not illegal activity) and marathon, which denotes an arduous (i.e., difficult) intellectual task requiring sustained effort, endurance, and mental resilience. The meaning of a hackathon varies depending on the specific context and intent. In an academic context, a hackathon can be considered to involve several concepts, ranging from resourceful, unconventional approaches to problem-solving. Though a hackathon is an event, typically lasting for a few days to address a specific challenge, for academic purposes, it is conducted as a noncompetitive semester-long activity. The evaluation is done as and when the project is completed, by a panel of industry experts. The hackathons not only help participants develop skills like problem-solving, critical thinking, creativity, teamwork, communication and time management, but



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also foster indigenous technology development, promote innovation and entrepreneurship, and contribute to non-formal learning and skill enhancement. Students can take up a hackathon project individually or in a group of not exceeding 4 students.

The respective BoS will announce the problem statements in the beginning of the 5th semester. The topic selected can be discipline specific, interdepartmental, industrial, social (refers to immediate human relations, interactions, and individual behavior within a community), societal (describes larger, general issues, institutions, and structures that define society as a whole), environmental, health, financial, or innovative in nature, leading to development of a working prototype, application, or product. Hackathon projects are aligned with the principles of Outcome-Based Education (OBE) and support the objectives of innovation, skill development, and experiential learning in engineering education. Projects shall be evaluated by industry experts, based on creativity, problem-solving approach, teamwork, and possible implementation, as far as possible, as and when the project is completed.

Capstone Project

The Capstone project is a comprehensive, year-long project carried out in two phases during 6th and 7th semesters of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem.

This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution. It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up projects individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

Types of Capstone Projects: Capstone projects undertaken for one year may fall into one or more of the following categories:

a) Research-Oriented Projects

- Focus on investigating new concepts, theories, or technologies.
- Aim to generate new knowledge or contribute to academic research.

b) Experimental/Analytical Projects

- Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
- Including detailed data collection, analysis, and interpretation.

c) Simulation/Modelling Projects

- Use computational tools to model, simulate, and predict system behavior.
- Reduce the need for physical prototyping in the initial stages.

d) Industrial/Industry-Sponsored Projects

- Carried out in collaboration with an industry partner, address real-world engineering problems faced by the organization.

e) Interdisciplinary/Multidisciplinary Projects



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- Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.

f) Entrepreneurial/Innovation Projects

- Focus on product or service innovation with potential for commercialization.
- Include aspects of market analysis, cost estimation, and business planning.



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Course Title	STRENGTH OF MATERIALS		
Course Code	25CV301	(L-T-P) C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48 TW&SL=90
Course Objective: To understand how solid materials behave under various types of forces and loads. Course Outcomes: At the end of course, student will be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Comprehend the basic properties of materials and behavior of materials under load with basics of structural mechanism.	PO1, PO2, PO3	
CO2	Calculate the Bending Moments & Shear Forces for given statically determinate beams subjected to different types of loads and support conditions. Understand the behavior of long and short columns and to calculate their load carrying capacities under axial loading	PO1, PO2, PO3	
CO3	Calculate the bending stresses and shear stresses for a given beam of symmetric cross sections and represent the variation of fiber stresses and shear stresses in diagrams.	PO1, PO2, PO3, PO4	
CO4	Compute the deflection of statically determinate beams for various loads and support conditions and understand the concept of compound stresses and the applications of the same in 2-D problems.	PO1, PO2, PO3, PO4	
MODULE-1			12 Hrs
Simple Stresses and Strains: Introduction, Assumptions, Properties of materials, Types of stresses and strains, definition and units, Hooke's law, Poisson's ratio, volumetric strain, elastic constants and the relationship among them, Stress-Strain diagrams for ferrous and non-ferrous materials, FRP Bars and Prestressing Strands, Bars of varying cross sections -Tapering bars of circular and rectangular cross – sections, Elongation due to self-weight, Analysis of composite sections, thermal stresses including compound bars.			
Self-Study Component: <i>Learn to distinguish ferrous and non-ferrous materials, composite sections and concept of loading and stress.</i>			



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MODULE-2	10 Hrs
Bending moments and shear forces: Statically determinate beams, Definition of shear force and Bending moment, Sign conventions, Relationship between intensity of loading, shear force and bending moment. S.F and B M diagrams for cantilever, simply supported and over-hanging beams subjected to point loads UDL, UVL and Couples. Stresses in Beams - Bending stresses in beams: Introduction, Pure bending, Assumptions in simple bending theory, Bernoulli's Beam bending equation, Modulus of rupture, Section modulus, Flexural rigidity, Beam of uniform strength, Bending stress distribution in rectangular, circular, I,T and channel sections (symmetric about one) <i>Self-Study Component: Students shall work out Bending moment and shear force diagrams for typical loading of structural components. They shall also learn to estimate the bending stresses developed in the structural components</i>	
MODULE-3	10 Hrs
Shear stresses in beams: Introduction, Expression for shear stress intensity, Shear stress distribution in rectangular section, Circular, I, T and channel sections, Numerical examples (symmetric about one axis). Torsion of Circular Shafts: Introduction, Application of torsion in civil engineering, Assumptions, Equation for torsional shear stress in prismatic bar of circular cross-section, Strength and Stiffness, Torsional rigidity and Polar modulus, Power transmitted by solid and hollow circular shafts, Numerical examples. <i>Self-Study Component: The students shall work out shear stress distribution for typical singly symmetric Cross sections. Torsional stresses in circular shafts and principal stresses and principal planes due to the action of torsional moment and bending moment shall be worked out for typical cases of distribution of torsional moment and bending moment.</i>	
MODULE-4	10 Hrs
Flexure of Beams : Definition of slope and deflections, Differential equation of flexure, Sign conventions, Expressions for slope and deflection for standard loading cases using (a) Double Integration method and (b) Macaulay's method for prismatic beams. Examples on cantilever beams, simply supported beams and overhanging beams carrying point loads, UDL. Columns and Struts: Introduction, Short and long columns, Concept of Stability of Columns, Euler's theory of long columns, Derivations, Assumptions and limitations, Radius of gyration, Effective length, Slenderness ratio, Buckling load (concepts of stability of structures), Rankine's formula and its applications. <i>Self-Study Component: The students shall learn the importance of flexure by visiting sites of construction and workout slope & deflections in structural elements due to typical loading cases. The students shall calculate the buckling loads for long columns with different end conditions and hence understand the importance of end conditions in the buckling behaviour of columns.</i>	



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Strength of Material	S. Ramamrutham and R. Narayanan	20	Dhanpat Rai Pub. New Delhi	2020
2	Strength of Materials	Thimoshenko and Young	3	CBS Publisher and Distributor	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Analysis of Structures”	Vazirani and Ratwan	Vol 1	Khanna Publishers	2002
2	“Strength of Materials”	SS Bhavikatti	Fourth	Vikas Publishing House	2018

EBooks and online course materials:

1. https://onlinecourses.nptel.ac.in/noc24_me145/preview

Online Courses and Video Lectures:

1. [Preview: Strength Of Materials - IITM | SWAYAM](#)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):



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Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) On-Site Construction Material Testing and Report submission 2) Problem-Based Learning (PBL) Activity	20
Total		50

Activity Based Learning (27 Hours)

ABL1 (20 Hours) : Activity 1 Details		Hours
1.	a. Field Visit for sourcing the materials	10
	b. Report	10
Total		20
ABL2 (7 Hours): Activity 2 Details		Hours
2.	a. Numerical Problems solving application to site conditions	2
	b. Assignment submission-Solution of Numericals	5
Total		7



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ABL1 (20 Hours): Activity 1 Details		Hours
1.	Identify the physical and mechanical differences between ferrous and non-ferrous materials listing out their typical applications in engineering structures.	2
2.	Identify the behavior of composite materials and how composite sections respond under axial loading.	3
3.	Understand the concept of thermal stress and evaluate its effects in compound bars subjected to temperature variation.	1
4.	Draw Shear Force (S.F) and Bending Moment (B.M) diagrams for cantilever, simply supported, and overhanging beams subjected to point loads, uniformly distributed loads (UDL), uniformly varying loads (UVL), and couples.	4
5.	Develop proficiency in estimating section modulus and flexural rigidity for beams under bending.	4
6.	Analyze the development of torsional stresses in solid and hollow circular shafts and apply relevant equations to calculate stiffness and power transmission.	2
7.	Determine shear stress distribution for standard symmetric cross-sections subjected to transverse loads.	4
Total		20
ABL2 (7 Hours): Activity 2 Details		Hours
8.	Work out deflection and slope in prismatic beams using double integration and Macaulay's method for various loading conditions.	2
9.	Visit construction sites (or refer to case studies) to observe real-world structural deflections and correlate theoretical findings.	2
10.	Compute buckling loads for columns with various end conditions using Euler's and Rankine's methods, and understand the importance of slenderness ratio and effective length in structural stability.	3
Total		07

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1 and 2)	3
Activity Evaluation	1
Semester End Exam	3
Total	7



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Course Title	ENGINEERING SURVEYING		
Course Code	25CV302	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	100 Marks	Total Hours	42L+28P+50TW&SL=120

Course Objective:

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concepts of surveying to field practice.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the knowledge of fundamentals of surveying to determine the relative position of points in the horizontal plan.	PO1, PO2	
2	Apply the knowledge of fundamentals of surveying to calculate the relative position of points in vertical plan	PO1, PO2	
3	Comprehend the knowledge of working principle and system of measurements in EDM	PO1	
4	Apply the knowledge surveying to set out simple, compound and reverse curves.	PO1, PO2	

MODULE-1

12 Hrs.

Introduction - Definition and Importance of survey, Classification of survey. Principles of survey. Classification of maps, Units of measurements, Conventional symbols.

Chain surveying - Accessories used in chain survey, Ranging, Reconnaissance survey, Field book, Index sketch, Errors, Map numbering system. Problems with a well-conditioned triangle.

Compass surveying - Basic definitions, Prismatic and Surveyor's compasses, Traversing, Declination, Quadrantal bearings, Whole circle bearings, Local attraction, and related problems

Total station Survey - EDM devices and their working principles, Coordinates system of measurements, Temporary adjustment of Total station, Parts of total station, Accessories.

Self - study component: *Students shall study the various maps and drawings in surveying*



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MODULE-2	10 Hrs..
Leveling – Objectives and uses of leveling, Definitions and Terms used in leveling, Types of levels, Correction to Curvature and Refraction, Calculation of RL by HI method and Rise and fall method, Fly leveling and Profile leveling, Numerical problems. Contouring – Definition and Uses, Characteristics of contours, Methods of contouring, Interpolation of contours, Contour gradient <i>Self-study component: Students shall visit the ongoing project of water supply and highway.</i>	
MODULE-3	10 Hrs..
Theodolite Survey - Theodolite and types, Fundamental axes and Parts of a transit theodolite, Uses of theodolite, Temporary adjustments of a transit theodolite, Measurement of horizontal angles using Repetition and Reiteration methods – Measurement of vertical angles. Trigonometric Levelling - Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method – Distance and difference in elevation between two inaccessible objects by double plane method, and related problems <i>Self-study component: Students shall study the advanced survey techniques</i>	
MODULE-4	10 Hrs.
Curves - Necessity, types of curves, simple curves – elements, designation of curves, Simple curves - elements – setting out of simple curves by linear methods and method of Rankine's deflection angles. Compound curves - elements – setting out of compound curves. Reverse curve - between two parallel straights – equal radius – unequal radius. <i>Self-study component: Students shall visit the ongoing highway projects.</i>	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Surveying Vol 1 & 2	Punmia B. C	18th	Laxmi Publications, Pvt. Ltd, New Delhi	2016
2	Surveying	Bassak N. N	2nd	Tata McGraw Hill	2017



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Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Surveying	Roy. S. K.,	2nd	Prentice Hall of India,	2010
2	Surveying and Levelling	S. S. Bhavikatti,	2nd	International publishing house Pvt.	2018

EBooks and online course materials:

1. <https://archive.nptel.ac.in/courses/105/107/105107122/>

Online Courses and Video Lectures:

2. https://onlinecourses.nptel.ac.in/noc22_ce05/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	26
6	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Profile & Cross-Sectional Levelling, Gradient Setting, and Earthwork Quantity Estimation Using Manual and AutoCAD Methods 2) Setting Out of a Site plan using Total Station	20
Total		50

Laboratory Plan (if integrated course):

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100



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Lab Program	Program Details
1	Field experiments to set out perpendiculars at various points on a given line using cross staff and tape.
2	Direct Ranging operations.
3	Area Calculation by Direct ranging and Setting out Perpendiculars.
4	Indirect Ranging operations.
5	Measurement of bearing of the sides of a closed traverse.
6	Profile and Cross section Levelling to draw the Longitudinal and Cross section of highway.
7	Block Levelling for preparation of Contour Plan.
8	Determine the Horizontal angle between the points by Repetition method.
9	Determine the Horizontal angle between the points by Reiteration method.
10	Single Plane method using Theodolite.

PART B	
1	Plan and set out perpendicular offsets for a given site using suitable surveying instruments and evaluate the accuracy of the layout.
2	Perform direct ranging on varying terrain and determine the most accurate method for aligning survey stations.
3	Survey a field using direct ranging and perpendicular offsets, then estimate the area and compare it with an alternative method.
4	Carry out indirect ranging on obstructed terrain and assess the accuracy of the established alignment.
5	Conduct a closed traverse , measure bearings, identify closing errors, and suggest suitable corrections.
6	Prepare the longitudinal and cross-sectional profile of a selected road alignment and recommend improvements based on the terrain.
7	Develop a contour plan of a selected site using block levelling and identify suitable locations for civil engineering works.



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8	Measure horizontal angles using the repetition method and evaluate the effect of repeated observations on accuracy.
9	Determine horizontal angles using the reiteration method and compare the results with the repetition method.
10	Set out a horizontal angle using the single-plane theodolite method for a given engineering application and assess the precision of the layout.



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Activity Based Learning (26 Hours)

ABL1 (13 Hours): Activity 1 - Survey of a Proposed Road Alignment		Hours
1.	Reconnaissance survey, selection of alignment, establishment of Bench Mark (BM) and Temporary Bench Marks (TBM).	01
2.	Setting out the centre line and marking chainages at regular intervals.	01
3.	Conduct profile (longitudinal) leveling and record observations in the field book.	02
4.	Conduct cross-sectional levelling at specified chainages and record observations.	02
5.	Reduce Levels (RLs) and prepare the longitudinal profile and cross-sections manually.	02
6.	Plot the longitudinal profile and cross-sections using AutoCAD.	02
7.	Design and set the proposed road gradient based on engineering standards.	01
8.	Compute cutting and filling quantities using the Average End Area Method, cross check using Auto CAD and prepare the earthwork report.	02
Total		13
ABL2 (13 Hours): Activity 2 - Preparation of Topographic Plan using AutoCAD		Hours
1.	Introduction to Total Station, identification of parts, instrument setup, centering and leveling.	02
2.	Orientation of the instrument and establishment of a reference station.	01
3.	Measurement of horizontal distance, vertical angle, and elevation of selected points.	02
4.	Collection of coordinates of ground features using Total Station.	03
5.	Download and process the survey data using Total Station software/AutoCAD.	02
6.	Preparation of a simple site plan in AutoCAD and submission of the survey report.	03
Total		13



Type of Evaluation	Hours
Test (1 and 2)	3
Laboratory Conduction	1
Lab Test	3
Semester End Exam	3
Total	10

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Course Title	ENGINEERING GEOLOGY, BUILDING MATERIALS AND COMPONENTS		
Course Code	25CV303	(L-T-P) C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48TW&SL=90

Course Objective:

1. Study and identify different types of natural materials like rocks & minerals and soil.
2. Give students a clear understanding on structural functions and role of materials to achieve that

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify varieties of minerals and rocks based on structure and composition	PO1	
2	Apply your knowledge in various construction materials, for sustainable and innovative building solutions.	PO1	
3	Analyze modern construction materials designed for energy efficiency and sustainability	PO2	
4	Assess the properties of building materials & components to compare it to quality standards	PO9, PO10	

MODULE-1

10 Hrs

Application of Geology in Civil Engineering Practices, Understanding the earth, internal structure and composition. Introduction to the Seismic zone. Classification of Rocks, Igneous Rocks, Sedimentary Rocks and Metamorphic Rocks of their properties with examples; Deformation and faults in rocks.

Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos; Carbonate Group (Cement); Gypsum (POP, gypsum sheets, cement); Silica Group; Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite(aluminum); Chalcopyrite(copper).

Self- study component: *The students shall visit sites and learn to identify different types of rocks and minerals and study their performance.*

MODULE-2

10 Hrs.



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Stones: Varieties of building stones, qualities of good building stones, dressing of stones, selections and suitability of stones, uses of stones, decay and preservation of stones, quarrying of stones, Testing of Stones. Bricks Qualities of brick making earth, standard specifications, properties and testing of bricks Solid and hollow blocks, stabilized mud blocks, aerated blocks, rammed earth, reinforced brick work. Different types of masonry bonds - English, Flemish. <i>Self- study component: The students shall visit construction sites and learn to identify different types of Masonry units, bonds in masonry and study their performance</i>	
MODULE-3	10 Hrs
Staircases: Types, Empirical design of doglegged staircase and open well staircase Location of doors, size of doors and door frames, types of doors and windows, ventilators Form work: Material for formwork, types of form work, shuttering and scaffolding details in RCC columns, beams and floors <i>Self- study component: The students shall visit the construction sites and identify various types of doors.</i>	
MODULE-4	12 Hrs
Lintel its types and uses in buildings, Plastics: Types, constituents of plastic, properties, uses of plastics in building industries Timber: Properties, defects and uses; plywood and its applications. Paints, Varnishes and Distempers: Constituents of oil paint, characteristics of a good paint, types of paints, Varnishes – constituents of varnishes – types of varnishes, Distemper and application to new and old surfaces. Surface preservatives - metallic coating by hot dipping. Glass and its application in Civil Engineering. Properties and application of modern insulation materials in residential buildings Aerogel Vacuum Insulation Panels (VIPs) for building construction industry utilization of FRP composites in the civil infrastructure Composite Ferrocement System: s, Precast Concrete Blocks: Laminated Thermoplastic Panels <i>Self- study component: The students shall visit the construction site and must identify the new construction materials and study their performance</i>	



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Engineering & General Geology [paperback]	Parbin Singh	Eighth edition	Katson educational series	[2020]
2	“Building Construction”,	B.C. Punmia	Twelfth Edition	Laxmi Publications, New Delhi,	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Building Construction”,	P.C. Varghese.	2nd edition	Prentice Hall of India, New Delhi,	2017
2	“Building Construction”,	Sushil Kumar,	20th edition,	Standard Publishers & Distributors, New Delhi,	2023
3	IS 2185 Concrete masonry units:		Fourth edition		2005
4	IS 1077-1992 COMMON BURNT CLAY BUILDING BRICKS-SPECIFICATION		Fifth edition		2005

EBooks and online course materials:

1. <https://www.classcentral.com/subject/construction-materials>
2. <https://testbook.com/civil-engineering/building-materials-uses>



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Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_ce107/preview
2. https://onlinecourses.nptel.ac.in/noc20_ar04/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 3) Assignment 4) Regular short quizzes conducted for each module for understanding of the most recent concepts.	20
Total		50



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Activity Based Learning (27 Hours)

ABL1 (14 Hours): Activity 1 Details		Hours
1.	Field Visit	8
2	Report	6
Total		14
ABL2 (13 Hours): Activity 2 Details		Hours
1	1.Presentation	3
	2.Assignment	10
Total		13

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1 and 2)	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2												
CO2	3												
CO3		3											
CO4									2	2			



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Course Title	WATER SUPPLY AND TREATMENT ENGINEERING		
Course Code	25CV304	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs	Hours / Week	03
SEE	100 Marks	Total hours	42L+48TW&SL=90
Course Objective: 1. Study drinking water quality standards and to illustrate qualitative analysis of water 2. Understand and design of different unit operations and unit process involved in water treatment process			
Course Outcomes:			
#	Course outcomes	Mapping to POs	Mapping to PSOs
CO1	Estimate average and peak water demand for a community.	PO1, PO2	-
CO2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choices for a community.	PO1, PO6	-
CO3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system	PO1, PO2	PSO1
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.	PO1, PO2,	PSO1
MODULE-1			12 Hrs.
Introduction: Need for protected water supply, Factors affecting water supply scheme and benefits. Demand Of Water: Types of water demands - domestic demand, institutional and commercial, public uses, fire demand. Factors affecting per-capita demand, variations in demand of water, Peak factor, Design periods and factors governing the design period. Different methods of Population forecasting. Fire demand - Estimation by Kuichling's formula, Freeman formula and National Board of Fire UnderWriters formula. Water Treatment: Objectives and Treatment flowchart – significance of each unit. Sources: Concept of hydrological cycle, Surface and subsurface sources - suitability with regard to quality and quantity. Factors governing the selection of a particular source of water. Self-Study Component: <i>Forecast the future population and design water supply scheme for hassan city.</i>			



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MODULE-2	10 Hrs.
Quality of Water: Concept of safe water: wholesomeness, palatability and potability. Waterborne diseases including Health significance of Fluoride and Nitrates. Examination of water: Objectives, Physical, Chemical and Microbiological Examinations using analytical & instrumental techniques. Drinking water standards: BIS & WHO standards. Numerical problems on pH and MPN. Collection and Conveyance of Water: Intake structures - different types of intakes; factors for the selection and location of intakes. Pumps - Necessity, types, power of pumps, factors for the selection of a pump. design of the economical diameter for the rising main. <i>Self-Study Component: Visit nearby intake structure and submit a detailed report on it.</i>	
MODULE-3	10 Hrs
Aeration – Principle and types of aerators. Sedimentation: Theory, settling tanks, types and design. Aided sedimentation- with coagulants, dosages, chemical feeding, flash mixing and flocculates. Filtration: Mechanism - theory of filtration, types of filters- slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design (excluding under drainage system and backwashing of filters). Disinfection: Definition, Requirements, methods of disinfection, Chlorination, chlorine demand, residual chlorine. <i>Self-Study Component: Students shall visit nearby water treatment plants and study various treatment techniques adopted and shall submit a report of their observations</i>	
MODULE-4	10 Hrs
Softening: Definition, methods of removal of hardness by lime soda-process and zeolite process with merits and demerits. Miscellaneous treatment: Removal of colour, odour and taste with methods like aeration, use of copper sulphate, activated carbon treatment, oxidizing organic matters, removal of iron and manganese. Fluoridation and defluoridation. RO and Nanofiltration. Distribution Systems: System of supply, service reservoirs and their capacity determination, distribution systems of layouts. Water Conservation – Rain Water Harvesting. <i>Self-Study Component: Design a simple rainwater harvesting layout for a household.</i>	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Engineering: Volume I – Water Supply Engineering	Santosh Kumar Garg	28	Khanna Publisher	2022
2	Water Supply Engineering	B. C. Punmia, Arun Kumar Jain, Arun Kr. Jain	10	Laxmi Publications	2022



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Water and Wastewater Technology	Mark J. Hammer & Mark J. Hammer Jr.	VII	Pearson Education	2012
2	CPHEEO Manual on water supply and treatment engineering,	Ministry of Urban Development, Government of India, New Delhi,	III	Akalank Publications	2019

EBooks and online course materials:

1. https://www.google.co.in/books/edition/Water_Supply_Engineering/74HYY31zwhQC?hl=en&gbpv=0

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc21_ce3

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1. Group Activity - Field visit and report submission 2. Quiz	20
Total		50

Activity Based Learning (27 Hours)

ABL1 (25 Hours) : Field Visit and Report Submission - Group Activity		Hours
1	Design a water supply scheme for a Hassan City	05
2	Visit a nearby Intake structure and submit a detailed report	05
3	Visit nearby water treatment plants and study various treatment techniques adopted and shall submit a report of their observations	05
4	Design a simple rainwater harvesting layout for a household	05
5	Submit a report on the concept of different colour coded caps in packaged drinking water bottles	05
Total		25
ABL2 (02 Hours): Activity 2 Details		Hours
1	Assignment	01
2	Quiz	01
Total		02



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1 and 2)	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3											
CO2	3					2							
CO3	2					3							
CO4	3					3							



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Course Title	BUILDING PLANNING & DRAFTING		
Course Code	25CV305	(L-T-P) C	(1-0-2) 2
Exam	3 Hrs	Hours/Week	03
SEE	100 Marks	Total Hours	14 L+28P+18TW&SL=60

Course Objective: Understand the principles of building planning, building bye-laws and drafting standards.

1. **To introduce** the principles of building planning, building bye-laws, and drafting standards.
2. **To familiarize** students with space planning, functional zoning, and circulation concepts in building design.
3. **To provide knowledge** of preparing Building drawings of residential and public buildings.
4. **To develop proficiency** in the use of CAD tools for professional building drafting.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the principles of building planning, building bye-laws and drafting standards in the design and preparation of building drawings.	PO3, PO7	
2	Develop bubble diagrams and conceptual building layouts based on user requirements.	PO5, PO6	
3	Design and prepare building drawings of residential and public buildings.	PO3, PO9	
4	Develop building drawings using Computer-Aided Drafting (CAD) software.	PO5	

MODULE I	3 Hrs
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Introduction to Building Planning and Drafting:

Introduction to building drawing and drafting. Principles of building planning. Building orientation, site selection and building bye-laws. Space standards and planning norms. Building components and their functions. Design process in building planning. Client requirements and space programming. Bubble diagrams and relationship diagrams. Functional zoning. Set-back distances and calculation of carpet area, plinth area and Floor Area Ratio (FAR).

Self Study Component:

Case Study of a Residential Building: Study a residential building in your locality and identify its orientation, setbacks, building components, circulation pattern, carpet area, plinth area, and FAR. Prepare a brief report with sketches.



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MODULE 2	4 Hrs
Computer-Aided Building Drafting Introduction to Computer-Aided Drafting (CAD) and the drafting environment. Coordinate systems and drawing setup. Layers, object properties and templates. Drawing and editing commands. Text, dimensions, hatching and annotations. Blocks, attributes and reusable components. Plotting, layouts and printing standards. Preparation of complete Building drawings, including plans, elevations, sections and service layouts using CAD software. Self Study Component: CAD Interface and Command Reference: Explore the CAD software interface and prepare a handbook listing the commands available in the Draw, Modify, Annotation, Layers, Blocks, Properties, View, Utilities, and Output panels (Ribbon/Menu). Include the purpose and application of each command with sketches.	
MODULE 3	3 Hrs
Building Design Development: Design development from concept to building layout. Planning and design of residential and public buildings. Preparation of floor plans, elevations and sections. Preparation of area statements, schedules of openings and circulation analysis. Self Study Component: Prepare bubble and line diagrams for any one building on the college campus (e.g., Library, Administrative Block, Department Building, Canteen etc based on its functional requirements.	
MODULE 4	4 Hrs
Building Services – Electrical, Water Supply & Sanitary Systems Introduction to building services. Electrical planning for residential buildings, standard electrical symbols, lighting and power layouts. Water supply and sanitary systems, plumbing and sanitary symbols, and preparation of electrical, water supply, and sanitary layout drawings using standard drafting practices. Self Study Component: Building Services Documentation: Visit a residential or public building and document the electrical layout, water supply system, sanitary fixtures, plumbing network and standard symbols used. Prepare a labelled sketch and short report.	
Laboratory Exercises	28 Hrs



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1.(a) Floor Plan of a Single-Storeyed Building:

Prepare the detailed floor plan of a single-storeyed residential building using CAD tools from the given single-line diagram, incorporating the required building components and complying with the applicable building bye-laws.

1.(b) Elevation of a Single-Storeyed Building:

Develop the front elevation of the single-storeyed residential building using CAD tools based on the prepared floor plan and appropriate architectural and drafting standards.

2. Sectional Details of a Single-Storeyed Building:

Prepare suitable sectional details of the single-storeyed residential building using CAD tools, showing the foundation, plinth, floor, walls, openings, roof, and other relevant building components.

3.Floor Plan of two Storeyed Building:

Prepare the detailed floor plan of a double-storeyed residential building using CAD tools from the given single-line diagram, incorporating building components and complying with applicable building bye-laws.

4.Elevation of two Storeyed Building:

Develop the elevation of the double-storeyed residential building using CAD tools and prepare the schedule of openings, including doors, windows, and other relevant details as per drafting standards.

5. Sectional Details of two Storeyed Building:

Prepare the sectional details of the double-storeyed residential building and develop the furniture layout using CAD tools, ensuring proper representation of building elements.

6.Floor Plan of Public Building: Prepare the detailed floor plan of a public building (e.g., school) using CAD tools based on the given single-line diagram, incorporating functional spaces and standard drafting practices.

7. Elevation and Schedule of Openings of Public Building:

Develop the elevation of the public building using CAD tools and prepare the schedule of openings, including doors, windows, and other relevant architectural details.

8.Sectional Details Public Building

Prepare the sectional details of the public building using CAD tools based on the given single-line diagram, showing important building components and construction details.

9. Electrical Layout of a Building

Prepare the electrical layout of a building using CAD tools based on the given single-line diagram, incorporating standard electrical symbols, lighting points, power points, and drafting conventions.

10.Water Supply and Sanitary Layout of a Building

Prepare the water supply and sanitary layout of a building using CAD tools based on the given single-line diagram, incorporating standard plumbing symbols, fixtures, pipe arrangements, and drafting practices.



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1.Introduction to Computer-Aided Drafting (CAD) Tools, Drafting Environment and Commands

1.Introduction to CAD tools and drafting environment, including basic drawing setup, coordinate systems, layers, object properties, and essential CAD commands for creating and modifying drawings.

2.Manual Preparation of Residential Building Drawings and Area Calculations

Prepare the plan, elevation, and sectional details of a single-storeyed residential building using paper and pencil based on the given single-line diagram, incorporating the prescribed setback distances and calculating the carpet area, plinth area, and Floor Area Ratio (FAR).

3.Manual Preparation of Double-Storeyed Residential Building Drawings

Prepare the plan, elevation, and sectional details of a double-storeyed residential building using paper and pencil based on the given single-line diagram, incorporating the schedule of openings and adhering to standard drafting practices.

4.Functional layout for a Primary Health Centre by developing suitable bubble diagrams and line diagrams based on the given space requirements and functional relationships.

5.Functional layout for Engineering Office by developing bubble diagrams and line diagrams based on the given space requirements, functional relationships, and workflow.

6.Functional Layout college canteen line diagram by developing bubble diagrams and line diagrams based on the given space requirements, functional relationships, and workflow.

7.Plan a Smart and Comfortable Classroom

Develop a functional classroom layout considering student seating, teacher space, board location, circulation, natural lighting, ventilation, accessibility, and suitable locations for electrical facilities.

8.Redesign a HOD Chamber Plan

Study the HOD Chamber plan and redesign it to improve circulation, privacy, lighting, ventilation, furniture arrangement, and functional zoning. Present the “Before and After” layouts with a brief justification.

9.Alternative Layout Development for a Residence

Develop and compare two alternative floor-plan layouts for a given residential building requirement. Select the suitable layout based on functional zoning, circulation, privacy, and space utilization

10.Planning of a Barrier-Free Public Building

Develop a classroom layout incorporating universal design principles such as ramps, accessible toilets, wider circulation spaces, and user-friendly movement.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Building drawing with an integrated approach to Built Environment Drawing”	MG Shah, CM Kale, SY Patki,	6th edition ISBN: 978-9389538137.	Tata Mc Graw Hill Publishing co. Ltd., New Delhi	2020
2	“Building Construction”	Gurucharan Singh,	17th edition	Standard Publishers, & distributors, New Delhi.	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	National Building Code”,			BIS, New Delhi,	2025
2	CAD lab Manual, Department of Civil Engineering, MCE				2025

EBooks and online course materials:

1. [https://Engineering drawing and computer graphics - Course \(nptel.ac.in\)](https://Engineering drawing and computer graphics - Course (nptel.ac.in))

Online Courses and Video Lectures:

1. <https://youtu.be/5SUchhTEvNQ?si=eUy54l5edaNjrZ8Z>
2. https://youtu.be/1p4i2OKGJeM?si=yLdRwu-wgY_DRhrw



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	1	14	14
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	04
6	Evaluation of Learning Process	-	-	
Total Learning Hours/Semester				60

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Continuous Evaluation in every lab session	10
CIE	Two lab CIE conducted with theory and lab component	20
CIE	Report submission (CAD Drawing Printouts)	20
Total		50



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Activity Based Learning (02 Hours)

ABL1 (01 Hour): Activity 1 Details		Hours
Objective : COMapping : CO1, CO4 To understand the application of building bye-laws and planning regulations through the evaluation of an existing building.		
Activity Description: Students, in groups, will assess a residential or institutional building for compliance with building bye-laws by examining orientation, setbacks, circulation, FAR, and open spaces. They will identify deviations, if any, and report with drawings in CAD.		
Submission: ● Observation checklist ● Sketches/photographs ● Brief report ● Group slide presentation (5 nos)		
Learning Outcome: Students will be able to evaluate existing buildings for compliance with building planning principles and bye-laws.		
Total		02
ABL2 (01 Hours): Activity 2 Details		Hours
Conceptual Planning and CAD Development for Civil Engineering Block Extension. CO2, CO4		
Objective: To develop conceptual building planning and CAD drafting skills based on user requirements.		
Activity Students, in groups, will identify the space requirements for an extension to the Civil Engineering Block on the college campus. Based on the identified requirements, they will prepare a bubble diagram, line diagram , and a CAD drawing of the proposed building layout.		Description:
Submission: ● Requirement analysis ● Bubble diagram ● Line diagram ● CAD drawing ● Group slide presentation (5 nos)		
Learning Students will be able to transform user requirements into conceptual layouts and develop professional building drawings using CAD.		Outcome:
Total		02



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE	4
Viva voce	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1			2				2						
CO2					3	2							
CO3			3						2				
CO4					3								



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Course Title	BUILDING MATERIALS TESTING LAB		
Course Code	25CV306	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=30

Course Objective:

1. Perform standard laboratory tests on engineering materials and to determine their mechanical properties.
2. Analyze and interpret the experimental results to evaluate the behavior of engineering materials and compare the obtained properties with theoretical values and relevant IS standards.

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

#	Course Outcomes	Mapping to PO's	Mapping to POS's
CO1	Perform tensile, compression, shear, torsion, hardness, impact, bend, and rebend tests on ferrous and non-ferrous materials following standard laboratory procedures.	PO1, PO2, PO4, PO5	
CO2	Determine and analyze the mechanical properties of engineering materials, including strength, hardness, toughness, ductility, stiffness, and torsional behavior, from experimental test results.	PO1, PO2, PO4	
CO3	Evaluate the structural behavior of engineering materials and wooden beams under different loading conditions by interpreting experimental data and comparing the results with standard specifications and theoretical concepts.	PO1, PO2, PO4	

Part-A

Lab Program	Program Details
1	Tension test on mild steel specimen and Reinforcing bars, bend and Rebend Tests
2	Compression test on mild steel and Cast-Iron specimen.
3	Compression test on Concrete cube.
4	Shear test on cast iron specimen
5	Hardness tests on Ferrous metals– Brinell's apparatus



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6	Hardness tests on Non-ferrous metals– Brinell’s apparatus
7	Split Tensile Strength of Concrete Using Cylinder Specimen
8	Compression test on Brick
9	Compression test on cement mortar cube.
10	Demonstration of Strain Gauges.
Part-B	
Lab Program	Program Details
1	Impact test on Mild Steel (Charpy apparatus).
2	Impact test on Mild Steel (Izod apparatus).
3	Torsion test on Mild Steel circular section (Vertical torsion tests).
4	Torsion test on Mild Steel circular section (Horizontal torsion tests).
5	Experimental Investigation on Flexure Test on Wood under point load condition parallel to the plane.
6	Experimental Investigation on Flexure Test on Wood under point load condition perpendicular to the plane
7	Compression test on tile.
8	Determination of Young's Modulus Using a Tensometer.
9	Demonstration of Universal Testing Machine (UTM)
10	Demonstration on LVDT.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Strength of Materials	B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain	Latest Edition	Laxmi Publications, New Delhi	2022
2	Strength of Materials	S. S. Bhavikatti	Latest Edition	Vikas Publishing House Pvt. Ltd., New Delhi	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Strength of Materials (Mechanics of Solids)	R. K. Rajput	Latest Edition	S. Chand & Company Ltd., New Delhi	2022
2.	Strength of Materials	R. Subramanian	3rd Edition	Oxford University Press, New Delhi	2017

EBooks and online course materials:

1. [Mechanics of Materials \(Roylance\) - Engineering LibreTexts](https://nptel.ac.in/courses?searchQuery=Strength+of+Materials&utm_source)
https://nptel.ac.in/courses?searchQuery=Strength+of+Materials&utm_source

Online Courses and Video Lectures:

1. https://ocw.mit.edu/search/?q=Mechanics+of+Materials&utm_source
2. https://nptel.ac.in/courses?searchQuery=Strength+of+Materials&utm_source



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100



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Course Title	SKILL LAB		
Course Code	25CVL307A	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=30

Course Objective:

1. To enable students to comprehend and interpret civil engineering drawings.
2. To impart knowledge of building components, detailing techniques, NBC provisions.

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

COs	Course Outcomes	Mapping to PO's	Mapping to POS's
CO1	Interpret architectural and structural drawings including plans, elevations, sections, and detailing techniques.	PO1, PO3	PSO2
CO2	Apply basic NBC provisions to identify building components and check simple residential drawings for compliance.	PO1, PO3	PSO2
CO3	Prepare simple building sketches and demonstrate practical understanding through lab-based activities	PO1, PO3	PSO2

Part A: Fixed Experiments

14 Hrs

1. Study of National Building Code (NBC) provisions related to residential buildings including setbacks, ventilation, lighting, room sizes, sanitation, and fire safety.
2. Study and interpretation of standard drawing sheet layout including sheet size, title block, scale, symbols, line types, dimensioning, and units of measurement.
3. Study and interpretation of a residential site plan showing plot dimensions, orientation, setbacks, access road, and site features.
4. Study and interpretation of architectural floor plans including room layout, doors, windows, circulation, and space planning.
5. Study and interpretation of building elevations showing architectural features, floor levels, openings, and external appearance.
6. Study and interpretation of building sections showing foundation, plinth, floor levels, roof, and structural components.
7. Study and interpretation of structural drawings including foundation, column, beam, slab, and reinforcement detailing.
8. Study and interpretation of Mechanical, Electrical, and Plumbing (MEP) drawings used in residential buildings.
9. Checking residential building drawings for compliance with selected National Building Code (NBC) provisions.
10. Preparation of a complete residential building drawing sheet incorporating site plan, floor plan, elevation, section, title block, dimensions, symbols, and notes.



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Part B: Open-Ended Experiments	14 Hrs.
1. Develop a site layout for a residential building on a given plot by satisfying NBC provisions related to setbacks, orientation, and access. 2. Design a functional floor plan for a residential building based on the given client requirements, ensuring proper lighting, ventilation, and circulation. 3. Modify an existing residential floor plan to improve space utilization, accessibility, and compliance with NBC provisions. 4. Prepare suitable elevations for a given floor plan by selecting appropriate architectural features, materials, and aesthetic elements. 5. Develop a building section for a given floor plan showing structural and architectural components with appropriate detailing. 6. Propose a suitable structural layout by selecting the location of foundations, columns, beams, and slabs for a simple residential building. 7. Develop a conceptual Mechanical, Electrical, and Plumbing (MEP) layout for a residential building considering functionality and ease of maintenance. 8. Analyze a residential building drawing with intentional deficiencies and propose suitable modifications to improve functionality and NBC compliance. 9. Prepare a complete residential building drawing sheet by selecting appropriate scales, symbols, dimensioning, and detailing techniques for a given problem statement. 10. Design and present a complete residential building drawing integrating architectural planning, structural layout, MEP concepts, and NBC provisions for the given design requirements.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Civil Engineering Drawing	N. D. Bhatt	30th Edition	Charotar Publishing House	2022
2	Building Construction h	B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain	11th Edition	Laxmi publication	2021

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Building Construction	Sushil Kumar	22nd edition	Standard Publishers	2023
2	Civil Engineering Drawing	M. Chakraborti	2nd Edition	Mona Publishers	2020



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EBooks and online course materials:

<https://nptel.ac.in/courses/112103019>

https://onlinecourses.nptel.ac.in/noc21_me125/preview

<https://nptel.ac.in/courses/112102304>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Laboratory Performance and Record writing	25
Continuous Internal Evaluation (CIE) Practical Examination	25
SEE	50
Total	100



ABL1 (01 Hour): Activity 1 Details	Hours
Collect a sample residential building drawing sheet. Identify the title block, scale, north line, symbols, abbreviations, and drawing notes. Read and interpret the site plan, floor plan, elevation, section, and structural details. Identify major building components such as foundation, plinth, wall, column, beam, slab, lintel, staircase, doors, and windows. Check the drawing for basic National Building Code (NBC) provisions related to setbacks, room sizes, lighting, ventilation, accessibility, and fire safety. Prepare a neat report with labelled sketches, observations, and NBC compliance remarks.	
Total	01
ABL2 (01 Hours): Activity 2 Details	Hours
A residential plot with given dimensions and client requirements shall be provided. Develop a conceptual site plan and floor plan by considering functional space planning and circulation. Decide the location of rooms, doors, windows, staircases, and other building components. Incorporate basic National Building Code (NBC) provisions related to setbacks, lighting, ventilation, accessibility, and sanitation. Prepare a conceptual elevation or section for the proposed building. Present and justify the proposed design with neat sketches and a brief report explaining the planning decisions and compliance with NBC provisions.	
Total	01

Type of Evaluation	Hours
Laboratory Conduction	3
Activity (Reports)	1
Semester End Exam	3
Total	7

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Course Title	SUSTAINABLE MATERIALS & REINFORCEMENT PRACTICES		
Course Code	25CVL307B	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=30

Course Objective:

1. To identify practical problems in civil engineering materials and construction.
2. To study, design, and test brick and mortar mixes.
3. To develop reinforcement detailing and bar bending skills.

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

COs	Course Outcomes	Mapping to PO's	Mapping to POS's
CO1	Identify and analyze problems related to civil engineering materials and construction practices and Design mix proportions and evaluate performance of bricks and mortar through testing	PO1, PO3, PO4	
CO2	Prepare and optimize bar bending schedules for structural elements and demonstrate practical skills in reinforcement fabrication and laboratory testing.	PO1, PO4, PO5	

Part A

1	Identification of problem statements in civil engineering.
2	Case study on brick products (clay, fly ash, eco-bricks using waste glass powder or sawdust, rice husk ash, stone dust, and waste tire rubber
3	Mix design calculations for bricks, Preparation and testing of mortar mixes Preparation of brick specimens.
4	Test on bricks - Dimensionality, density, durability - alternative wetting and drying
5	Test on bricks - Compressive strength, Water absorption, Efflorescence test
6	Expansion on saturation
7	Introduction of reinforcing materials
8	Physical properties of steel reinforcement (MS/HYSD)
9	Cutting length calculations (hooks, bends, laps).
10	Manual bar bending practice.



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Part B	
1	Identify a civil engineering problem in the local area and propose feasible solutions.
2	Compare clay, fly ash, and eco-bricks to recommend the best material for a given application.
3	Design and prepare an eco-friendly brick mix using locally available waste materials.
4	Evaluate the durability of different bricks under alternate wetting and drying cycles.
5	Assess the compressive strength, water absorption, and efflorescence of different brick types.
6	Investigate the effect of saturation on the performance of bricks.
7	Select suitable reinforcing materials for different structural applications based on performance.
8	Compare the physical properties of MS and HYSD reinforcement and justify their use.
9	Prepare an optimized Bar Bending Schedule (BBS) to minimize reinforcement wastage.
10	Fabricate and evaluate a reinforcement cage for a beam or column using manual bar bending.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Building Materials	S. K. Duggal	5th Edition	New Age International Publishers.	2022
2	Concrete Technology –	M. S. Shetty (Revised by A. K. Jain)	, Revised Edition,	S. Chand Publishing	2019



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Building Construction h	B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain	11th Edition	Laxmi publication	2021
2	Reinforced Concrete Design	S. Unnikrishna Pillai and Devdas Menon	3rd Edition,	McGraw Hill Education	2017.

EBooks and online course material:

https://onlinecourses.nptel.ac.in/noc22_ce50

<https://www.nptel.ac.in/courses/105105105>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100



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Activity Based Learning (02 Hours)

ABL1 (01 Hour): Activity 1 Details	Hours
Identification of Sustainable Construction Materials: Students examine different types of bricks (clay, fly ash, eco-bricks) and identify their properties, applications, and advantages through group discussion and sample observation. Prepare a neat report with sketches and component labels.	
Total	01
ABL2 (01 Hours): Activity 2 Details	Hours
Preparation and Verification of Bar Bending Schedule (BBS): Students prepare a BBS for a simple beam/slab from a given drawing, calculate steel quantities, and discuss methods to minimize reinforcement wastage.	
Total	01

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity (Reports)	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2	3						3			
CO2	3			3	3								



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Course Title	PYTHON PROGRAMMING FOR CIVIL ENGINEERING		
Course Code	25CVL307C	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=30
Course Objective: To highlight the significance of Python programming and its practical applications in solving complex engineering problems. Course Outcomes: At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To develop proficiency in using core scientific computing libraries, including NumPy, Matplotlib, and Pandas, for engineering analysis.	PO5	PSO1
2	To develop the capacity to leverage Python for numerical computation, analysis, and problem-solving within engineering domains.	PO2, PO5	PSO2
Part A:			14 Hrs.
1	NumPy – Arrays and Matrices: Create one-dimensional and multi-dimensional arrays, perform indexing, slicing, reshaping and basic mathematical operations.		
2	NumPy – Engineering Matrix Operations: Perform matrix addition, subtraction, multiplication, transpose, inverse and solution of simultaneous linear equations.		
3	Pandas – Series: Create Pandas Series and perform indexing, filtering, arithmetic operations and basic statistical analysis using civil engineering data.		
4	Pandas – DataFrame: Create and manipulate DataFrames containing engineering test data; perform sorting, filtering, handling missing values and basic data analysis.		
5	Matplotlib – Engineering Data Visualization: Plot line graphs, bar graphs, scatter plots and histograms for civil engineering data.		
6	Matplotlib – Advanced Plots: Generate subplots, contour plots, surface plots and polar plots for engineering applications.		
7	Resultant of Concurrent Coplanar Force Systems: Develop a Python program to calculate the magnitude and direction of the resultant force and visualize the force system.		
8	Centroid of an Asymmetric T-Section: Develop a program to calculate the centroid of an asymmetric T-section using coordinate/area methods and display the geometry.		



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9	Projectile Motion Analysis: Develop a Python program to determine projectile trajectory, maximum height, range and time of flight and plot the trajectory.
10	Beam Analysis – Shear Force and Bending Moment: Develop a Python program to calculate and plot SFD and BMD for a simply supported beam under specified loading.
Part B: Programs	
	14 Hrs.
1	Develop a Python program to determine the resultant of a system of forces acting at different angles and investigate the effect of changing force magnitude and direction.
2	Develop a Python-based solution to determine the centroid of an irregular composite section consisting of different geometric shapes.
3	Develop a program to analyze projectile motion under different initial velocities and projection angles and identify the condition producing maximum range.
4	Develop a Python program to generate SFD and BMD for a beam with different loading conditions and compare the resulting diagrams.
5	Develop a program to analyze aggregate gradation for different proportions of fine and coarse aggregates and identify an appropriate blend.
6	Develop a Python program to process stress-strain data and automatically determine important material parameters and generate the stress-strain curve.
7	Using NumPy and Matplotlib, develop a program to perform statistical analysis and visualization of civil engineering laboratory data such as compressive strength or concrete test results.
8	Using Pandas, analyze a given water-quality dataset and identify variations in parameters such as pH, turbidity, TDS and other available parameters using suitable plots.
9	Develop a Python program to analyze rainfall data for different months/years and visualize rainfall variation using appropriate statistical plots.
10	Develop a Python-based analysis of traffic data to determine variations in traffic volume and identify peak traffic periods using Pandas and Matplotlib.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Python Programming for Scientists and Engineers	Johnny Wei-Bing Lin, Hannah Aizenman, Erin Manette Cartas	1st Edition	Cambridge University Press	2022
2	Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib	Robert Johansson	2nd Edition	Apress	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Mechanics: Statics & Dynamics	Russell C. Hibbeler	16th Edition	Pearson	2026
2	A Textbook of Strength of Materials (Mechanics of Solids)	Er. R. K. Rajput	8th Edition	S. Chand Publishing	2022 / 2026
3	Concrete Technology: Theory and Practice	M. S. Shetty	9th Edition	S. Chand Publishing	2018 / 2026

EBooks and online course material:

<https://nptel.ac.in/courses/106106212>

https://onlinecourses.nptel.ac.in/noc26_cs80/preview



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Activity Based Learning (02 Hours)

ABL1 (01 Hour) : Activity 1 Details	Hours
The Material Data Case Study Students use Pandas and NumPy to clean raw lab data (UTM and sieve analysis) and calculate engineering stress and strain. They then use Matplotlib to plot the stress-strain and particle size distribution curves to identify key material parameters.	
Total	01
ABL2 (01 Hours): Activity 2 Details	Hours
Mini-project: Solve a real civil engineering problem using Python and present the methodology, code, visualizations, and conclusions.	
Total	01



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity (Reports)	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1					3								
CO2		3			2								



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Course Title	STRUCTURAL ANALYSIS		
Course Code	25CV401	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48TW&SL=90
Course Objective: To impart knowledge about concepts classical methods of structural analysis Course Outcomes: At the end of course, student will be able to,			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Comprehend the knowledge on various forms of engineering structures, role of determinacy of structures and analysis of trusses.	PO1,PO2	PSO1
CO2	Comprehend the behavior of arches and cables.	PO1,PO2	PSO1
CO3	Analyze the displacements of structures by energy methods & Mohr's theorems	PO1,PO2	PSO1
CO4	Analyze indeterminate structures to get an insight of behavior of structures under different types of loads	PO1,PO2	PSO1
MODULE-1			12 Hrs
Introduction: Meaning & definition of structural analysis, Degrees of freedom, Static & Kinematic indeterminacy. Analysis of Plane Trusses: Behavior of trusses, assumptions, analysis of statically determinate plane trusses by method of joints & method of sections Arches: Three hinged circular and parabolic arches with supports at same and different levels, determination of horizontal thrust, normal thrust, radial shear and bending moment.			
<i>Self-Study Component - The students shall visit different kinds of structures within the campus and outside the campus and learn to identify structural components.</i>			
MODULE-2			10 Hrs.
Cables: Analysis of cables under point loads and udl, length of cables - Supports at same and at different levels. Displacements - Energy Methods: Strain energy and complementary strain energy, strain energy due to axial load, bending and shear, first theorem of Castigliano, Computation of slopes & deflections of cantilever, cantilever bent & simply supported beams.			
<i>Self-Study Component - The students shall visit different structural arrangements pertaining to arches and cables and learn to identify their structural action.</i>			
MODULE-3			10 Hrs.
Displacements - Virtual work principle- Concept of virtual work/unit load, Computation of slopes & deflections of cantilever, cantilever bent & simply supported beams. Deflection of Beams: Mohr's (Moment- Area) theorems, computation of slopes & deflections of cantilever and simply supported beams using moment area theorems.			
<i>Self-Study Component - The students shall understand the importance & role of elastic constant & moment of inertia pertaining to slope & deflection in structures.</i>			



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MODULE-4	10 Hrs.
Deflection of beams: Conjugate beam principle, computation of slopes & deflections of cantilever & simply supported beams by conjugate beam concept. Analysis of Indeterminate Structures: Consistent Deformation method, Applications to Propped cantilever and fixed beams. Analysis of Indeterminate Structures: Clapeyron's theorem of three moments – Application to continuous beams.	
<i>Self-Study Component - The students shall visit different construction sites and learn to identify & understand the behavior of determinate and indeterminate structures.</i>	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Basic Structural Analysis	Reddy C. S	3rd	Tata McGraw Hill, New Delhi.	2026(Updated Reprint)
2	Theory of structures	Ramamruthum S	11th	Dhanpat Rai & Sons, New Delhi.	2021

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Structural Analysis	Laursen	International Student Edition	McGraw Hill, New Delhi.	2020
2	Theory of Structures	Pandit and Gupta	1st Edition	McGraw Hill Education	2023

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc26_ce52/preview
2. <https://nptel.ac.in/courses/105105166>
3. <https://nptel.ac.in/courses/105101085>



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Collaborative learning 2) Assignment	20
Total		50

Activity Based Learning (27 Hours)

ABL1 (12 Hours): Activity 1- Individual Assignment		Hours
1	Analyse the truss and determine the forces acting on the members.	4
2	Analyse the beam using strain energy and unit load method.	4
3	Analyse the beam using the moment area and conjugate beam method.	4
Total		12
ABL2 (15 Hours): Activity 2- Collaborative learning		Hours
1	Consider a real-world problem and analyse the truss and determine the forces acting on the members.	5
2	Consider a real-world problem and analyse the beam using strain energy and unit load method.	5
3	Consider a real-world problem and analyse the beam using the moment area and conjugate beam method.	5
Total		15



Type of Evaluation	Hours
Test (1 and 2)	3
Activity Evaluation	1
Semester End Exam	3
Total	7

[illegible]



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DEPARTMENT OF CIVIL ENGINEERING

Course Title	FLUID MECHANICS AND HYDRAULICS		
Course Code	25CV402	(L-T-P)C	(3-0-2)4
Exam	3 Hrs	Hours/Week	5
SEE	100 Marks	Total Hours	42L+28P+50TW&SL=120

Course Objective:

1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand boundary layer concepts and flow through pipes

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand fundamental concepts of fluid mechanics including fluid properties, statics, and basic flow characteristics.	PO1, PO2	
2	Apply principles of fluid kinematics and dynamics in solving flow-related engineering problems.	PO1, PO2	
3	Analyse fluid flow in pipe and open channel systems considering flow conditions and energy concepts.	PO1, PO2	
4	Perform experimental and activity-based studies on fluid flow systems using laboratory setups and analyse results to validate theoretical concepts.	PO8, PO9	

MODULE-1

12 Hrs.

Fluids: Definition, Types and Properties - Mass density, Specific volume, Specific weight, Relative density, Viscosity, Vapor pressure, Surface tension, Stability of bubble, droplet and jet, Capillarity-numerical problems. Fluid Statics: Fluid Pressure and its Measurements, Fundamental Equation of Fluid Statics. Hydrostatic forces on immersed bodies (vertical and inclined)

Self-study component: Equilibrium conditions of submerged and floating bodies.



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MODULE-2	10 Hrs..
Fluid kinematics: Methods of describing fluid motion, Types of fluid motion, Velocity and acceleration, Rotational and irrotational flows, Reynold's transport equation, Continuity equation, Velocity potential and Stream function, Cauchy-Reimann equations, Flownet. Fluid dynamics: Types of forces-definition and effects of Coriolis force, Forces influencing fluid motion, Euler and Bernoulli's equations, Application of Bernoulli's equation - numerical problems and Flow measurement. <i>Self-study component: Linear momentum equation, Momentum correction factor, Applications of momentum equation</i>	
MODULE-3	10 Hrs.
Pipe flow: Reynold's number and classification of flow, Head loss - Major & Minor loss in pipe flow-numerical problems, Darcy-Weisbach equations and use of Moody's Diagram, Total energy and hydraulic gradient lines, Compound pipes, Pipes in series and parallel, Branching pipes-numerical problems. Water Hammer, Equations for pressure rise due to gradual and sudden closure of valves in rigid and elastic pipes - numerical problems. <i>Self-study component: Surge tanks – types and functions</i>	
MODULE-4	10 Hrs.
Uniform Open Channel Flow: Flow measurement using notches and weirs – rectangular, triangular, trapezoidal notches. Uniform flow Equations for uniform flow - Chezy's and Manning's equations, Most economic channel sections of different geometry, Energy concepts in free surface flows. Specific energy and Specific force diagrams, Critical flow, and Hydraulic exponent for critical flow. Hydraulic Jump - Equation for a classic hydraulic jump, Energy loss and efficiency of a jump. <i>Self-study component: Free surface flows, Comparison of open channel flow with pipe flow, Classification of flow in open channels.</i>	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	"Hydraulics and Fluid Mechanics, including Hydraulic Machines",,	Modi P. N and Seth S. M,	20th edition, 2015.	Stanford Book House, New Delhi	2015
2	"Fluid Mechanics and Hydraulic Machines-problems and solutions",	Subramanya K	1st edition	Tata McGraw Hill Publishing Co. Ltd.	2018
3	"A Text book of Fluid Mechanics and Hydraulic Machines",	Bansal R. K	Revised 9th edition	Laxmi publications, New Delhi,	2017



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Fluid mechanics and hydraulic machines.	Gupta, S.C	-	Pearson Education India	2006
2.	Fluid Mechanics and Hydraulic Machines.	Goyal, M.K	-	PHI Learning Pvt. Ltd	2015

EBooks and online course materials:

[https://Fluid Mechanics \[Introduction Video\]](https://Fluid Mechanics [Introduction Video])

Online Courses and Video

Lectures: <https://www.youtube.com/watch?v=N1ZVw8GDSaE&t=126s>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	29
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Laboratory Plan (if integrated course): [PTO]



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PART A	
Lab Program	Program Details
1	Determine the properties of fluid: specific mass, specific weight, specific volume and specific gravity.
2	Determination of Cd for: Venturi meter
3	Determination of Cd for: Orifice meter
4	Determination of Cd for: Rectangular Notch
5	Determination of Cd for: Triangular Notch
6	Determine the loss of head in pipes (Major loss)- $\frac{1}{2}$ inch,
7	Determine the loss of head in pipes (Major loss)-1 inch
8	Determine the loss of head in pipes (Major loss)- $\frac{3}{4}$ inch
9	Determination of Minor Losses in Pipes (Sudden Enlargement and Contraction)
10	Determination of Hydraulic Coefficients of Vertical Orifice
PART B	
1	Using materials available study how capillary rise changes with tube diameter and liquid type. From your measurements, estimate the surface tension of each liquid and compare it with standard reference values.
2	Locate the centre of pressure experimentally (e.g., by balancing moments with known weights) and compare your results with the theoretical force $F = \rho g A \bar{h}$ and the standard centre-of-pressure formula
3	Investigate how the position of the centre of gravity affects stability, and find the point at which the body just tips over (capsizes).
4	Design an experiment to measure flow velocity at each section for a steady discharge from a tap or a bucket-with-hole setup. Verify whether $A_1 V_1 = A_2 V_2$ holds
5	Set up two simple demonstrations: (a) a forced vortex by rotating the container of water at constant speed and observing the water surface shape, and (b) a free vortex by draining water through a small central hole in a wide, shallow container. Track floating markers
6	Determine the flow rate (and hence velocity and Reynolds number) at which the flow transitions from laminar to transitional to turbulent, and compare your observed critical Reynolds number with the standard textbook value (~ 2000).
7	Set up a length of hose or pipe with a tap/valve and one or two bends or fittings. Using small piezometer tubes at different points, measure the pressure head and calculate the major loss (friction) and minor loss (fittings) for different flow rates. Compare your results with values from the Darcy-Weisbach equation.
8	Using a hose connected to a tap with a valve at the free end, close the valve suddenly and then gradually, and observe the difference in vibration/sound at each closure speed. Estimate the pressure rise in each case and compare it with the theoretical value from the water hammer equation.
9	Design a set up of small channel carrying water to measure the head of water above the notch for different flow rates and calculate the discharge using the standard notch formula



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10	Design a set up to measure the flow depth, channel slope, and discharge, then calculate the flow velocity using Manning's or Chezy's equation. Compare the calculated velocity with the actual velocity observed
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Activity Based Learning (27 Hours)

ABL1 (14 Hours): Activity 1 Details		Hours
1	Research and identify at least three types of surge tanks (e.g., simple, restricted orifice, differential) and summarize their working principles .	5Hrs
2	Compare their functions in terms of water hammer control, cost, maintenance, and operational efficiency. Present your comparison in a tabular format.	5Hrs
3	Based on a given scenario (assume a hilly terrain with a long penstock and variable load), recommend the most suitable type of surge tank , justifying your choice based on system needs and technical feasibility.	4Hrs
Total		14
ABL2 (15 Hours): Activity 2 Details		Hours
1	Define and explain the three types of equilibrium (stable, unstable, and neutral) for both submerged and floating bodies , with clear diagrams for each case. <i>(3 marks)</i>	5Hrs
2	Conduct or simulate a simple experiment using materials like a plastic bottle (partially filled), a wooden block, and a metal object in water. Record observations on how each body behaves when slightly tilted. Identify their type of equilibrium and explain why. <i>(4 marks)</i>	5Hrs
3	Based on your understanding and the experiment, derive the conditions for equilibrium using concepts like center of gravity (G) and center of buoyancy (B) . Explain how metacentric height (GM) affects floating body stability. <i>(3 marks)</i>	5Hrs
Total		15



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Evaluation of Learning Process (10 Hours)

Type of Evaluation	Hours
Test (1 and 2)	3
Laboratory Conduction	1
Lab Test	3
Semester End Exam	3
Total	10

Course Articulation Matrix

Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2												
CO2	3												
CO3		3											
CO4								2	2				



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DEPARTMENT OF CIVIL ENGINEERING

Course Title	CONCRETE TECHNOLOGY		
Course Code	25CV403	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs	Hours/Week	5
SEE	100 Marks	Total Hours	42L+28P+50TW&SL=120

Course

Objective:

1. To understand various aspects related to concrete ingredients, properties of concrete and concrete mix design.
2. Understand the importance of quality control procedures in ensuring the durability and performance of concrete structures.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the fundamental properties of concrete ingredients, for conventional concrete mixtures	PO1	
2	Analyze the fresh and hardened concrete results for optimized mix design	PO1, PO2	
3	Demonstrate proficiency in conducting and interpreting non-destructive tests of concrete	PO2, PO3	
4	Validate the basic principles of concrete mix design and its practical applications.	PO3	PSO1

MODULE-1

12 Hrs.

Concrete Ingredients – Cement, water and Aggregates: Chemical composition of cement, hydration of cement, types of cement, manufacture of OPC by dry process (flow charts only). Testing of cement Grades of Cement, Blended cement.

Quality of mixing water. **Fine Aggregate** - types- manufacture sand, Gradation and zoning, fineness modulus, specific gravity, unit weight, moisture content, bulking, presence of deleterious materials.

Coarse aggregate – Importance of size, shape and texture, gradation of aggregates, Alkali – Aggregate reaction, (Relevant BIS provisions to be discussed regarding the properties of concrete ingredients).

Concrete Admixtures: Chemical admixtures - Plasticizer, super plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures – fly ash, GGBS, silica fumes and rice husk ash - applications, advantages & disadvantages.

Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of mix design pertaining to ongoing consultancy works.



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MODULE-2	10 Hrs.
Process of manufacture of concrete -Batching (volume batching and weigh batching) Mixing: Hand mixing and mechanical mixing, Transportation - wheel barrow, cable and ropeway, conveyer belt, pumping etc., Placing of concrete, Compaction – hand compaction and compaction by vibration, Curing – different methods of curing. Quality control aspects. Properties of Fresh Concrete: Workability – factors affecting workability, measurement of workability – slump, flow test, compacting factor, Kelly Bal test and Vee-Bee consistometer. Segregation and bleeding. Properties of Hardened concrete: - Compressive Strength - Factors affecting strength - w/c ratio, gel/space ratio, effect of maximum size of aggregate and curing, Testing of hardened concrete-compressive strength, split tensile strength. flexural strength. Relation between compressive strength and tensile strength, bond strength, Modulus of rupture. Elasticity – relation b/w modulus of elasticity and strength, factors affecting modulus of elasticity, Poisson’s ratio. Shrinkage – plastic shrinkage, drying shrinkage and autogenous shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep. <i>Self-Study Component - The students should visit construction sites and learn to understand workability and properties of green and hardened concrete. Also, to visit the facility of Creep Rig to understand sustained loading on concrete specimens.</i>	
MODULE-3	10 Hrs.
Concrete mix design: Concept of mix design, variables in proportioning, exposure conditions and statistical quality control of concrete, mix design as per IS:456-2000, IS :10262-2019 and SP-23, numerical examples on mix design as per IS. Method. Mix design with and without admixtures. Durability: Definition, significance, permeability of concrete. Sulfate attack, chloride attack, carbonation, freezing and thawing, causes of cracking in concrete – plastic shrinkage, settlement cracks, construction joints, thermal expansion, structural design deficiencies etc <i>Self-Study Component - The students shall visit the concrete lab and learn to identify the different types of cements, aggregates and testing facilities</i>	
MODULE-4	10 Hrs.
Nondestructive testing of concrete: Principles, applications and limitations of Rebound hammer test, Penetration and pull-out test, Ultrasonic pulse velocity test and Core test. Special concrete: Constituents, properties and applications of Light weight concrete, high density concrete, high strength and high-performance concrete, fiber reinforced concrete, SCC, HVFAC (High Volume Fly Ash Concrete) and Ready mixed Concrete. <i>Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of NDT and special concrete’s pertaining to ongoing research works.</i>	



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Concrete Technology- Theory and Practice”,	Shetty, M.S	8th	S. Chand and Co, New Delhi.	2022
2	“Concrete Technology”	Neville, A.M. and Brooks, J.J.	2nd	Pearson Education, Asia	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	“Concrete Technology”	Gambhir, M.L,	5th	Tata Mc Graw Hill, New Delhi	2017
2	Recommended guidelines for concrete mix design-	IS:10262 -2019	2nd	BIS publication	2019

EBooks and online course materials:

1. [Concrete Technology: Theory and Practice by M S Shetty & A K Jain | S Chand Publishing](#)
2. [Bce051 - Concrete Technology | PDF](#)

Online Courses and Video Lectures:

1. [Concreting materials | Coursera](#)
2. [NPTEL :: Civil Engineering - Concrete Technology](#)



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	26
6	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				120

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Laboratory component	Details of activities to be conducted 1) Laboratory record 2) Laboratory CIE	20
Total		50



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Laboratory Plan (if integrated course):

PART A

Lab Program	Program Details
1	Determination of fineness of cement using Sieve/Blaine Air Permeability Test.
2	Determination of normal consistency and setting time of cement.
3	Determination of setting time of cement.
4	Determination of soundness of cement using Le Chatelier apparatus.
5	Determination of moisture content and water absorption of fine aggregate.
6	Determination of moisture content, water absorption and bulk density of coarse aggregate.
7	Sieve analysis of fine aggregates.
8	Sieve analysis of coarse aggregates.
9	Determination of compressive strength of hardened concrete
10	Determination of split tensile strength of hardened concrete

PART B

Sl. No.	Open-Ended Experiment
1	Evaluate and recommend the most suitable fine aggregate from different sources based on specific gravity for a selected concrete application.
2	Assess and recommend the most suitable coarse aggregate from different sources based on specific gravity for structural concrete.
3	Investigate the bulking characteristics of fine aggregates from different sources and recommend suitable moisture corrections for concrete mix design.
4	Investigate the influence of different curing methods on concrete strength development and recommend the most effective curing practice for the given application.
5	Assess the quality and probable strength of an existing concrete member using the Rebound Hammer test and recommend its structural suitability.



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6	Evaluate the integrity and quality of an existing concrete member using the Ultrasonic Pulse Velocity (UPV) test and interpret the results as per relevant standards.
7	Investigate the influence of superplasticizer on the workability of concrete using the Slump Test and recommend the optimum dosage for the desired workability.
8	Evaluate the effect of superplasticizer on low-workability concrete using the Compaction Factor Test and recommend its suitability for different construction applications.
9	Investigate the effect of varying water–cement ratios on the workability of concrete using the Slump Test and recommend the optimum water–cement ratio for the specified application.
10	Assess Workability of self-compacting concrete using slump flow, J ring, U box, V funnel and L box.

Activity Based Learning (26 Hours)

ABL1 (13 Hours): Activity1- NDT		Hours
Use of UPV and Rebound Hammer NDT machines and testing the existing buildings in the campus and preparing the report on the same.		
1.	Use of UPV for testing and prepare the report	7
	A. For Concrete cubes B. For existing buildings	
2.	Use of Rebound Hammer for testing and prepare the report	6
	C. For Concrete cubes D. For existing buildings	
Total		13
ABL2 (13 Hours): Activity2		Hours
1.	Students shall visit different construction sites and record the data for	
	E. Grade of concrete F. Workability G. Compressive strength H. Type of mix	
	The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 3 sites has to be covered	3*4=12 +1
Total		13



Type of Evaluation	Hours
Test (1 and 2)	3
Laboratory Conduction	1
Lab Test	3
Semester End Exam	3
Total	10

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Course Title	TRANSPORTATION ENGINEERING		
Course Code	25CV404	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48TW&SL=90

Course Objective: To learn broader understandings on various aspects of transportation engineering

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conduct necessary field investigation for generation of required data for proposing new alignment or re-alignment of existing roads	PO1, PO2, PO3	
2	Evaluate the engineering properties of the materials and suggest the suitability of the same for the pavement construction.	PO1, PO2, PO3	
3	Design the thickness of pavement (Flexible and Rigid) and various pavement evaluation methods.	PO1, PO2, PO3	
4	Evaluate the condition of highway drainage and associated problems and to evaluate the highway economics by various methods.	PO1, PO2, PO3	

MODULE-1

10 Hrs.

Introduction: Importance of transportation – Comparison with all the modes – characteristics of road transportation – Jayakar committee recommendations and Implementation – 3rd and 4th Road development plans, numerical problems. Present scenario of road development in India Highway
Planning and Alignment: Different Road patterns – Planning surveys –Factors affecting highway alignment, Ideal requirements – Steps in New and Realignment.

Self-study component: *Students will visit to understand the impact of different patterns of road to know the advantages and disadvantages of the pattern in regard to traffic flow conditions.*



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MODULE-2	10 Hrs.
Highway Geometric Design – Importance – Controlling factors –Design speed, Surface characteristics – cross sectional elements-- camber — sight distances – Horizontal and vertical alignment. Pavement Materials and Construction: CBR and plate load tests – properties and requirements of Road aggregates – Bitumen – Types, construction procedures for subbase, base and surface courses <i>Self-study component: Students will collect the data from State Highway department and design both horizontal and vertical geometrics and compare with existing geometrics</i>	
MODULE-3	10 Hrs.
Pavement Design: Design factors – Determination of ESWL, problem (Graphical method) – IRC method design of flexible pavement (IRC38-2012)- Stresses in rigid pavement – IRC method of design rigid pavement (IRC58-2015) (Excluding design of joints and problems on the above). <i>Self-study component: Students will visit ongoing project in and around Hassan city and to compare properties of materials analyzed with IRC specifications.</i>	
MODULE-4	10 Hrs.
Highway drainage: Surface drainage – types – functions, Sub surface drainage – Basic design principle. Highway Economics and financing: Highway user costs – VOC using charts – Highway costs – Economic analysis by Annual cost method – Highway financing – BOT and BOOT concept <i>Self-study component: Students will visit different roads and identify important types of failures and list the suggestions to overcome the failure.</i>	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Highway Engineering	Khanna and Justo	10	Khanna publications New Delhi	2022
2.	Highway Engineering	Kadiyali, L.R.	8	Khanna Publishers, New Delhi	2021

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Guidelines for the Design of Flexible Pavements	IRC	Code Book	IRC: 37-2012	2012
2.	Guidelines for the Design of Rigid Pavements	IRC	Code book	IRC 58 - 2015	2015



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Online Courses and Video Lectures:

1. <https://nptel.ac.in/courses/105107220>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ SemesSter
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50



ABL1 (14 Hours): Activity 1 Details		Hours
1.	List the types of road patterns adopted nearby and summarise the benefits and list out the solutions for existing problems.	02
2	Select a real-world case study on Highway alignment, Geometric design aspects - curves, camber, sight distances and document it	06
3.	Prepare a technical report with drawings, charts, and IRC references with reference to a case study	06
Total		14
ABL2 (13 Hours): Activity 2 Details		Hours
1.	Conduct a field study on traffic volume and estimate the capacity of the road. Design a suitable type of pavement based on the vehicular data.	08
2.	Identify different types of drainage structures according to soil conditions, and recommend appropriate remedial measures for their maintenance	05
Total		13

Type of Evaluation	Hours
Test (1 and 2)	3
Activity Evaluation	1
Semester End Exam	3
Total	7

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MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CIVIL ENGINEERING

Course Title	WASTEWATER ENGINEERING		
Course Code	25CV405	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48TW&SL=90
Course Objective: To inculcate the basics concepts of wastewater treatment, its design and management Course Outcomes: At the end of course, student will be able to,			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Estimate average and peak wastewater from a community and design suitable conveyance systems for sewage and storm water	PO1, PO2, PO6	
2	Evaluate wastewater quality to suggest suitable small scale treatment option	PO1, PO2, PO6	
3	Design a comprehensive wastewater treatment system to achieve required quality standards for safe disposal and reuse of wastewater	PO1, PO2, PO6	PSO1
4	Design an effective and efficient sludge and wastewater disposal system	PO1, PO6,	PSO1
MODULE-1			11 Hrs.
Introduction: Wastewater disposal - Necessity for sanitation, types of sewerage systems and their suitability. Quantity of Sewage: Dry weather flow, factors affecting dry weather flow, Estimation of storm flow, Rational method and Empirical formulae of design of storm water drain, Time of concentration. Design of Sewers: Hydraulic formulae for velocity, self-cleansing and non-scouring velocities, Design of hydraulic elements for circular sewers flowing full and for partially full, Sewer pipe material, Shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewer. Self-Study Component: Review different sewer pipe materials and their properties and prepare a comparison table			
MODULE-2			10 Hrs.



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Sewer Appurtenances: Catch basins, Manholes, Flushing tanks, oil and grease traps, Drainage traps, Basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage. Sewage Pumps - Need, Types of pumps and pumping stations. Analysis of Sewage: Physical, chemical, and biological characteristics, concepts of Aerobic and Anaerobic activity, CNS cycles, more emphasis on BOD and COD –significance, Sampling and techniques. <i>Self-Study Component: Understand the basic principles of house drainage including gradient, venting, and water seals and review routine maintenance practices to avoid blockages and maintain hygiene in domestic drainage</i>	
MODULE-3	11 Hrs.
Disposal of Effluents: By dilution, self-purification phenomenon, oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Disposal standards on land and water, Chlorination of sewage. Treatment of Sewage: Flow diagram of municipal sewage treatment plant. Primary Treatment: screening, grit chambers, skimming tanks and design of primary sedimentation tank. <i>Self-Study Component: Research on modern chlorination alternatives like UV or ozonation in tertiary treatment and present findings. Conduct a mock BOD/COD test in a lab setup or virtually through a simulation platform.</i>	
MODULE-4	10 Hrs.
Secondary Treatment: Trickling filter (Types and Design), Activated sludge process - Principle and flow diagram, methods of aeration, modifications, F/M ratio, Design of ASP. Methods of sludge disposal: Sludge digestion and Sludge drying beds. Miscellaneous Treatment Methods: Septic tanks and Oxidation Pond. Introduction to RBC, UASB, Anaerobic filters. <i>Self-Study Component: Students shall visit the nearby Industry and observe the methods adopted for sewage treatment and disposal. The students shall submit a report of their observations under self-study components.</i>	



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Environmental Engineering – Vol. II: Sewage Disposal and Air Pollution Engineering	S.K. Garg	29th Edition	Khanna Publishers	2022
2.	Wastewater Engineering	Dr. B.C. Punmia, Er. Ashok Jain, Dr. Arun Jain	3rd Edition	Laxmi Publications Pvt. Ltd	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Wastewater Engineering: Treatment and Resource Recovery	Metcalf & Eddy, George Tchobanoglous, H. David Stensel	5th Edition	McGraw-Hill Education	2014
2.	Wastewater Treatment: Concepts and Design Approach	G.L. Karia and R.A. Christian	2nd Edition	PHI Learning Pvt. Ltd.	2013

EBooks and online course materials:

1. Wastewater Engineering: Treatment and Reuse - <https://archive.org/details/wastewaterengine0000unse>
2. Fundamentals of Wastewater Treatment and Engineering - https://priodeep.weebly.com/uploads/6/5/4/9/65495087/fundamentals_of_wastewater_treatment_and_engineering.pdf
3. Basic Principles of Wastewater Treatment - <https://library.oapen.org/bitstream/handle/20.500.12657/31052/1/640138.pdf>

Online Courses and Video Lectures:

1. Wastewater Treatment and Recycling by Prof. Manoj Kumar Tiwari, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc24_ce105/preview
2. Physico-Chemical Processes for Wastewater Treatment by Prof. Vimal Chandra Srivastava (IIT Roorkee) - https://onlinecourses.nptel.ac.in/noc22_ch25/preview



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 3) Details of activity 1 4) Details of activity 2	20
Total		50



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Activity Based Learning (27 Hours)

ABL1 (26 Hours): Activity 1 Details		Hours
Field Visit and Report Submission	Design a combined sewerage system for Hassan city	05
	Visit a nearby rain gauge station and submit a report on the working principle and determination of rainfall intensity	05
	Visit a nearby newly constructed layout and submit a detailed report on various sewer appurtenances installed	05
	Submit a plan of your individual houses showing drainage connections	05
	Visit a nearby sewage treatment plant and submit a report on various unit of STP	06
Total		26
ABL2 (1 Hours): Activity 2 Details		Hours
Quiz	Conduction of quiz	01
Total		01

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1 and 2)	3
Quiz (1 and 2)	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	3	2											
CO2	2					3							
CO3	3	2											
CO4	3					2							



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DEPARTMENT OF CIVIL ENGINEERING

Course Title	HIGHWAY MATERIAL TESTING LAB		
Course Code	25CV406	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	03
SEE	50 Marks	Total Hours	28L+2TW&SL=30
Course Objective: To familiarize students with standard laboratory testing procedures for evaluating the physical, mechanical, and durability properties of aggregates used in pavement construction, in accordance with relevant IS codes. Course Outcomes: At the end of course, student will be able to,			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Demonstrate the ability to conduct standard laboratory tests on coarse aggregates to determine their physical, mechanical, and durability properties—in accordance with relevant codes, and interpret the results for their suitability in pavement construction.	PO1, PO2, PO4 , PO5	PSO1
2	Demonstrate the ability to evaluate the engineering properties of bituminous materials by performing standard tests—and analyze the results to assess their applicability in flexible pavement design.	PO1 PO2, PO4, PO5	PSO1

Laboratory Plan (if integrated course):

Lab Program	List of Exercises
1	Determination of Abrasion test on aggregate
2	Determination of Aggregate Crushing Value
3	Determination of flakiness index for coarse aggregate
4	Determination of elongation index for coarse aggregate & angularity number
5	Determination of soundness of aggregate at specified age
6	Determination of adhesion of aggregate with bitumen
7	Determination of specific gravity & penetration value of bitumen.
8	Determination of ductility & softening point of bitumen.
9	Determination of flash and fire point & viscosity of bitumen.
10	Demonstration of Marshall stability test on bituminous material.



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PART B

Sl. No.	Open-Ended Experiment
1	Evaluate and recommend the most suitable coarse aggregate from different sources based on abrasion resistance for a selected pavement application. Justify your recommendation using experimental results and relevant standards.
2	Evaluate and recommend the most suitable coarse aggregate from different sources based on crushing value for a selected pavement or concrete application. Justify your recommendation using experimental results and relevant standards.
3	Evaluate and recommend the most suitable coarse aggregate from different sources based on the flakiness index for a selected pavement or concrete application. Justify your recommendation using experimental results and relevant standards.
4	Evaluate and recommend the most suitable coarse aggregate from different sources based on the angularity number and for a selected pavement or concrete application. Justify your recommendation using experimental results and relevant standards.
5	Evaluate and recommend the most suitable aggregate from different sources based on soundness for a concrete application exposed to varying environmental conditions. Justify your recommendation using experimental results and relevant standards
6	Evaluate and recommend the most suitable aggregate from different sources based on its adhesion characteristics with bitumen for a selected flexible pavement application. Justify your recommendation using experimental results and relevant standards.
7	Investigate and recommend the most suitable bitumen from different sources based on specific gravity for a selected pavement application. Justify your recommendation using experimental results and relevant standards.
8	Select and justify the most suitable grade of bitumen based on its ductility and softening point for a selected pavement application and climatic condition using experimental results and relevant standards.
9	Analyze and recommend the most suitable grade of bitumen based on its flash point, fire point, and viscosity for a selected pavement application and climatic condition. Justify your recommendation using experimental results and relevant standards.
10	Analyze and recommend the most suitable bituminous mix based on Marshall stability and flow values for a selected pavement application. Justify your recommendation using experimental results and relevant standards.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Highway Material & Pavement Testing	S.K.Khanna, C.E.G.Justo, A.Veeraragavan	10	Nem Chand And Brothers Rorkee	2023
2.	Highway Engineering	Khanna and Justo	10	Khanna publications New Delhi	2022
3.	Principles and Practice of Highway Engineering	Partha Chakroborty & Animesh Das	12	PHI learning	2017



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	IS 2386 (Part 4) – Aggregate Crushing Value, Impact Value			IS	
2.	IS 2386 (Part 3) – Specific Gravity & Water Absorption			IS	
3.	IS 2386 (Part 5) – Soundness Test			IS	
4.	IS 2386 (Part 1) – Flakiness Index & Elongation Index			IS	
5.	IS 2386 (Part 4) – Abrasion Test (Los Angeles Abrasion)			IS	
6.	IS 6241: 1971 – Method for Determination of Stripping Value (Adhesion with Bitumen)			IS	
7.	IS 1201: 1978 – Sampling of Bituminous Materials			IS	
8.	IS 1208: 1978 – Determination of Ductility			IS	
9.	IS 1205: 1978 – Determination of Softening Point (Ring & Ball)			IS	
10.	IS 1203: 1978 – Determination of Penetration			IS	
11.	IS 1202: 1978 – Determination of Specific Gravity			IS	
12.	IS 1209: 1978 – Flash and Fire Point			IS	
13.	IS 1210: 1978 – Viscosity (Tar and Bitumen)			IS	

Online Courses and Video Lectures:

<https://nptel.ac.in/courses/105107220>



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ SemesSter
1	Class Room Teaching & Learning	2	14	18
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Activity Based Learning (27 Hours)

ABL1 (01 Hour) : Activity 1 Details Case Study & Material Analysis	Hours
Collect aggregate and bitumen samples from field sources and perform a set of standard tests on aggregates (abrasion, crushing value, flakiness index, elongation index, soundness, angularity, adhesion).	01
Total	01
ABL2 (01 Hour): Activity 2 Details	Hours
Analyze material properties in line with relevant specifications as per IS codes. Evaluate the suitability of materials for different pavement layers. Interpret Marshall Stability test results to judge mix performance.	01
Total	01



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2	2							2	
CO2	3	3		2	2							2	



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CIVIL ENGINEERING

Course Title	STRUCTURAL PROTOTYPE LAB		
Course Code	25CVL407A	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs	Hours/Week	2
SEE	100 Marks	Total Hours	28P +2 TW&SL=30
Course Objective: • To impart hands-on skills in masonry construction. • To understand the construction and behavior of arches. • To develop basic steel fabrication skills. • To enable prototype development for structural systems.			
Course Outcomes:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Demonstrate practical skills in masonry construction, mortar preparation, tile laying, bedding, grouting, and finishing using standard construction practices.	PO1, PO5	PSO1, PSO2
2	Fabricate basic steel joints, structural frame models, truss systems, and composite prototypes to understand fabrication techniques, load transfer, and structural behavior.	PO3, PO5	PSO1, PSO2



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PART A	
1	Study and identify different masonry units (brick, stone, and concrete blocks) and their applications
2	Prepare mortar mixes and construct masonry using stretcher and header bonds.
3	Construct masonry using English bond and Flemish bond, and examine joints and finishing techniques.
4	Study tile types, bedding materials, laying tools, and prepare the base surface for tile installation.
5	Lay floor/wall tiles with proper alignment, leveling, spacing, grouting, and quality inspection.
6	Study structural frames, steel sections, fabrication tools, and perform marking, cutting, drilling, and fastening operations.
7	Practice basic welding and fabricate lap and butt joints using steel members.
8	Fabricate a simple structural frame model and observe load transfer and structural behavior.
9	Develop a small steel truss model and evaluate its structural performance
10	Design and fabricate a composite prototype (masonry + steel/arch model) and demonstrate its structural behavior.

PART B	
1	Identify and recommend the most suitable masonry unit (brick, stone, or block) for a given construction application.
2	Design and prepare a mortar mix suitable for different masonry works and justify the selected proportion.
3	Construct and compare different brick bonds to determine the most suitable bond for a specific structural requirement.
4	Select suitable tiles and bedding materials for a given building application based on performance and cost.



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5	Lay a tiled surface using an appropriate installation method and evaluate its quality, alignment, and finish.
6	Plan and fabricate a simple steel component by selecting suitable fabrication processes and tools.
7	Fabricate and evaluate welded joints (lap or butt) and recommend the most appropriate joint for a given application.
8	Develop a structural frame model and investigate its load transfer and stability under different loading conditions.
9	Design and fabricate a steel truss model to achieve maximum strength with minimum material usage.
10	Design and build a composite prototype (masonry + steel/arch) and evaluate its structural performance and failure behavior.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Building Materials	S.K. Duggal	6th Edition,	New Age International Publishers	2024
2.	Concrete Technology —.	M. S. Shetty, Revised by A. K. Jain, S	Revised edition	Chand Publishing	2026



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Building Construction –	S. S. Bhavikatti,	2025–26 edition	Vikas Publishing	2026
2.	Building Materials –	S. S. Bhavikatti,	edition	Vikas Publishing	2024

EBooks and online course materials:

1. https://onlinecourses.nptel.ac.in/noc22_ce50/preview
2. <https://www.nptel.ac.in/courses/105105105>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning			
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process			
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100



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Activity Based Learning (2 Hours)

ABL 1 (01 Hours) : Activity 1 Details		Hours
1	Brick Quality Testing Simulation & Data Interpretation: Students are given sample data of compressive strength, water absorption, and efflorescence results of different bricks. They analyze results, compare performance, and recommend the most suitable brick type for construction in different environments.	1
ABL 2 (01 Hours): Activity 2 Details		Hours
2	Reinforcement Detailing Optimization Challenge: Students are given two structural layouts (beam/column/slab). They calculate reinforcement requirement and compare two design options to identify the most economical and efficient Bar Bending Schedule (BBS) with minimum wastage.	1
Total		2

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3				2							3	1
CO2			3		3							1	3



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CIVIL ENGINEERING

Course Title	WATER DISTRIBUTION NETWORK MODELLING WITH EPANET LAB		
Course Code	25CVL407B	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P +2 TW&SL=30
Course Objective: To provide hands-on training in hydraulic and water quality modelling of water distribution networks (WDN) using EPANET 2.2 software, enabling students to build, simulate, analyze, and design pipe networks for real-world water supply engineering applications. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Build, simulate, and analyze water distribution networks using EPANET 2.2 — including steady-state and extended period hydraulic simulations for branched and looped networks, pump systems, pressure control valves (PRV/FCV), and elevated storage tanks — and validate results against manual calculations conforming to IS standards.	2, 5	
2	Simulate and interpret water quality parameters (chlorine residual decay, water age, and source tracing) in distribution networks, and apply EPANET for practical WDN design, calibration, and system rehabilitation scenario analysis.	2, 5, 6	
List of Exercises			



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PART – A: Fixed Experiments	
Exp No.	Title and Description of Experiment
Exp 1	Introduction to EPANET Interface & Single Pipe Problem
Exp 2	Hydraulic Analysis of a Branched (Dead-End) Pipe Network
Exp 3	Hydraulic Analysis of a Looped Pipe Network
Exp 4	Pipe Network with Elevated Storage Tank (ESR)
Exp 5	Pump Modelling and Pump Curve (H-Q) Analysis
Exp 6	Pressure Reducing Valve (PRV) Modelling
Exp 7	Extended Period Simulation (EPS) with 24-Hour Demand Pattern
Exp 8	Tank Level Variation and Pressure Zone Analysis
Exp 9	Water Quality Modelling — Chlorine Residual Analysis
Exp 10	Water Age Analysis and Source Tracing
PART – B: Open-Ended Experiments	
(Note: Open-ended experiments are not pre-determined. Students explore, design, and conduct experiments based on the problem statement)	
Exp 1	Campus / Institutional WDN Modelling
Exp 2	Residential Layout WDN Design
Exp 3	Demand Scenario Comparison
Exp 4	Pump Selection and Energy Optimization Study
Exp 5	Leakage Detection and Water Loss Quantification
Exp 6	Chlorine Booster Station Location Optimization
Exp 7	Pipe Rehabilitation Prioritization for Ageing Network
Exp 8	Multi-Zone Pressure Management for Hilly Terrain
Exp 9	Fire Flow Analysis and Network Adequacy Check
Exp 10	Water Age Minimization through Network Interventions

Course Contents
EPANET Fundamentals (Exp 1) EPANET 2.2 interface overview; toolbars and menus; network element types (junctions, reservoirs, tanks, pipes, pumps, valves); input data requirements; hydraulic options — flow units



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(LPS), head loss formula (Hazen-Williams); running steady-state simulation; interpreting node and link reports; saving and exporting results. Single pipe head loss problem with manual verification.

Basic Hydraulic Network Analysis (Exp 2, 3, 4)

Branched (dead-end) pipe networks — continuity-based flow analysis, EPANET modelling and pressure determination. Looped pipe networks — gradient algorithm in EPANET vs Hardy-Cross iterative method; energy conservation in closed loops. Elevated Service Reservoir (ESR) modelling — tank properties (Min/Max Level, diameter, initial level); source contribution analysis and zone interaction.

Pumps and Pressure Control Devices (Exp 5, 6)

Pump modelling — H-Q curve definition (single-point, three-point, multi-point); pump operating point determination; EPANET Energy report for pump power and efficiency. Valve modelling — Pressure Reducing Valve (PRV), Flow Control Valve (FCV), Pressure Sustaining Valve (PSV); PRV application for pressure zone management; comparison of system behavior with and without PRV.

Extended Period Simulation (Exp 7, 8)

Demand pattern definition — hourly multipliers for 24-hour demand cycle; pattern assignment to junctions; EPS simulation options (duration, hydraulic time step). Tank level variation and system response to peak demand; identification of pressure-deficient nodes (IS 1172: min 7 m residual); pressure zone analysis and engineering interventions (booster pumps, pipe upsizing, PRV repositioning).

Water Quality Modelling (Exp 9, 10)

EPANET water quality analysis types — Chemical (chlorine), Age, Trace. Chlorine decay modelling: bulk decay (K_b), wall decay (K_w); 72-hour simulation for steady chlorine distribution; nodes with Cl < 0.2 mg/L (WHO guideline). Water age analysis — identification of stagnant water zones; source tracing — percentage contribution from each supply source in multi-source systems.

Open-Ended Applications (B1–B10)

Student-driven exploration covering: field-based WDN modelling, residential layout design, demand scenario comparison, pump selection, leakage detection, chlorine booster optimization, pipe rehabilitation prioritization, pressure zone management, fire flow analysis, and water age minimization — all using EPANET 2.2.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	EPANET 2.2 Users Manual	Rossman, L.A., et al.	v2.2	US EPA, Cincinnati, OH	2020
2	Water Supply Engineering	Santosh Kumar Garg	18th	Khanna Publishers, New Delhi	2022

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Water Distribution System Modelling and Management	Walski, T.M., et al.	1st	Haestad Press, Waterbury, CT	2003
2	Environmental Engineering	Peavy, Rowe & Tchobanoglous	SI	McGraw-Hill, New York	2013
3	Water Resources Engineering	Mays, L.W.	2nd	Wiley, New Jersey	2010

Ebooks and Online Course Materials:

1. EPANET 2.2 Software and Documentation — Free download: <https://www.epa.gov/water-research/epanet>
2. EPyT (EPANET Python Toolkit) Documentation — <https://epanet-python-toolkit-epyt.readthedocs.io>
3. IS 1172:1993 — Code of Basic Requirements for Water Supply, Drainage and Sanitation (BIS, New Delhi)

Online Courses and Video Lectures:

1. NPTEL: Water and Wastewater Engineering (Prof. S. Murty Bhallamudi, IIT Madras) — <https://nptel.ac.in>
2. YouTube: EPANET Tutorials by US EPA and Open Water Analytics Community
3. Coursera / edX: Urban Water Systems (TU Delft) — Water distribution network modelling module

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Practical — EPANET Lab Sessions (Experiments 1–12)	2	14	28



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2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Activity Based Learning (2 Hours)

ABL1 (01 Hour): Activity 1 Details	Hours
Field Visit and WDN Mapping Exercise: Students visit the campus / nearby institutional water supply system. They identify and sketch the pipe layout, note down node elevations, pipe diameters, materials, and tank details. Data collected is used to build a basic EPANET model in the subsequent lab session. Students submit a field observation sheet and a network sketch.	01
ABL2 (01 Hours): Activity 2 Details	Hours
Case Study Presentation — Real-World WDN Failure Analysis (PART-B: Exp B7 / B8 / B9): Each group of 2–3 students is assigned a documented case study of a WDN failure (pipe burst, pressure deficit, chlorine decay) from published literature or municipal records. Groups analyse the failure cause, model it in EPANET using Part-B open-ended approach and present their findings (5 minutes per group) including the remedial measure simulated. Peer evaluation contributes to CIE marks.	01
Total	02



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1		2	1		3								
CO2		2			2	2							



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Course Title	TOTAL STATION APPLICATION IN CIVIL ENGINEERING		
Course Code	25CVL407C	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=90

Course Objective:

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concepts of surveying to field practice.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To determine the relative position of points in horizontal plane and vertical plane using total station.	PO5, PO9	
2	Develop plans, draw maps and draft reports for surveying projects of Civil Engineering works	PO2, PO8	

Lab Program	Program Details
1	To carry out Temporary adjustments of total station
2	To determine the horizontal angle and vertical angle between the points using total station
3	To determine the area of given boundary by using total station
4	To determine the difference in elevation between two points using Total station
5	To Conduct profile levelling and cross levelling for existing highway projects.
6	To Prepare contour map by block levelling using total station.
7	To set out a simple curve using total station
8	To set out the Compound curve by Using Total Station. (Using Rankine's deflection angles)
9	To set out the Reverse curve by Using Total Station. (Using Rankine's deflection angles)
10	Preparation of Centre line marking, Column positioning and Footing marking using Total station.



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PART B	
1	Perform temporary adjustments of a total station and evaluate the impact of improper adjustments on survey accuracy.
2	Measure horizontal and vertical angles between selected points and analyze their accuracy for engineering applications.
3	Survey a given site using a total station and determine its area by selecting an appropriate surveying method.
4	Determine the difference in elevation between selected points and assess its suitability for construction planning
5	Conduct profile and cross levelling for a selected road alignment and recommend improvements based on the survey data.
6	Prepare a contour map of a selected site using total station observations and identify suitable locations for development.
7	Design and set out a simple circular curve for a given road alignment using a total station.
8	Set out a compound curve for a specified alignment using Rankine's deflection angle method and evaluate the setting-out accuracy.
9	Set out a reverse curve using Rankine's deflection angle method and compare its field applicability with a compound curve.
10	Plan and execute centre line marking, column positioning, and footing layout for a simple building using a total station, and verify the dimensional accuracy.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	An Introduction to Total Station Topographic Survey Procedures	<u>J Paul Guyer</u>	2nd	Independently Published	25 February 2018
2.	Advanced Surveying: Total Station, GIS and Remote Sensing	<u>GOPI</u>	1st	Pearson Education India	1 January 2006

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Surveying	Basak. N. N	2nd	Tata McGraw Hill Publishing Co., ltd	2014
2.	Irrigation and Water Power Engineering	Punmia, B. C	16th	Laxmi Publications, New Delhi	2016
3.	Highway Engineering	Khanna, S. K. & Justo CES	11th	Nemchand Brothers, Roorkee	2017
4.	Water Supply Engineering	Garg, S. K	37th	Laxmi Publications	2023

EBooks and online course materials:

1. Surveying

Online Courses and Video Lectures:

1. [https://nptel.ac.in/courses/Digital Land Surveying And Mapping \(DLS&M\)](https://nptel.ac.in/courses/Digital Land Surveying And Mapping (DLS&M))



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50



Activity Based Learning (27 Hours)

ABL1 (7 Hours): Activity 1 Details		Hours
Designing cycling path centerlines:		
1.	Measure RLs , compute cross-sections and volume of earth.	07
ABL2 (6 Hours): Activity 2 Details		Hours
2.	Import raw data into software, validate coordinate frames and prepare the report	06
Total		13

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

[illegible]



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DEPARTMENT OF CIVIL ENGINEERING

Course Title	BUILDING INFORMATION MODELLING LAB		
Course Code	25CVL407D	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2TW&SL=30
Course Objective: .To introduce the concepts and workflow of Building Information Modelling (BIM) in the Architecture, Engineering and Construction (AEC) industry. To familiarize students with BIM software tools for architectural modelling and project documentation. To provide hands-on experience in creating and editing parametric building components and site models. To develop the ability to generate construction drawings, schedules and project sheets from BIM models. Course Outcomes: At the end of course, student will be able to,			
#	Course Outcomes	Mapping to PO's	Mapping to POS's
CO1	Develop parametric 3D models of building components and site features using BIM software.	PO5	
CO2	Generate coordinated project documentation, including views, schedules, legends and sheets, from BIM models.	PO3, PO5, PO9	



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List of Exercises

1. Introduction to BIM Concepts and Software Environment

Introduction to Building Information Modelling (BIM), BIM workflow, and overview of the BIM software interface and tools.

Project Setup and Basic Configuration

Creation of a new BIM project, setting up project parameters, levels, grids, units, and basic project configurations.

2. Creation and Modification of Wall Elements

Modelling of different types of walls using BIM tools and applying editing techniques for accurate representation.

3. Modelling of Architectural Components

Creation and placement of doors, windows, floors, ceilings, and roof elements using parametric components.

4. Modelling of Circulation Elements

Development of staircases, ramps, railings, and other circulation elements using appropriate BIM tools.

5. Development of a 3D Model of a Single-Storeyed Residential Building

Creation of a complete 3D BIM model of a single-storeyed residential building incorporating major architectural elements.

6. Modelling of Building Services Components

Creation and placement of plumbing fixtures and sanitary components in a residential building model.

7. Site Modelling and Building Placement

Creation of topographic surfaces, building pads, and basic site components using BIM site modelling tools.

8. Room Information and Quantity Extraction

Creation of rooms, room tags, legends, room schedules, and quantity schedules from the BIM model.

9. Generation of BIM Views and Annotations

Preparation of plans, elevations, sections, and 3D views with appropriate annotations, dimensions, and detailing.

10. Preparation of BIM Drawing Sheets

Development of drawing sheets by arranging views, adding title blocks, and preparing BIM drawings for plotting and printing.



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PART B

1.Design and BIM Modelling of a Small Residential Room

Develop a BIM model of a room based on user requirements by selecting suitable dimensions, doors, windows, and furniture arrangement.

2.Create a BIM Model of a Small Office Room

4.Develop a simple office layout with workstations, furniture, doors, windows, and required building components.

3. BIM Modelling of a Classroom Layout

Prepare a classroom model by arranging furniture, doors, windows, and other architectural elements based on functional requirements.

4.BIM-Based Design of a Small Toilet Block

Develop a BIM model of a toilet block with sanitary fixtures, partitions, doors, and plumbing components.

5.Create a BIM Model of a Small Residential Building Site

Develop a basic site model by placing a residential building, pathways, boundary wall, and landscape elements.

6.BIM-Based Planning of a Small Canteen

Prepare a simple BIM model of a canteen with kitchen area, dining space, service area, and furniture layout.

7.BIM Modelling of a Small Bus Shelter

Develop a basic BIM model of a bus shelter with seating, roof, supporting elements, and surrounding site features.

8.BIM Documentation of an Existing Building

Prepare a simple BIM model of an existing building and generate plan, elevation, section, and 3D views.

9.BIM-Based Design of a Garden Pavilion

Create a simple BIM model of a small pavilion considering structure, openings, seating arrangement, and site location.

10.BIM Modelling of a Simple Staircase and Ramp

Develop different types of staircases and ramps using BIM tools and study their applications.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers,	Eastman, C., Teicholz, P., Sacks, R., and Liston, k	3rd Edition,	John Wiley & Sons,	2018
2	Mastering Autodesk Revit Architecture 2022	Krygiel, E. and Vandezande,	1st Edition	John Wiley & Sons	2021



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Hardin, B. and McCool, D.,	BIM and Construction Management: Proven Tools, Methods, and Workflows	3rd Edition,	Wiley,	2015.
2	Wing, E.,	Autodesk Revit 2022 for Architecture: No Experience Required,	1st Edition,	John Wiley & Sons	2021

EBooks and online course materials:

1. Eastman, C. et al., BIM Handbook (3rd Edition) – Wiley Online Library.
2. Autodesk, Autodesk Revit Help and User Guide.
3. National Institute of Building Sciences (NIBS), National BIM Standard – United States (NBIMS-US).

Online Courses and Video Lectures:

Autodesk Revit Learning – <https://www.autodesk.com/learn>
Autodesk Knowledge Network – <https://knowledge.autodesk.com>
Autodesk University – <https://www.autodesk.com/autodesk-university>
buildingSMART International – <https://www.buildingsmart.org>
National Institute of Building Sciences (NBIMS-US) – <https://www.nibs.org>
Autodesk Revit Video Tutorials (Official YouTube Channel) – <https://www.youtube.com/@autodesk>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30



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Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Activity Based Learning (02 Hours)



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ABL1 (01 Hour): Activity 1 Details	Hours
ABL Activity : BIM-Based Design Proposal CO1, CO2 Objective: To develop a BIM model based on user requirements. Activity Students will identify the space requirements for a proposed extension to the Civil Engineering Block (or another campus building) and prepare a BIM model of the proposed building. The model shall include architectural components, room information, and drawing sheets for presentation. Submission: Requirement Analysis BIM model Drawings (plans, elevations, and 3D views) Project presentation Description: Students will be able to develop a BIM model and generate coordinated project documentation based on user requirements.	
Total	01
ABL2 (01 Hours): Activity 2 Details	Hours
BIM for Facility Management CO1, CO2	



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Objective: To understand the application of Building Information Modelling (BIM) in facility management. Activity Description: Students, in groups, will survey a selected campus building and collect room and asset information, including room details, occupancy, furniture, doors, windows, and sanitary fixtures. The collected data will be organized as a facility management database for BIM applications. Submission: ● Building information model and plan ● Asset information sheet ● Room data schedule ● Group presentation Learning Outcome: Students will be able to organize building information for BIM-based facility management.	
Total	01

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Laboratory Conduction	3
Activity Evaluation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1					3								
CO2			2		3				2				



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Course Title	BIOLOGY FOR ENGINEERS		
Course Code	25CV408	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28L+2TW&SL=30
Course Objective: 1. To analyze the structure and function of human organ systems from an engineering perspective, incorporating principles of mechanics and biology. 2. To compare biological systems with engineered systems, focusing on fluid mechanics, stress, and transport mechanisms. Course Outcomes: At the end of course, student will be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the structure and functions of various organ systems in the human body in an engineering perspective.	PO1, PO2, PO11	
2	Relate the basic principles of engineering mechanics to the human body.	PO1, PO2, PO11	
3	Relate various natural transport mechanics in engineered systems.	PO1, PO2, PO11	
4	Compare the mechanics of fluids in natural and engineered systems.	PO1, PO2, PO11	
MODULE-1			
			8 Hrs.
Human Anatomy and Health Aspects in Civil Engineering: Understanding the relationship between the human body and workplace safety by studying the major body systems, the health effects of toxic gases encountered in civil engineering works, and the measures required to ensure safe working conditions through proper ventilation, personal protection, and confined-space safety practices.			
MODULE-2			7 Hrs.
Skeletal System: Material Properties of bones, Stress and Strain, Bending Moment and torsional Loads, Area, Moment of Inertia, Joints of Human Body and Degree of Freedom.			
MODULE-3			7 Hrs.
Transport System in the Human Body: Transportation of matter (solids, liquids and gases), removal of waste products, convection and diffusion mechanisms, Fick's Law, Osmosis for water Balance, Comparison of engineering system design with transport systems in human body.			
MODULE-4			8 Hrs.



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Circulatory System: Fluid Mechanics in Human body, Comparison of natural system with engineered system, Viscosity of fluids, Type of fluid Flow and the influence of Reynolds' number, Fluid energy, Hydrostatic Pressure, Comparison of Engineering System Designs with circulatory systems in human body.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Biology for Engineers	Johnson A T	2nd	CRC Press	(2018)
2.	Occupational Health and Safety Management	Charles D. Reese	3rd Edition	CRC Press, Taylor & Francis	(2018)

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Environmental Biology for engineers and Scientists	Vaccari, D A Strom, P F & Alleman, John Wiley & Sons	1st	Wiley-Interscience	(2005)
2.	Biologically-inspired condition monitoring of civil engineering structures	Smarsly K	International Journal of Computer and Electrical Engineering, 2 (4), 770	-	(2010)
3.	Construction Safety and Health Management	David L. Goetsch	2nd Edition	Pearson Education	2011

EBooks and online course materials:

1. <https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false>
2. https://www.researchgate.net/publication/381665726_Biology_for_Engineers



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Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	2
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				30

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two Multiple Choice Questions Patterned CIE conducted for 20 marks each	40
Activity Details	Details of activities to be conducted 1) Presentations and Models	10
Total		50

Activity Based Learning (27 Hours)

ABL1 (1 Hours) : Activity 1 Details	Hours
Students will prepare models/presentations on human organ systems and explain their functions from an engineering perspective. They will demonstrate concepts such as stress, strain, bending, and joint movements using simple experimental setups.	
Total	1
ABL2 (1 Hours): Activity 2 Details	Hours
Students will compare biological transport and circulatory systems with engineering systems through simple demonstrations and observations. The activity helps students understand transport phenomena, fluid flow, and their applications in the human body.	
Total	1



Type of Evaluation	Hours
Test(1 and 2)	2
Activity Evaluation	2
Semester End Exam	3
Total	7

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