



**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT,
KABLANA (JHAJJAR)
An Autonomous Institute**

‘A’ GRADE ACCREDITED BY NAAC

**Evaluation Scheme and Syllabus
Common for B.Tech (Civil Engineering)
And
B.Tech (Civil Engineering – Working Professionals)
Second Year (B-Scheme)
(Under NEP-2020)
(Effective from the session: 2026-27)**



**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU,
ROHTAK**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA,
JHAJJAR (HR.)**

Scheme of Studies and Examinations

Common for B.Tech (Civil Engineering) – 3rd Semester

and

B.Tech (Civil Engineering - Working Professionals) – 3rd Semester

w.e.f. 2026-27

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Schedule (Marks)				Exam Duration in H
				L	T	P			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-CE-201B	Building Construction and Material	3	0	0	3	3	30	45		75	3
2	Professional Core Courses	PCC-CE-203B	Construction Techniques and Equipments	3	0	0	3	3	30	45		75	3
3	Professional Core Courses	PCC-CE-205B	Fluid Mechanics	3	0	0	3	3	30	45		75	3
4	Professional Core Courses	PCC-CE-207B	Surveying	3	0	0	3	3	30	45		75	3
5	Professional Core Courses	PCC-CE-209B	Engineering Geology	3	0	0	3	3	30	45		75	3
6	Engineering Science Courses	ESC-CE-211B	Engineering Mechanics	3	0	0	3	3	30	45		75	3
7	Professional Core Courses	LC-PCC-CE-213B	Building Materials Lab	0	0	2	2	1	10		15	25	3
8	Professional Core Courses	LC-PCC -CE-215B	Fluid Mechanics Lab	0	0	2	2	1	10		15	25	3
9	Engineering Science Courses	LC-ESC -CE-217B	Engineering Mechanics Lab	0	0	2	2	1	10		15	25	3
10	Professional Core Courses	LC-PCC -CE-219B	Surveying Lab	0	0	2	2	1	10		15	25	3
11	Professional Core Course	LC-PCC -CE-221B	CAD Lab	0	0	2	2	1	10		15	25	3
12	Mandatory Courses	MC-201B*	Environment al Science*	2	0	0	2	0	20		30	50*	3
Total Credits								23				575	

Notes:

- I. MC-201B is a mandatory non-credit course in which students will be required to obtain passing marks in theory. The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in detailed marks certificate of student.

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA,
JHAJJAR (HR.)**

**Scheme of Studies and Examinations
Common for B.Tech (Civil Engineering) – 4th Semester**

**and
B.Tech (Civil Engineering - Working Professionals) – 4th Semester
w.e.f. 2026-27**

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Schedule (Marks)				Exam Duration in H
				L	T	P			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Basic Science Courses	BSC-CE-202B	Engineering Mathematics-III	3	1	0	4	4	40	60		100	3
2	Professional Core Course	PCC-CE-204B	Hydraulic Engineering	3	0	0	3	3	30	45		75	3
3	Professional Core Course	PCC-CE-206B	Structural Analysis	3	0	0	3	3	30	45		75	3
4	Professional Core Course	PCC-CE-208B	Advanced Surveying	3	0	0	3	3	30	45		75	3
5	Professional Core Course	PCC-CE-210B	Design of Concrete Structures	3	0	0	3	3	30	45		75	3
6	Professional Elective Course	Refer Table-1	Professional Elective-I	3	0	0	3	3	30	45		75	3
7	Professional Core Course	LC-PCC -CE-212B	Hydraulic Engineering Lab	0	0	2	2	1	10		15	25	3
8	Professional Core Course	LC-PCC -CE-214B	Structural Analysis Lab	0	0	2	2	1	10		15	25	3
9	Professional Core Course	LC-PCC -CE-216B	Advanced Surveying Lab	0	0	2	2	1	10		15	25	3
10	Professional Core Course	LC-PCC -CE-218B	Concrete Lab	0	0	2	2	1	10		15	25	3
Total Credits								23				575	

Notes:

- I. At the end of the 4th Semester, each student shall undergo 4–6 weeks of Industrial/Practical Training in a Civil Engineering organization and submit a training report along with a training certificate from the organization. The evaluation shall be carried out in the 5th Semester.
- II. For Working Professionals: Submit a Training/Project report of their work in their respective company/Organization for the period of summer training/industrial training for evaluation. The evaluation shall be carried out in the 5th Semester.
- III. Students must choose one course from the Professional Elective–I category (Table 1). They may also opt for Massive Open Online Courses (MOOCs) offered through the SWAYAM, SWAYAM Plus, or NPTEL platforms, subject to the approval of the concerned Chairperson, Board of Studies/Head of the Department.

Table 1 Professional Elective – I

Sr. No.	Code	Subject
1	PEC-CE-220B	Repair and Rehabilitation of Structures
2	PEC-CE-222B	Climate Hazards and Disaster Mitigation
3	PEC-CE-224B	Material Testing and Evaluation
5	-----	MOOCs offered through SWAYAM, SWAYAM Plus, or NPTEL platforms

Course Code	PCC-CE-201B				
Category	Professional Core Course				
Course Title	Building Construction and Material				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are • To provide knowledge of building components and construction techniques. • To understand properties and applications of construction materials. • To develop ability to select suitable materials for various construction requirements. • To familiarize students with construction practices and standards.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Define building materials, components, and construction terminology.	Level 1: Remember
CO2	Understand construction practices and functional requirements of buildings.	Level 2: Understand
CO3	Apply suitable materials and construction techniques.	Level 3: Apply
CO4	Analyze building components for durability and sustainability.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Building Planning and Masonry: Building planning principles, Functional components of buildings, Building terminology, Building orientation, Modular coordination, Masonry units, Mortars and mortar joints, Brick masonry bonds, Masonry construction practices, Composite masonry, Glass block masonry, Quality of workmanship, Common defects in masonry. Module 2: Roofs, Floors and Openings: Roof systems, Roof coverings, King-post and Queen-post trusses, Floor systems, Floor finishes, Doors, Windows, Ventilators, Aluminium and uPVC door-window systems, Hardware, Fixtures and fastener.
Unit-II	Module 3: Timber and Building Products: Timber properties and preservation, Engineered wood products, Plywood, Blockboard, Particle board, Fibre boards, Architectural glass, Glazing systems, Composite panels, Lightweight building products. Module 4: Building Finishes and Surface Materials: Building stones, Stone finishes, Stone cladding, Flooring systems, Ceramic, Vitrified and Cement concrete tiles, Wall finishes, Paints, Primers, Varnishes, Protective coatings, Decorative finishes, Building envelope materials.

Unit-III	Module 5: Walls and Foundations: Load-bearing and framed construction, Load-bearing and non-load-bearing walls, Cavity walls, Partition walls, Selection of foundation systems, Shallow foundations, Masonry foundations, Basic site investigation, Foundations in difficult soil conditions, Introduction to deep foundations. Module 6: Staircases and Accessibility: Planning and layout of staircases, Stair terminology, Types of staircases, Accessibility provisions, Universal design principles, Ramps, Lifts, Escalators, Moving walkways.
Unit-IV	Module 7: Building Protection: Damp-proofing, Waterproofing, Fire-resistant construction, Fire-resistant materials, Thermal insulation, Acoustic insulation, Moisture control, Weather protection, Building durability concepts. Module 8: Emerging Building Materials: AAC blocks, Geosynthetics, Fibre Reinforced Polymer (FRP) products, Fibre cement boards, Composite building panels, Lightweight building materials, Recycled building materials, Smart building materials, Energy-efficient building materials, Sustainable building products..

Suggested Readings:

1. Building Construction by Sushil Kumar, Standard Pub., N. Delhi
2. Building Material by Rangawala
3. Construction Engineering by Y.S. Sane
4. Building Construction by Gurcharan Singh, Standard Pub., N. Delhi

Useful Video Links

Unit No.	Topic	Link
Unit-I	Building Planning & Components	https://www.youtube.com/results?search_query=nptel+building+planning+civil+engineering
	Building Stones	https://www.youtube.com/results?search_query=building+stones+civil+engineering
Unit-II	Timber in Construction	https://www.youtube.com/results?search_query=timber+building+materials+nptel
	Roofing Systems	https://www.youtube.com/results?search_query=roofing+systems+building+construction
Unit-III	Wall Construction	https://www.youtube.com/results?search_query=load+bearing+wall+construction
	Staircase Planning	https://www.youtube.com/results?search_query=staircase+planning+civil+engineering
Unit-IV	Waterproofing	https://www.youtube.com/results?search_query=waterproofing+building+construction
	Smart & Sustainable Materials	https://www.youtube.com/results?search_query=smart+building+materials+civil+engineering

Course Code	PCC-CE-203B				
Category	Professional Core course				
Course Title	Construction Techniques and Equipments				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are: • To understand the fundamentals of construction equipment and techniques. • To familiarize with modern construction methods and site practices. • To develop knowledge of construction planning, safety, and quality in civil engineering projects.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Describe the fundamentals of construction equipment and techniques.	Level 1: Remember
CO2	Explain construction methods and techniques.	Level 2: Understand
CO3	Apply construction principles to civil engineering works.	Level 3: Apply
CO4	Analyze construction practices for efficient project execution.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Earthmoving and Material Handling Equipment: Classification and selection of construction equipment, Earthmoving equipment (Excavators, Bulldozers, Loaders, Scrapers), Hauling and compacting equipment, Material handling equipment (Cranes, Hoists, Conveyors, Equipment productivity and safety). Module 2: Concrete Construction Equipment: Concrete batching and mixing plants, Transit mixers, Concrete pumps, Vibrators, Concrete placing and finishing equipment, Asphalt plants and road paving equipment, Equipment maintenance.
Unit-II	Module 3: Temporary Works and Site Preparation: Site clearance and site preparation, Excavation and dewatering methods, Temporary works in construction, Basic concepts of formwork, Centering, Falsework, Scaffolding, Shoring and bracing, Construction joints, Inspection and safety during temporary works. Module 4: Industrialized Construction Systems: Prefabrication, Precast concrete construction, Modular construction, Pre-engineered buildings (PEB), Segmental construction, Composite construction, Slip form construction, Tunnel form construction, Jump form construction, Advantages and limitations.
Unit-III	Module 5: Specialized Construction Techniques: Bridge construction methods, Deep excavation, Cofferdams, Sheet piling, Underwater concreting, Trenchless construction (Pipe jacking and Micro-tunnelling), Construction in difficult ground conditions.

	Module 6: Construction Planning and Site Management: Construction sequence and workflow, Site layout and organization, Material storage and handling, Temporary facilities, Resource utilization, Productivity improvement techniques, Introduction to Lean Construction, Construction records and documentation.
Unit-IV	Module 7: Heavy Construction and Infrastructure Development: Construction of highways, Railways, Bridges, Tunnels, Dams, Airports, Multistoreyed buildings, Steel structures, Precast construction, Challenges in large infrastructure projects. Module 8: Construction Safety and Quality Management: Construction safety management, PPE, Hazard identification, Risk assessment, Inspection procedures, Construction quality assurance, Construction documentation, Construction waste management, Sustainable construction practices.

Suggested Readings

1. R.L. Peurifoy, C.J. Schexnayder & A. Shapira – Construction Planning, Equipment and Methods (McGraw Hill)
2. S.C. Sharma & S.K. Duggal – Building Construction (McGraw Hill India)
3. B.C. Punmia, A.K. Jain & A.K. Jain – Building Construction (Laxmi Publications)
4. S.C. Rangwala – Building Construction (Charotar Publishing House)
5. Dr. Mahesh Varma – Construction Equipment and Methods (Metropolitan)
6. G.R. Raina & S.K. Gupta – Construction Management and Equipment
7. M.L. Gambhir – Building and Construction Materials (McGraw Hill Education)
8. NPTEL – Construction Planning and Equipment – <https://nptel.ac.in>
9. CPWD Works Manual – <https://cpwd.gov.in>

Useful Video Links

Unit No.	Topic	Link
Unit -I	Construction Equipment (Earthmoving & Material Handling)	https://www.youtube.com/playlist?list=PLbMVogVj5nJQ5kq5z6zq1Q8o8qk0qkqkq
	Concrete Construction Equipment	https://civilblog.org/building-materials-and-construction-civil-engineering-video-lectures/
Unit -II	Formwork Systems	https://civilblog.org/building-materials-and-construction-civil-engineering-video-lectures/
	Industrialized Construction	https://www.youtube.com/user/NPTELHRD/playlists
Unit -III	Bridge & Tunnel Construction	https://www.youtube.com/watch?v=0olpSN6_TCc
	Deep Excavation & Cofferdams	https://www.youtube.com/watch?v=HowDoSpillwaysWork-fjapgTd-QUg
Unit -IV	Construction Safety Practices	https://www.youtube.com/watch?v=j04CtMzo_0Y
	Conceptual Engineering Insights	https://www.youtube.com/@PracticalEngineeringChannel

Course Code	PCC-CE-205B					
Category	Professional Core Course					
Course Title	Fluid Mechanics					
Scheme and Credits	L	T	P	Credits	Semester-III	
	3	0	0	3		
Course Objectives	The objectives of this course are: • To introduce properties and behavior of fluids at rest and in motion. • To develop understanding of fluid statics and fluid dynamics principles. • To enable analysis of pipe flow and open channel flow problems. • To prepare students for hydraulic engineering applications.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

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

COs	Skills Demonstrated	RBT Level
CO1	Define basic concepts of fluids.	Level 1: Remember
CO2	Understand properties of fluids.	Level 2: Understand
CO3	Apply equations of fluid flow to solve engineering problems.	Level 3: Apply
CO4	Analyze the behavior of fluid flow.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module1: Fluids and Their Properties: Introduction of fluid, fluid classifications, hypothesis of continuum, Shear stress in a moving fluid, molecular structure of material, fluid density, viscosity, causes of viscosity in gases and liquids, surface tension, capillary effect, vapor pressure, cavitations, compressibility and the bulk modulus. Module2 : Pressures and Head: Types of Pressure, Pascal's law of pressure at a point, variation of pressure vertically in a fluid under gravity, equality of pressure at the same level in a static fluid, general equation for the variation of pressure due to gravity from a point to point in a static fluid, pressure and head, the hydrostatic paradox.
Unit-II	Module 3 : Static Forces on Surface and Buoyancy: Fluid static, action of fluid pressure on surface, resultant force and centre of pressure on a plane surface under uniform pressure, resultant force and centre of pressure on a plane surface immersed in a liquid, pressure diagrams, forces on a curved surface due to hydrostatic pressure, buoyancy, equilibrium of floating bodies, stability of a submerged body, stability of floating bodies, determination of the metacentric height, determination of the position of the metacentre relative to the centre of buoyancy. Module 4: Motion of Fluid Particles and Streams: Fluid flow, different types of flow, frames of reference, analyzing fluid flow, motion of a fluid particle, acceleration of a fluid particle, discharge and mean velocity, continuity of flow, continuity equations for 2-D and 3-D flow in Cartesian coordinates of system.

Unit-III	Module 5: The Energy Equation and its Application: Momentum and fluid flow, Momentum equation for 2-D and 3-D flow along a stream line, momentum correction factor, Euler's equation of motion along a stream line, Mechanical energy of a flowing fluid – Bernoulli's theorem, kinetic energy correction factor, pitot tube, determination of volumetric flow rate via pitot tube, changes of pressure in tapering pipe, principle of venturimeter, pipe orifices, theory of small orifices discharging to atmosphere, theory of large orifices, Rotameter, elementary theory of notches and weirs, flow in a curved path. Module 6: Dimensional Analysis And Similarities: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance of dimensionless, use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, Kinematic similarity, model testing-Model laws, Undistorted and Distorted models
Unit-IV	Module 7: Flow Through Pipes: Boundary layer flow, Elementary turbulent flow, Flow through pipes, Head losses in pipes, Bends and Fittings, Reynold's experiments, Prandtl mixing length hypothesis, Velocity distribution in pipes, Concept of smooth and rough pipes, Pipe friction factor relations. Pipe network.

Suggested Readings:

1. Hydraulic and Fluid Mechanic by P.N.Modi&S.M.Seth
2. Introduction to Fluid Mechanics by Robert W.Fox& Alan T.McDonald 3 Fluid Mechanics Through Problems by R.J.Garde
3. Engineering Fluid Mechanics by R.J.Garde&A.G.Mirajgaoker
4. Fluid Mechanic and Hydraulic machines R.K. BANSAL

Useful Video Links

Unit No.	Topic	Link
Unit-I	Fluids and Their Properties	https://youtu.be/iTanaNwMDKo?si=_6zrC4tftGCfjclw
	Pressures and Head	https://youtu.be/38xWEHdUjD0?si=0rkPRLcfpMPEck8a
Unit-II	Static Forces on Surface and Buoyancy	https://youtu.be/9bdGZkkHukA?si=cOuXF9YrsNt_VEXt
	Motion of Fluid Particles and Streams	https://youtu.be/jnDbVE17Pzg?si=5Y4PVBzFDOYTFJto
Unit-III	The Energy Equation and its Application	https://youtu.be/WGuzqF2GCBg?si=AmyZNYaVxkG8SRIJ
	Dimensional Analysis And Similarities	https://youtu.be/tV3ShM1fo5Y?si=YqqMpiXoEEzb7gtH
Unit-IV	Flow Through Pipes	https://youtu.be/1X71UfOCEU4?si=GMIX_i71UAfC0QmS

Course Code	PCC-CE-207B				
Category	Professional Core Course				
Course Title	Surveying				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are: •To impart knowledge of fundamental surveying principles and measurement techniques used in civil engineering practice. •To develop competency in the use of chain, compass, level, theodolite, and related surveying instruments. •To enable computation and adjustment of levelling, traversing, and contouring data.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall basic concepts of surveying.	Level 1: Remember
CO2	Understand methods of surveying.	Level 2: Understand
CO3	Apply surveying techniques for measurement of civil engineering projects.	Level 3: Apply
CO4	Analyze survey data and errors.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Surveying Fundamentals and Direction Measurement: Definition and objectives of surveying, principles and classification of surveying, instruments for linear measurement, methods of linear measurement – chaining and taping, errors in linear measurement and tape corrections, types of compass – prismatic and surveyor's compass, bearings – whole circle and reduced bearing, meridians – true, magnetic and arbitrary, magnetic declination, local attraction – causes, detection and correction, methods of compass traversing, checks in traversing, adjustment of closed traverse with examples. Module 2: Leveling and Geodetic Trigonometric leveling: Terms used in leveling, types of levels and staff, principles of levelling, reduction of levels and booking of staff readings, examples. Height and distances- base of the object accessible and inaccessible, geodetically observation, correction due to curvature and refraction, axis signal correction, difference in elevation between two points.
Unit-II	Module 3: Plane Table Surveying: Plane table accessories, Types and methods of plane table surveying, sources of error, advantages and disadvantages of plane table surveying. Module 4: Contouring: Contours and characteristics of contour lines, Contour interval and Factor affecting CI locating contours, interpolation of contours, Use of contour maps.

Unit-III	Module 5: Angle Measurement: Theodolite, parts of theodolite, Temporary adjustment of Theodolite, measurement of horizontal and vertical angles by different methods, theodolite traversing, adjustments of closed traverse. Module 6: Tachometric surveying: Principle of tachometric surveying, different instrument used in tachemetry, stadia and tangential method of tachemetry, tachemetric constants and their determinations, examples.
Unit-IV	Module 7: Curves: Classification of curves, elements of simple circular curve, location of tangent points- chain and tape methods, instrumental methods, Examples; types of transition curves; Vertical Curves: Necessity and types of vertical curves, setting out of a vertical curve. Module 8: Total Station – Basic Concepts: Definition and purpose of Total Station, main components – electronic theodolite, EDM and other method of distance measurement.

Suggested Readings:

- Surveying volume I and II: B C Punmia.
- Engineering Surveying (Sixth Edition): W. Schofield.
- Text Book of Surveying: C. Venkataramiah.
- Introduction to GPS: The Global Positioning System: Ahmed El-Rabbany.
- Surveying by Duggal.
- Various Online resources including NPTEL.

Useful Video Links

Unit No.	Topic	Link
Unit-I	Basics of Surveying and Linear measurement	https://youtu.be/chhuq_t40rY?si=O-rZ0GyeQRQ0I1Ht
	Terms used in levelling	https://youtu.be/La5A5PLQjaQ?si=e6zg_3GViavxOn
Unit-II	Methods of plane table surveying	https://youtu.be/COldgKBaiqw?si=8ONvMgLWwjP8Ql2p
	Contours and characteristics of contour lines	https://youtu.be/pHarJN7Wo0M?si=WzMPfR8rcJid_GoQ
Unit-III	Theodolite, parts of theodolite	https://youtu.be/6yyMZSHCbCo?si=qX3gYxRgeXr6Ef4s
	Tachometric surveying	https://www.youtube.com/watch?v=HuJMSS3T070&list=PL5UuHQx11pk3VBalpNcdAgxXSwG9QGyZp
Unit-IV	Curves, Classification of curves	https://youtu.be/EMFPb3Rn7Jw?si=mEJPVQhLMuYcf39L
	Total Station – Basic Concepts	https://youtu.be/a2Z1Z_M6SEo?si=IxvBgExEABmO5Xgg

Course Code	PEC-CE-209B				
Category	Professional Core Course				
Course Title	Engineering Geology				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are: - To provide fundamental knowledge of geology, minerals, rocks, and geological processes relevant to civil engineering. - To develop skills for map interpretation, rock analysis, and evaluation of geological conditions in engineering projects and hazards.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	70 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall basic concepts of geology, minerals, rocks, and earth structure.	Level 1: Remember
CO2	Understand geological processes like weathering, erosion, petrology, and structural geology.	Level 2: Understand
CO3	Apply geological knowledge to map interpretation, identification of minerals/rocks, and engineering evaluation of rock properties.	Level 3: Apply
CO4	Analyze geological conditions in civil engineering projects (dams, slopes, earthquakes) and assess hazards with suitable measures.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1 : Introduction: Scope, Subdivision of Geology, Interior of Earth, Importance of Geological Studies in Various Civil Engineering Projects, Department Dealing with this Subject in India and their Scope of Work- GSI, Granite Dimension Stone Cell, NIRM; Use of Geological Maps and Interpretation of Data. Module 2: Physical Geology: External and Internal Geological Forces Causing Changes; Weathering, Erosion and Denudation of the Surface of the Earth; Factors Affecting Weathering and Product of Weathering; Superficial Deposits and its Geotechnical Importance: Water Fall and Gorges, River Meandering, Alluvium, Glacial Deposits, Desert Landform, Loess, Mudflows, Coastal Deposits.
Unit-II	Module 3 : Mineralogy : Origin and Composition of Minerals, Physical Properties of Minerals, Susceptibility of Minerals to Alteration, Rock Forming Minerals, Megascopic Identification of Common Primary and Secondary Minerals. Module 4 : Petrology: Rock Formation Processes, Ternary Diagram, Igneous Petrology-Volcanic Phenomenon, Types of Volcanic Eruption, Chemical and Mineralogical Composition, Texture and its Types, Sedimentary Petrology- Mode of Formation, Mineralogical Composition, Texture and its Types; Metamorphic Petrology- Agents and Types of Metamorphism, Metamorphic Grades, Mineralogical Composition, Structures and Textures.

Unit-III	Module 5: Structural Geology: Forms and Structures of Rocks, Stress and Strain in Rocks, Deformation and Tectonics, Dip and Strike, Bedding Planes and Outcrops; Fold- Types and Nomenclature, Criteria for Their Recognition in Field; Faults: Classification, Recognition in Field. Module 6 : Properties of Rock Masses: Sub Surface Investigations of Rocks and Engineering Characteristics of Rocks Masses; Field and Laboratory Tests on Rocks, Stress Deformation and Bearing Capacity of Rocks, Important Variables Influencing Rock Properties and Behaviour, Measurement of Velocity of Sound in Rock.
Unit-IV	Module 7 : Geology of Dam and Reservoir: Site Geological Consideration for Selecting Dam and Reservoir Site, Causes of Failure of Reservoir, Favourable and Unfavourable Conditions in Different Types of Rocks in Presence of Various Structural Features, Precautions to Counteract Unsuitable Conditions. Module 8: Geological Hazards: Rock Instability and Slope Movement; Concept of Sliding, Consequences of Land Sliding, Prevention by Surface Drainage, Slope Reinforcement by Rock Bolting and Rock Anchoring; Earthquake: Magnitude and Intensity of Earthquake, Seismic Waves; Seismic Zones in India.

Suggested Readings

- A textbook of Geology by P.K Mukherjee
- Physical and General Geology by SK Garg
- Engineering and General Geology by Prabin Singh.
- Introduction of physical Geology by A.holmes

Useful Video Links

Unit No.	Topic	Link
Unit-I	Scope, Subdivision of Geology	https://youtu.be/ksJpBG0R5pM?si=5cOmhlDq6Xb0awyf
	Weathering, Erosion and Denudation of the Surface of the Earth	https://youtu.be/GCiSOGweitU?si=ic3lArR5MbmJW8k3
Unit-II	Origin and Composition of Minerals	https://youtu.be/kVopWFgOcrU?si=f3pJdh4aNfhq2-DZ
	Sedimentary Petrology	https://www.youtube.com/live/ezqUycfNlzE?si=obAP9KAHLAakI1Rz
Unit-III	Dip and Strike, Bedding Planes and Outcrops	https://youtu.be/WdBtwf3vl_0?si=y3aNj_0tu0CX2MBD
	Sub Surface Investigations of Rocks	https://youtu.be/ZLmqtF2FtkU?si=fs6mlkfDoktkC3cO
Unit-IV	Dam and Reservoir Site	https://youtu.be/bDwow2-WzHo?si=dmCdQXbKE1C8YEU
	Earthquake: Magnitude and Intensity of Earthquake	https://youtu.be/mWXpUo-KOw?si=LPPrSZANDX9MDRCx

Course code	ESC-CE-211B				
Category	Engineering Science Course				
Course title	Engineering Mechanics				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are: • To introduce fundamental principles of statics and mechanics of rigid bodies. • To develop ability to analyze forces, moments, and equilibrium conditions. • To apply mechanics principles to solve engineering problems. • To build foundation for advanced structural subjects.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Define basic concepts of engineering mechanics.	Level 1: Remember
CO2	Understand behavior of various force systems.	Level 2: Understand
CO3	Apply mechanics principles to solve structural problems.	Level 3: Apply
CO4	Analyze structural components under various loading conditions.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Force Systems and Friction: System of forces, equilibrium of particles and rigid bodies in two and three dimensions, Free Body Diagrams (FBDs), support reactions, internal forces in structural members (axial force, shear force and bending moment), dry friction, laws of friction, angle of friction, angle of repose, applications of friction (ladders, wedges and belt). Module 2: Simple and Compound Stresses and Strains: Mechanical properties of engineering materials, normal and shear stresses and strains, Hooke's law, elastic constants and their relationships, Poisson's ratio, stresses and deformation of prismatic, stepped and tapered bars under axial loading and self-weight, compound bars, thermal stresses and strains, factor of safety, proof stress.
Unit-II	Module 3: State of Stress and Strain: Stress transformation under plane stress, principal stresses and principal planes, principal strains, maximum shear stress, Mohr's Circle for stress analysis, combined normal and shear stresses. Module 4: Shear Force and Bending Moment: Classification of beams and loading systems, shear force and bending moment, differential relationships among load, shear force and bending moment, axial force, shear force and bending moment diagrams for statically determinate beams, point of contra-flexure.

Unit-III	Module 5: Flexural and Torsional Behaviour: Theory of simple bending, flexure formula, bending stresses, combined direct and bending stresses, section modulus, composite beams, kern and middle-third rule, transverse shear stress distribution in beams, theory of pure torsion, torsion equation, solid and hollow circular shafts, power transmission through shafts, shafts in series and parallel, combined bending and torsion. Module 6: Thin Pressure Vessels and Columns: Thin cylindrical pressure vessels, circumferential (hoop) stress, longitudinal stress, volumetric strain, classification of columns, slenderness ratio, Euler's buckling theory, Rankine-Gordon formula, eccentrically loaded columns.
Unit-IV	Module 7: Analysis of Plane Trusses: Classification of trusses, perfect, deficient and redundant trusses, zero-force members, analysis of statically determinate plane trusses by Method of Joints and Method of Sections. Module 8: Failure Theories: Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum Shear Stress Theory (Tresca Criterion), Maximum Strain Energy Theory, Distortion Energy Theory (von Mises Criterion), comparison and applications of failure theories.

Suggested Readings

- Strength of Material by G.H. Ryder, MacMillan Publishers India Ltd.
- Mechanics of Materials by E.J. Hearn, Elsevier Publications.
- Mechanics of Materials by Punmia and Jain, Laxmi Publications (P) Ltd.
- Mechanics of Materials by R.C. Hibbeler, Pearson Higher Education.
- Strength of Materials by Timoshenko and Young,, East West Press.
- Mechanics of materials by V Gupta, Narosa publishing house.

Useful Video Links

Unit No.	Topic	Link
I	Simple Stresses and Strains	https://youtu.be/DzyIEz3dKXQ?si=_k7krOEATzbR_uU1Z
II	Compound stress and strains	https://youtu.be/EDdUiNHLF2o?si=-_qcKtD_1pof_AEA4
III	Buckling of columns	https://youtu.be/vhXJ6ZcKb5c?si=jHZ2-2e595JXXwSC
IV	Different types of trusses	https://youtu.be/ef-5HtnBubU?si=pqpXD05mgSuGrabd

Course code	LC-PCC-CE-213B				
Category	Lab Course				
Course title	Building Materials Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives:	The objectives of this course are: • Understand the basic properties of construction materials. • Develop practical skills in testing and handling construction materials. • Interpret laboratory test results using standard procedures. • Assess the quality and suitability of materials for construction applications.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to:

COs	Skills Demonstrated	RBT Level
CO1	Identify the properties of common construction materials.	Level 1: Remember
CO2	Explain standard testing procedures and relevant specifications for construction materials.	Level 2: Understand
CO3	Demonstrate laboratory tests on construction materials following standard procedures.	Level 3: Apply
CO4	Analyze test results to assess the construction materials for engineering applications.	Level 4: Analyze

List of Experiments

1. Determination of normal consistency of cement.
2. Determination of initial and final setting time of cement.
3. Determination of fineness of cement.
4. Determination of soundness of cement.
5. Determination of compressive strength of cement mortar.
6. Sieve analysis of fine and coarse aggregates.
7. Determination of specific gravity and water absorption of aggregates.
8. Determination of bulk density and void ratio of aggregates.
9. Testing of bricks for dimensions, water absorption, efflorescence and compressive strength.
10. Testing of concrete blocks and AAC blocks.
11. Determination of moisture content and basic properties of timber.
12. Identification and study of building products such as plywood, fibre boards, aluminium, uPVC and architectural glass.

Useful Video links:

Exp. No.	Topics	Links
1	Determination of Normal Consistency of Cement	https://www.youtube.com/results?search_query=normal+consistency+of+cement+vicat+apparatus
2	Determination of Initial and Final Setting Time of Cement	https://www.youtube.com/results?search_query=initial+and+final+setting+time+of+cement+vicat+apparatus
3	Determination of Fineness of Cement	https://www.youtube.com/results?search_query=fineness+test+of+cement+sieve+test
4	Determination of Soundness of Cement	https://www.youtube.com/results?search_query=soundness+test+of+cement+le+chatelier+apparatus
5	Determination of Compressive Strength of Cement Mortar	https://www.youtube.com/results?search_query=compressive+strength+test+of+cement+mortar
6	Sieve Analysis of Fine and Coarse Aggregates	https://www.youtube.com/results?search_query=sieve+analysis+of+fine+and+coarse+aggregates
7	Specific Gravity and Water Absorption of Aggregates	https://www.youtube.com/results?search_query=specific+gravity+and+water+absorption+test+of+aggregates
8	Bulk Density and Void Ratio of Aggregates	https://www.youtube.com/results?search_query=bulk+density+and+void+ratio+of+aggregates
9	Testing of Bricks (Dimensions, Water Absorption, Efflorescence & Compressive Strength)	https://www.youtube.com/results?search_query=brick+testing+water+absorption+efflorescence+compressive+strength
10	Testing of Concrete Blocks and AAC Blocks	https://www.youtube.com/results?search_query=concrete+block+and+AAC+block+testing
11	Moisture Content and Basic Properties of Timber	https://www.youtube.com/results?search_query=timber+moisture+content+test+and+properties
12	Identification of Building Products (Plywood, Fibre Boards, Aluminium, uPVC & Glass)	https://www.youtube.com/results?search_query=building+materials+plywood+fibre+board+aluminium+uPVC+glass

Course code	LC-PCC-CE-215B				
Category	Lab Course				
Course title	Fluid Mechanics Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives:	The objectives of this course are: • To conduct experiments related to fluid flow and measurement. • To verify theoretical principles through experimentation. • To analyze experimental data and hydraulic performance.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to:

COs	Skills Demonstrated	RBT Level
CO1	Recall hydraulic instruments, measuring devices, and fluid properties.	Level 1: Remember
CO2	Understand principles of fluid flow, pressure, and discharge measurement.	Level 2: Understand
CO3	Illustrate experiments to determine flow characteristics.	Level 3: Apply
CO4	Analyze flow characteristics and energy losses.	Level 4: Analyze

List of Experiments

1. Verification of Bernoulli's Theorem
2. Calibration of V notch
3. Calibration of Rectangular notch
4. Calibration of Trapezoidal notch
5. Study of Pressure Measuring Devices
6. Determination of Metacentric height
7. Hydrostatics Force on Flat Surfaces/Curved Surfaces
8. Venturimeter
9. Orifice meter
10. Determination of coefficient C_d , C_v , and C_c

Useful Video links:

Exp. No	Experiment	Links
1	Verification of Bernoulli's Theorem	https://www.youtube.com/watch?v=m90wPNvxAIg
2	Calibration of V notch	https://www.youtube.com/watch?v=ILY4QMQUIY5s
3	Calibration of Rectangular notch	https://www.youtube.com/watch?v=0u-jamQjVk0
4	Calibration of Trapezoidal notch	https://www.youtube.com/watch?v=ZOVlvLVYDjE

Course code	LC-ESC-CE-217B				
Category	Lab Course				
Course title	Engineering Mechanics Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives:	The objectives of this course are: • To provide practical exposure to mechanics principles through experiments. • To develop skills in conducting experiments and interpreting results. • To correlate theoretical concepts with experimental observations.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to:

COs	Skills Demonstrated	RBT Level
CO1	Recall basic concepts of engineering mechanics.	Level 1: Remember
CO2	Understand the principles of equilibrium, friction, and mechanical behavior of bodies.	Level 2: Understand
CO3	Illustrate experiments related to forces, moments, friction, and centroids.	Level 3: Apply
CO4	Analyze experimental results and compare them with theoretical values.	Level 4: Analyze

List of Experiments

1. To determine elastic properties of a beam.
2. Torsion of cylindrical rods (Shaft).
3. To determine and analyse deflection of curved beams.
4. Experimental and analytical study of behaviour of struts with various end conditions.
5. To determine deflection of trusses – Horizontal and vertical deflection of various joints of a pin jointed truss.
6. Experimental and analytical study of a 3bar pin jointed Truss.
7. Experimental and analytical study of an elastically coupled beam.
8. To plot stress- strain curve for mild steel – Demonstration

Useful Video links:

Exp. No	Experiment	Links
1	To determine elastic properties of a beam.	https://www.youtube.com/watch?v=nC0Sk36SZ0w
2	To determine and analyze deflection of curved beams.	https://www.youtube.com/watch?v=cGTebUY2xQc
3	Experimental and analytical study of behavior of struts with various end conditions.	https://www.youtube.com/watch?v=wgCXC-8UOU0
4	Experimental and analytical study of a 3bar pin jointed Truss.	https://www.youtube.com/watch?v=Lwzcwm3oL8A

Course code	LC-PCC-CE-219B				
Category	Lab Course				
Course title	Surveying Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives:	The objectives of this course are: - To develop practical skills in the use of surveying instruments such as chain, compass, level, theodolite, and total station. - To train students in conducting field surveys for measurement of distances, angles, elevations, and contours. - To develop competency in preparation of field books, survey maps, plans, and contour drawing.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After studying this course, the students will be able to:

COs	Skills Demonstrated	RBT Level
CO1	Recall surveying instruments, symbols, and field terminology.	Level 1: Remember
CO2	Understand principles of surveying.	Level 2: Understand
CO3	Perform field surveys using conventional surveying instruments.	Level 3: Apply
CO4	Analyze survey data to outline field observations.	Level 4: Analyze

List of Experiments

1. Chain Traversing and Compass Traversing
2. Differential Levelling
3. Fly Levelling
4. Cross Sectioning
5. Profile levelling
6. Plane Table surveying: Radiation and Intersection
7. Resection- 2 and 3-point problem with plane Table
8. Contouring and preparation contour map.
9. Demonstration of total station.

Useful Video links:

Exp. No	Experiment	Links
1	Chain Traversing	https://www.youtube.com/watch?v=hpbt71TljEA
2	Compass Traversing	https://www.youtube.com/watch?v=TKzEBJ1qkz8
3	Fly Levelling	https://www.youtube.com/watch?v=KDG9IJBp_bE
4	Cross Sectioning	https://www.youtube.com/watch?v=irNlaNP63nA

Course Code	LC-PCC-CE-221B				
Category	Lab Course				
Course Title	Civil Engineering CAD Lab				
Scheme and Credits	L	T	P	Credits	Semester-IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To introduce basic computer-aided drafting concepts for civil engineering applications. • To develop skills in 2D drafting and building drawing using CAD software. • To understand building planning principles and apply them in design drawings. • To prepare complete residential building drawings including plan, elevation, and section.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall CAD tools and drafting commands used in building drawing.	Level 1: Remember
CO2	Explain building planning principles and CAD drafting concepts.	Level 2: Understand
CO3	Apply CAD skills to prepare building plans, elevations, and sections.	Level 3: Apply
CO4	Analyze and develop complete residential building drawings using CAD software.	Level 4: Analyze

List of Experiments

1. Study of CAD software interface and basic drawing setup.
2. Practice of basic drawing commands (Line, Circle, Arc, Rectangle).
3. Application of modify commands (Move, Copy, Rotate, Mirror, Scale).
4. Use of Trim, Extend, Offset, Fillet, and Chamfer commands.
5. Creation and management of layers, text, and annotation tools.
6. Preparation of dimensioned geometrical drawings.
7. Drawing of basic civil engineering components such as doors, windows, and walls.
8. Preparation of a simple residential building layout plan.
9. Preparation of a fully dimensioned single-storey residential building plan.
10. Preparation of a two-storey residential building plan with staircase.
11. Drawing of front elevation of a residential building.
12. Preparation of longitudinal and transverse building sections.
13. Development of a site plan including setbacks and orientation.
14. Preparation of complete residential building drawing as a CAD project sheet.
15. Exporting and plotting of CAD drawings in standard formats.

Useful Video Links:

Exp. No.	Experiment	Link
1	Study of CAD Software Interface and Drawing Setup	https://www.youtube.com/results?search_query=AutoCAD+interface+and+drawing+setup+for+beginners

2	Basic Drawing Commands (Line, Circle, Arc, Rectangle)	https://www.youtube.com/results?search_query=AutoCAD+basic+drawing+commands+tutorial
3	Modify Commands (Move, Copy, Rotate, Mirror, Scale)	https://www.youtube.com/results?search_query=AutoCAD+modify+commands+tutorial
4	Trim, Extend, Offset, Fillet and Chamfer	https://www.youtube.com/results?search_query=AutoCAD+trim+extend+offset+fillet+chamfer
5	Layers, Text and Annotation	https://www.youtube.com/results?search_query=AutoCAD+layers+text+dimension+annotation
6	Dimensioned Geometrical Drawings	https://www.youtube.com/results?search_query=AutoCAD+dimensioning+geometrical+drawing
7	Drawing Doors, Windows and Walls	https://www.youtube.com/results?search_query=AutoCAD+doors+windows+walls+drawing
8	Simple Residential Building Layout Plan	https://www.youtube.com/results?search_query=AutoCAD+simple+house+plan+tutorial
9	Single-Storey Residential Building Plan	https://www.youtube.com/results?search_query=AutoCAD+single+storey+house+plan
10	Two-Storey Residential Building Plan with Staircase	https://www.youtube.com/results?search_query=AutoCAD+two+storey+house+plan+with+staircase
11	Front Elevation of Residential Building	https://www.youtube.com/results?search_query=AutoCAD+house+elevation+tutorial
12	Longitudinal and Transverse Building Sections	https://www.youtube.com/results?search_query=AutoCAD+building+section+drawing
13	Site Plan with Setbacks and Orientation	https://www.youtube.com/results?search_query=AutoCAD+site+plan+drawing+tutorial
14	Complete Residential Building CAD Project	https://www.youtube.com/results?search_query=AutoCAD+complete+house+drawing+project
15	Exporting and Plotting CAD Drawings	https://www.youtube.com/results?search_query=AutoCAD+plot+print+export+PDF+tutorial

Course code	MC-201B				
Category	Mandatory Courses				
Course title	Environmental Science				
Scheme and Credits	L	T	P	Credits	Semester-III
	2	0	0	2	
Course Objectives	The objectives of this course are: • To create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources. • To develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health. • To foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society. • To engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship.				
Assessment	20 Marks				
End Semester Examination	30 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Describe key terminologies of environmental studies, natural resources, ecosystems, pollution, environmental laws and human-environment interactions.	Level 1: Remember
CO2	Explain the relationships among ecosystems, biodiversity, pollution, social issues, environmental ethics and related legislation for sustainable development.	Level 2: Understand
CO3	Apply principles of environmental management, pollution control, disaster management and sustainable practices in real world environmental contexts.	Level 3: Apply
CO4	Analyze environmental issues, population growth impacts, climate change, welfare programs and the role of information technology in promoting public health and environmental sustainability.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 04 parts (Covering all units) of 1.5 marks each and remaining eight questions of 06marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance. Natural Resources: Renewable and Non-Renewable Resources; Natural Resources and Associated Problems. (a) Forest Resources: Use and Over-Exploitation, Deforestation, Case Studies, Timber Extraction, Mining, Dams and their effects on Forests and Tribal People. (b) Water Resources: Use and Over-Utilization of Surface and Groundwater, Floods, Drought, Conflicts Over Water, Dams—Benefits and Problems. (c) Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies.

	(d) Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer and Pesticide Problems, Waterlogging, Salinity, Case Studies. (e) Energy Resources: Growing Energy Needs, Renewable and Non-Renewable Energy Sources, Use of Alternate Energy Sources, Case Studies. (f) Land Resources: Land as a resource, Land Degradation, Man-Induced Landslides, Soil Erosion and Desertification. Role of an Individual in Conservation of Natural Resources, Equitable Use of Resources for Sustainable Lifestyles.
Unit-II	Ecosystems: Producers, Consumers and Decomposers, Energy Flow in the Ecosystem, Ecological Succession, Food Chains, Food Webs and Ecological Pyramids—Introduction, Types, Characteristic Features, Structure and Function of Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem and Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans and Estuaries). Biodiversity and Its Conservation: Introduction, Definition, Genetic Diversity, Species Diversity and Ecosystem Diversity. Biodiversity at Global, National and Local Levels, India as a Mega-Diversity Nation, Hotspots of Biodiversity. Values of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values. Threats to Biodiversity: Habitat Loss, Poaching of Wildlife and Man–Wildlife Conflicts, Endangered and Endemic Species of India. Conservation of Biodiversity: In-situ and Ex-situ Conservation.
Unit-III	Environmental Pollution: Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution and Nuclear Hazards. Solid Waste Management: Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies. Disaster Management: Floods, Earthquakes, Cyclones and Landslides. Social Issues and the Environment: From Unsustainable to Sustainable Development, Urban Problems Related to Energy, Water Conservation, Rainwater Harvesting, Watershed Management, Resettlement and Rehabilitation of People, Problems and Concerns, Case Studies. Environmental Ethics: Issues and Possible Solutions, Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies, Wasteland Reclamation, Consumerism and Waste Products. Environmental Legislation: Environment Protection Act, Air Prevention and Control of Pollution Act, Water Prevention and Control of Pollution Act, Wildlife Protection Act, Forest Conservation Act, Issues Involved in Enforcement of Environmental Legislation, Public Awareness.
Unit-IV	Human Population and the Environment: Population Growth, Variation among Nations, Population Explosion, Family Welfare Programme, Environment and Human Health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies. Field Work (Equivalent to 10 Lecture Hours) • Visit to a Local Area to Document Environmental Assets—River, Forest, Grassland, Hill or Mountain. • Visit to a Local Polluted Site—Urban, Rural, Industrial or Agricultural. • Study of Common Plants, Insects and Birds. • Study of Simple Ecosystems—Pond, River, Hills, Slopes, etc.

Suggested Readings

- Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
- The Biodiversity of India by Bharucha, MAP in Publishing Pvt.Ltd., Ahmedabad.
- Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc.,1989
- Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
- Global Biodiversity Assessment by V.H. Heywood & R.T.Watson, Cambridge University Press, 1995, 1140p.
- Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi, 1995, 284p.
- Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
- Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd., 1987, 345p.
- Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut, 2001.
- Survey of the Environment, The Hindu.
- Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
- Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
- Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA, 1998, 499p.
- A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.

Useful Video Links

Unit No.	Topic	Link
I	Environment Science: Introduction	https://www.youtube.com/watch?v=5QxxaVfgQ3k
	Natural Resources	https://www.youtube.com/watch?v=CXCT2R1K6Ts
	Ecosystem	https://www.youtube.com/watch?v=1dBU6HB8G6s
II	Biodiversity and its conservation	https://archive.nptel.ac.in/courses/102/104/102104068/
III	Sustainable Water Management In Urban Areas	http://digimat.in/nptel/courses/video/127106004/L29.ht
	Environmental Pollution	https://archive.nptel.ac.in/courses/123/105/123105001/
IV	Population and population growth	https://archive.nptel.ac.in/courses/102/104/102104068/
	National Family Welfare Programme	https://www.youtube.com/watch?v=X5F99L8ZEtc

Course Code	BSC-CE- 202B				
Category	Basic Science Course				
Course Title	Engineering Mathematics-III				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	1	0	4	
Course Objectives	The objectives of this course are to make the students • To understand and apply fundamental mathematical methods for solving differential equations, numerical problems, and transform-based models. • To develop logical reasoning and analytical skills through discrete mathematics and algebraic structures for engineering and scientific applications.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall the fundamental concepts of engineering mathematics.	Level 1: Remember
CO2	Explain mathematical techniques used in engineering analysis.	Level 2: Understand
CO3	Apply mathematical methods to solve engineering problems.	Level 3: Apply
CO4	Analyze engineering problems using appropriate mathematical tools.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Partial Differential equations: First order linear partial differential equations, First order non- linear partial differential equations, Charpit's method, Second order linear partial differential equations and their classifications, Method of separation of variables and its applications to wave equation, One dimensional heat equations and Two dimensional heat flow (steady state solutions only).
Unit-II	Numerical methods: Solution of Polynomial and Transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.
Unit-III	Transform Calculus: Laplace Transform, Properties of Laplace transform, Laplace transform of periodic functions, Inverse Laplace transform by different methods, Convolution theorem, Evaluation of integrals by Laplace transform, Solving ordinary differential equations by Laplace transform method.
Unit-IV	Probability and Statistics: Measures of central tendency, Moments, Skewness and Kurtosis, Basic concepts of Probability, Conditional probability, Baye's theorem, Random variables, Discrete random variables, Expectation of discrete random variables, Variance of a sum, Binomial distribution, Poisson distribution, Continuous random variables and their properties, Distribution functions, Normal Distribution.

Suggested Readings:

- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Numerical Methods by P. Kandasamy, K. Thilagavathy, K. Gunavathi, S. Chand and Company.
- Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning.
- A Textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.

Useful Video Links

Unit No.	Topics	Links
Unit I	First order linear partial differential equations	https://youtu.be/vQFFShhNyPo?si=noaoVs9vpiRm9nD2
	First order non-linear partial differential equations, Charpit's method	https://youtu.be/kEN_Ze8QNdM?si=_cs7Qn3cpNV4QWEu
	Second order linear partial differential equations and their classifications	https://youtu.be/kEN_Ze8QNdM?si=Rq69griDh-Zzr7dn
	Method of separation of variables and its applications to wave equation	https://youtu.be/kEN_Ze8QNdM?si=ww6-dO0Ph3gyoycg
Unit II	Solution of Polynomial and Transcendental equations	https://youtu.be/3j0c_FhOt5U?si=ZOx4OqOnj4kycbRi
	Interpolation	https://youtu.be/rWyTk9eubKM?si=DeOVGwmD72myPGkp
	Numerical integration	https://youtu.be/iviiGB5vxLA?si=u4l274cZxDZSw9Wm
Unit III	Laplace Transform	https://youtu.be/OA1OJrpfP20?si=iiu38t0ChNja5IEb
	Laplace transform of periodic functions	https://youtu.be/MM3vi7mQ60U?si=G5HNHLP4X1cePeRu
	Inverse Laplace transform by different methods	https://youtu.be/EDVJotmT584?si=r_8HyZkyRILVUPfb
	Solving ordinary differential equations by Laplace transform method	https://youtu.be/KaRx67h5xzk?si=otp94t8VjHzzE_in
Unit IV	Introduction of Probability	https://youtu.be/60vHy2lA4o4
	Discrete Random variable & Probability Distribution	https://youtu.be/Sv9UYnp9tbs?si=eHqwSJETA5SO3NFI
	Continuous Probability distribution	https://youtu.be/o2LB3KQME3U?si=NWap0TY_K8tPaAfu
	Miscellaneous	https://onlinecourses.nptel.ac.in/noc22_ma81/preview

Course Code	PCC-CE-204B				
Category	Professional Core courses				
Course Title	Hydraulic Engineering				
Scheme and Credits	L	T	P	Credits	Semester- IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To understand principles of open channel flow and hydraulic machines. • To analyze flow characteristics in channels and pipelines. • To study performance of turbines and pumps. • To apply hydraulic principles in water resources engineering				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Define basic concepts of hydraulic engineering.	Level 1: Remember
CO2	Describe problems related to various types of flow.	Level 2: Understand
CO3	Apply concepts to derive various equations for fluid.	Level 3: Apply
CO4	Analyze various types of flow.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Viscous Flow: Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe- Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing, movement of piston in dash pot, methods of measurement of viscosity. Module 2: Turbulent Flow: Expression for coefficient of friction, Darcy-Weishbach Equation, Moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.
Unit-II	Module 3: Hydraulic Turbines: Classification of Turbines, Impulse and Reaction Principles, Pelton, Francis and Kaplan Turbines, Velocity Triangles, Unit Quantities, Specific Speed, Efficiencies, Characteristic Curves, Governing, Cavitation. Module 4: Pumps: Classification of Pumps, Centrifugal Pumps, Reciprocating Pumps, Axial Flow and Mixed Flow Pumps, Priming, Cavitation, Characteristic Curves, Selection of Pumps, Hydraulic Ram.
Unit-III	Module 5: Flow in open channels: Type of channels, classification of flows, continuity energy and momentum equation, concept of critical depth and specific energy, critical depth for rectangular, triangular, circular, and trapezoidal channels, flow through transition with a hump and with change in width (contraction and expansion).

	Module 6: Uniform flow: Chezy's equation, Manning's formula, Factors affecting Manning's roughness coefficient, velocity distribution, shear stress distribution, Uniform flow computations for rectangular, trapezoidal, and circular channels, standard line canal channels, Hydraulically efficient channel sections, compound sections, Critical slope, and limit slope,
Unit-IV	Module 7: Gradually Varied Flow: Classification of flow profiles (M, S, C, H, and A profiles), control sections, serial combination of channel sections, Transitional depth, numerical solution of gradually varied flow problems. Module 8: Hydraulic jump: Hydraulic jump in rectangular channel: sequent depth ratio, Energy loss; Classification of jumps, characteristics of jumps in rectangular channels, use of jump as an energy dissipater.

Suggested Readings

1. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth,
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Open channel Flow, K. Subramanya, Tata McGraw Hill.
4. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
5. Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers, 1971
6. Fluid Mechanic and Hydraulic machines R.K. BANSAL

Useful Video Links

Unit No.	Topic	Link
Unit-I	Viscous Flow	https://youtu.be/0taaKGJ39X0?si=H-4A3yoItcyjZVTf
	Turbulent Flow	https://youtu.be/4w331Apzlj4?si=-GbJAAbuNEOmBC
Unit-II	Fluid Machines	https://www.youtube.com/live/wSTiH1h6DWQ?si=0pOm9BU4INmZgJQO
	Power Hydraulics	https://youtu.be/MNtLMqC9mJU?si=DZ4maC5VOBJELPMe
Unit-III	Flow in open channels	https://youtu.be/bjZ2bc8-gTE?si=oRrAqvSKvE-azUb-
	Uniform flow	https://www.youtube.com/live/54a8JR1IaM?si=IgKSp2x3TYUGndRS
Unit-IV	Gradually Varied Flow	https://youtu.be/VsFnxqCKCqY?si=NcE4rLTwRLEIQaD_
	Hydraulic jump	https://www.youtube.com/live/nHHD60kAtd0?si=hhWMhR0FFg-sk0hX

Course code	PCC-CE-206B				
Category	Professional Core course				
Course title	Structural Analysis				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are - To introduce analysis of determinate and indeterminate structures. - To develop ability to determine internal forces and deflections. - To apply classical methods for structural analysis. - To prepare students for design-oriented subjects.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Remember different structural analysis methods.	Level 1: Remember
CO2	Understand structural analysis methods.	Level 2: Understand
CO3	Apply analysis techniques to beams and frames.	Level 3: Apply
CO4	Analyze determine and indeterminate structures.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	MODULE 1: Deflection of Statically determinate structures: Elastic curve, slope and deflection of beams by Double Integration Method, Moment Area Method, Conjugate Beam Method and Unit Load Method, Maxwell's Reciprocal Theorem and Betti's Reciprocal Theorem. MODULE 2: Deflection of Statically determinate Frame & Truss: Principle of Virtual Work, strain energy due to axial force, bending, shear and torsion, Castigliano's First Theorem, determination of deflection in beams, pin-jointed trusses and rigid-jointed frames.
Unit-II	MODULE 3: Influence Lines and Moving Loads: Introduction to moving loads and influence lines; influence lines for support reactions, shear force, bending moment and member forces in statically determinate beams and plane trusses; Müller–Breslau Principle; analysis of moving concentrated loads, uniformly distributed loads and series of concentrated loads; maximum shear force, maximum bending moment, absolute maximum bending moment, Equivalent Uniformly Distributed Load (EUDL) and enveloping parabola.
Unit-III	MODULE 4: Arches: Theory and classification of arches, Eddy's Theorem, analysis of three-hinged circular and parabolic arches, radial shear, normal thrust and bending moment, horizontal thrust in three-hinged arches, effects of temperature and support settlement. MODULE 5: Cable and Suspension Bridge: Introduction of Cable and suspension Bridge uniformly loaded cables, Temperature stresses, and three hinged stiffening Girder and two hinged stiffening girder.

Unit-IV	MODULE 6: Indeterminate Structures & Deflection methods: Introduction to Indeterminate Structures, Determination of kinematic and static indeterminacy of beams, frames and trusses, Slope Deflection and Moment Distribution Methods- Analysis of continuous beams & portal frames, Portal frames with inclined members. MODULE 7: Kani's and Column Analogy Method: Elastic centre, properties of analogous column, application to beam & frames, Analysis of continuous beam and simple frames, Analysis of frames with different column lengths and end condition of the bottom storey.
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Suggested Readings

- Statically Indeterminate Structures by C.K. Wang, McGraw Hill Book Co., New York.
- Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros., Roorkee.
- Indeterminate Structures by R.L. Jindal, S. Chand & Co., New Delhi.
- Theory of Structures, Vol. I, by S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

Useful Video Links

Unit No.	Topic	Link
I	Deflection of determinate beams by Double Integration Method	https://youtu.be/ajGlZCND4rM?si=aoKNyj9Pt3wt_x4
II	Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying moving loads	https://youtu.be/zYEjDnVnnHs?si=QeeacW9-z1E3ngNd
III	Determination of horizontal thrust, shear force and bending moment diagram for arches	https://youtu.be/F8u5zgdo_C4?si=UDm2Z14drPxvNf_d
IV	Indeterminate Structures & Deflection methods	https://youtu.be/8nGgpKz07yk?si=xcYNj-Qxs3NUVnHm

Course Code	PCC-CE-208B				
Category	Professional Core course				
Course Title	Advanced Surveying				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are: • To develop advanced knowledge of surveying methods such as triangulation, tacheometry, • To enable computation and adjustment of advanced survey data for engineering projects, • To introduce remote sensing and photogrammetry concepts for mapping applications.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall advanced surveying concepts, instruments, and terminology.	Level 1: Remember
CO2	Understand adjustment computations and RS principles.	Level 2: Explain
CO3	Apply modern surveying techniques.	Level 3: Apply
CO4	Analyze spatial and remote sensing data.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Triangulation and Trilateration: Triangulation systems, classification, selection of triangulation stations, grades of triangulation, triangulation computations, Trilateration-Principle, Methods, advantages and disadvantages, introduction to total station. Module 2: Survey Adjustment and Computations: Definitions, types of error, weight of an observation, law of weights, most probable values, principle of least squares, normal equation.
Unit-II	Module 3: Astronomy : Definitions of astronomical terms, celestial coordinate systems, Napier's rule of circular parts, star at elongation, star at prime vertical, star at horizon, star at culmination, Astronomical triangle, various time systems, conversion of local time to standard time and vice versa. Module 4: Elements of Photogrammetry : Introduction, types of photographs, scale of a photograph, height displacements of vertical photographs, flight planning and its uses, crab and drift, number of photographs, relief displacements, height determination from parallax measurement, flight planning.
Unit-III	Module 5: Introduction to Remote Sensing: Definition of Remote Sensing, types of remote sensing, remote sensing system and components, active and passive remote sensing, EMR propagation, Atmospheric windows in Remote Sensing, Spectral signature, Satellite platforms: Geo-stationary and sun synchronous satellites, Applications of remote sensing in civil engineering.

Unit-IV	Module 6: Geographic Information System (GIS): Definition and objectives of GIS, components of GIS, linkage between spatial and non-spatial data, integration of Remote Sensing (RS) and GIS data, Digital Elevation Model (DEM), Introduction to GIS Softwares. Module 7: Global Positioning System (GPS): Introduction to GPS – Working Principle of GPS, components & types of GPS receivers, GNSS concepts, GPS, GLONASS, Galileo and NavIC, Components of GNSS, Differential GPS, Sources of errors, Positioning methods, Surveying applications, Infrastructure mapping.
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Suggested Readings

- Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill
- Punmia, B.C. 2005: Surveying I and II, Luxmi Publications
- Paul R Wolf: Elements of Photogrammetry
- G S Srivastava: An introduction to Geoinformatics
- BasudebBhatta: Remote Sensing and GIS
- G. L. Hosmer: Text-book on Practical Astronomy

Useful Video Links

Unit No.	Topic	Link
Unit-I	Triangulation systems	https://www.youtube.com/watch?v=-23Rvzey1Ko
	Theory of Errors	https://www.youtube.com/live/WNmitfzV4RM?si=4weVoaPr4ctZ1dPI
Unit-II	Definitions of astronomical terms, celestial coordinate systems	https://youtu.be/14-YsGiCNwl?si=Vf44PAY6qm_u3wg9
Unit-III	Elements of Photogrammetry	https://youtu.be/qDmu_r12TU8?si=B6U5pXihH35NZ-dI
Unit-IV	Introduction to remote sensing	https://youtu.be/cn5CWu_zt_s?si=HF-xclbvPwahitgF
	GIS and GPS	https://www.youtube.com/live/KEc0_IY5LOY?si=YL5qGNd_HUoz6HCO

Course Code	PCC-CE-210B				
Category	Professional Core course				
Course Title	Design of Concrete Structures				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are: • To develop a comprehensive understanding of reinforced concrete design principles, including working stress and limit state methods, structural elements, reinforcement detailing, and foundation systems, • To apply, analyze, evaluate, and integrate their behavior, safety, stability, and serviceability requirements for efficient, durable, and sustainable structural design.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Define and recall basic concepts of RCC design.	Level 1: Remember
CO2	Understand design philosophies.	Level 2: Understand
CO3	Apply RCC design methods.	Level 3: Apply
CO4	Analyze RCC structural elements.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Design methodology and Working stress Method: Introduction to Reinforced Concrete Design, Working Stress Method vs. Limit State Method, Building Codes and Design Philosophy, Characteristic strength and loads, Partial safety factors and factored load, Stress-strain relationship for concrete and steel, Basic assumptions of Working Stress Method, Permissible stresses in concrete and steel. Module 2: Limit State Method: Basic assumptions, Serviceability criteria (Control of deflection, Cracking, Slenderness and vibrations), Deflection and moment relationship for limiting values of span to depth, Limit state of crack width, Design examples.
Unit-II	Module 3: Design of Beams: Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement and design examples using limit state and working stress methods. Module 4: Shear Bond and Torsion: Analysis and Design of Sections in shear, bond and torsion, Diagonal tension, shear reinforcement, Development length, Anchorage and flexural bond, Torsional stiffness, equivalent shear, Torsional reinforcement, Design examples.
Unit-III	Module 5: Slabs: General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, Openings in slabs, Design Examples.

	Module 6: Stair Case: Various Types of Staircases, General Notes on Design of Stair, Design Examples.
Unit-IV	Module 7: Columns: Effective length, Minimum eccentricity, Short columns, under axial compression, Uniaxial and biaxial bending, Slender columns. Design examples. Module 8: Footings: Isolated and wall footings, Design examples. Foundations-Combined footings, raft foundation, design of pile cap and piles, under reamed piles, design examples.

Suggested Readings

1. Design of Reinforced Concrete Structures by P. Dayaratnam, Oxford & IBH Pub., N.Delhi.
2. Design of Reinforced Concrete-Limit State Design By A.K. Jain, Nem Chand & Bros., Roorkee.
3. Design of Reinforced Concrete by I.C. Syal & A.K. Goel, A.H. Wheeler & Co. Delhi
4. Reinforced Concrete Design by S.N. Sinha, Tmh Pub., N.Delhi.
5. Sp-16(S& T)-1980, Design Aids For Reinforced Concrete to IS:456, BIS, N. Delhi.
6. Reinforced cement concrete design by Neelam Sharma , S.K. Kataria & sons, N. Delhi.
7. Sp-34(S&T)-1987 Handbook on Concrete Reinforcement And Detailing, BIS, N. Delhi.

Useful Video Links

Unit No.	Topic	Link
Unit-I	Working stress and limit state methods	https://youtu.be/ba3mZhOpsTM?si=cR5Ec7Nhv6-dHT2l
	Limit State of Collapse Flexure	https://youtu.be/zVKf6hZfrhA?si=S8Zye0KA-nBzqUW2
Unit-II	Design of Shear	https://youtu.be/AfHmpWlcqq4?si=d3bD-x_PV-ZKLORe
	Concrete Reinforcement and Detailing	https://youtu.be/aJJedgPffVI?si=mYBTzapnJBW1Ksba
Unit-III	Design of Slab	https://youtu.be/PDJpcQq3PZE?si=1CxjrcXeHNHgWslI
	Design of one way and two ways slabs	https://youtu.be/PDJpcQq3PZE?si=2dEvG1hldX9Y2yvn
Unit-IV	Minimum eccentricity in column	https://youtu.be/ukIrYcFLyoc?si=FJLU2ajoaNQOg-y1
	Design of Footings	https://youtu.be/8ATp13mOhvg?si=nIau7l22DhUIhH8h

Course Code	LC-PCC-CE-212B				
Category	Lab Course				
Course Title	Hydraulic Engineering Lab.				
Scheme and Credits	L	T	P	Credits	Semester-IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To conduct experiments on open channel flow and hydraulic machines. • To evaluate discharge, velocity, and efficiency parameters. • To interpret hydraulic system performance.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall the behavior of fluids.	Level 1: Remember
CO2	Understand the different types of flow.	Level 2: Explain
CO3	Calculate the flow characteristics.	Level 3: Apply
CO4	Analyze the flow characteristics.	Level 4: Analyze

List of Experiments

1. To determine the coefficient of drag by Stokes law for spherical bodies.
2. To study the phenomenon of cavitation in pipe flow.
3. To determine the critical Reynolds number for flow through commercial pipes.
4. To determine the coefficient of discharge for flow over a broad crested weir.
5. To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6. To study the scouring phenomenon around a bridge pier model
7. To study the scouring phenomenon for flow past a spur.
8. To determine head loss due to various pipe fittings.

Useful Video links:

Exp. No	Experiment	Links
1	Coefficient of drag by Stokes' law	https://www.youtube.com/results?search_query=Stokes+Law+Experiment+Coefficient+of+Drag+Fluid+Mechanics
2	Cavitation in pipe flow.	https://www.youtube.com/results?search_query=Cavitation+in+Pipe+Flow+Laboratory+Experiment
3	Reynolds number	https://www.youtube.com/results?search_query=Reynolds+Number+Experiment+Fluid+Mechanics+Lab
4	Coefficient of discharge	https://www.youtube.com/results?search_query=Broad+Crested+Weir+Experiment+Coefficient+of+Discharge

Course Code	LC-PCC-CE-214B				
Category	Lab Course				
Course Title	Structural Analysis Lab				
Scheme and Credits	L	T	P	Credits	Semester-IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To perform structural experiments and software-based analysis. • To understand structural behavior under various loading conditions. • To analyze experimental and analytical results				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall different methods of structural analysis.	Level 1: Remember
CO2	Understand various structural analysis theorems and principles.	Level 2: Explain
CO3	Examine behavior of structures under different loading conditions.	Level 3: Apply
CO4	Analyze behavior of structures under different loading conditions.	Level 4: Analyze

List of Experiments

1. To verify moment area theorem regarding slope and deflection in a beam
2. To verify Maxwell's Reciprocal Theorem.
3. Experiment on a two – hinged arch for horizontal thrust and influence line for horizontal thrust
4. Analytical and experimental study of three hinged arch
5. Experimental and analytical study of unsymmetrical bending of a cantilever beam
6. Sway in portal frames – Demonstration

Useful Video links:

Exp. No	Experiment	Links
1	Moment Area Theorem	https://www.youtube.com/results?search_query=Moment+Area+Method+Deflection+of+Beams+NPTEL
2	Maxwell's Reciprocal Theorem	https://www.youtube.com/results?search_query=Maxwell+Reciprocal+Theorem+Beam+Deflection
3	Two-Hinged Arch	https://www.youtube.com/results?search_query=Two+Hinged+Arch+Experiment+Horizontal+Thrust
4	Three-Hinged Arch	https://www.youtube.com/results?search_query=Three+Hinged+Arch+Laboratory+Experiment

Course Code	LC-PCC-CE-216B				
Category	Lab Course				
Course Title	Advanced Surveying Lab				
Scheme and Credits	L	T	P	Credits	Semester-IV
	0	0	2	1	
Course Objectives	The objectives of this course are to Use the theodolite for measuring angles and use of tacheometer to determine distance and elevation and to draw simple circular curves, to calculate base line measurement and importance of triangulation, to use a total station to measure distance, elevation and coordinates and to use total station to plot a map of given area with software.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	To study and use of theodolite for angle measurements.	Level 1: Remember
CO2	To use tachometer for horizontal and vertical distances.	Level 2: Explain
CO3	To draw simple circular curves.	Level 3: Apply
CO4	To measure base line measurement.	Level 4: Analyze

List of Experiments

1. Study various parts of a theodolite
2. Measurement of horizontal and vertical angles with theodolite.
3. Measurement of Tachometric constants
4. Calculating horizontal distance and elevations using tachometer
5. Exercise of triangulation including base line measurement.
6. Setting out simple circular curves by deflection angle method.
7. Study the various parts of a total station.
8. Measurements of distance, elevation, coordinate with total station.
9. Special problems with total station.

Useful Video links:

Exp. No	Experiment	Links
1	Measurement of horizontal and vertical angles with theodolite	https://youtu.be/Mb2jbdqMJHA?si=6x3x-rULjspFXrDa
2	Measurement of Tachometric constants.	https://youtu.be/-q_4kK2z3mA?si=gdgUIGi5hWAVo1aP
3	Calculating horizontal distance and elevations using tachometer.	https://youtu.be/cIZbyEaD_PA?si=DnjKIdUV2luMtqL0
4	Study the various parts of a total station.	https://youtu.be/oFoegb0lx3o?si=lExcfpB30KYnw9T_

Course Code	LC-PCC-CE-218B				
Category	Lab Course				
Course Title	Concrete Lab				
Scheme and Credits	L	T	P	Credits	Semester-IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To perform laboratory tests on concrete, steel, and other materials. • To evaluate strength and durability characteristics. • To prepare comprehensive laboratory reports.				
Class work	10 Marks				
Exam	15 Marks				
Total	25 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall testing methods and standards.	Level 1: Remember
CO2	Understand behavior and failure modes of materials.	Level 2: Understand
CO3	Perform laboratory tests on materials.	Level 3: Apply
CO4	Analyze test data to determine parameters.	Level 4: Analyze

List of Experiments

1. Mix proportioning of normal concrete as per IS 10262.
2. Slump test for workability of concrete.
3. Compaction factor test.
4. Vee-Bee consistometer test.
5. Flow table test.
6. Compressive strength test on concrete cubes.
7. Split tensile strength test on concrete cylinders.
8. Flexural strength test on concrete beams.
9. Water absorption and permeability test of hardened concrete.
10. Non Destructive Testing
11. Comparative study of concrete produced with different water-cement ratios.

Useful Video Links

Exp. No.	Experiment	Link
1	Mix Proportioning of Normal Concrete (IS 10262)	https://www.youtube.com/results?search_query=IS+10262+concrete+mix+design
2	Slump Test for Workability of Concrete	https://www.youtube.com/results?search_query=slump+test+of+concrete
3	Compaction Factor Test	https://www.youtube.com/results?search_query=compaction+factor+test+of+concrete
4	Vee-Bee Consistometer Test	https://www.youtube.com/results?search_query=Vee+Bee+consistometer+test
5	Flow Table Test	https://www.youtube.com/results?search_query=flow+table+test+of+concrete

6	Compressive Strength Test on Concrete Cubes	https://www.youtube.com/results?search_query=compressive+strength+test+of+concrete+cube
7	Split Tensile Strength Test on Concrete Cylinders	https://www.youtube.com/results?search_query=split+tensile+strength+test+of+concrete
8	Flexural Strength Test on Concrete Beams	https://www.youtube.com/results?search_query=flexural+strength+test+of+concrete+beam
9	Water Absorption and Permeability Test of Hardened Concrete	https://www.youtube.com/results?search_query=water+absorption+and+permeability+test+of+concrete
10	Non Destructive Testing	https://www.youtube.com/results?search_query=rebound+hammer+test+on+concrete
11	Comparative Study of Concrete with Different Water-Cement Ratios	https://www.youtube.com/results?search_query=effect+of+water+cement+ratio+on+concrete+strength

Course Code	PEC-CE -220B					
Category	Professional Elective Course					
Course Title	Repair & Rehabilitation of Structure					
Scheme and Credits	L	T	P	Credits	Semester-VI	
	3	0	0	3		
Course Objectives	- To understand deterioration, distress, and behavior of concrete structures. - To develop skills in damage assessment, testing, and selection of repair and strengthening techniques. - To learn maintenance, protection, and structural health monitoring for durable structures.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

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

COs	Skills Demonstrated	RBT Level
CO1	Recall different types of repair materials in concrete structures.	Level 1: Remember
CO2	Understand principles of repair and maintenance.	Level 2: Understand
CO3	Apply various testing techniques of repair and maintenance.	Level 3: Apply
CO4	Analyze structural failures and select suitable repair and strengthening methods.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction: Overview of Distress, Deterioration in Concrete Structures, Global Scenario of Distressed Structures, Need for Repairs and Upgrading of Structures, Process for Durable Concrete Repair Deterioration of concrete structures :Types of Deterioration - causes & symptoms, mechanism & micro-structure of concrete, Physical and Chemical Deterioration and its factors, Deterioration due to Water Leakage, Fire – detection & mitigation, Deterioration due to Ageing and Inadequate Maintenance, Design & Construction Deficiencies like Overloading.
Unit-II	Visual deterioration of structures :Types of Cracks, Causes & Characteristic of Cracking in Various Structural Components, Measurement of Cracks and Interpretation of the Cracking Phenomena Conditional/damage assessment & Evaluation of structures: Structural Assessment-importance, objective, various stages, conditional evaluation of the structure, Damage Assessment Procedure, Preliminary & Detailed Investigation – scope, objectives, methodology & rapid visual inspection of structures , Damage Assessment Allied Tests (Destructive, Semi-Destructive and Non-Destructive), Field & Laboratory Testing Procedures- strength, corrosion activity, performance & Integrity, Durability.

Unit-III	Repairs of concrete structures :Repairing Materials- criteria, selection of repair materials, methodology, performance requirements, preparatory stage of repairs, different types of repair materials & their application and repair techniques Retrofitting/Strengthening :Need for Retrofitting, Design Philosophy of Strengthening Structures, Conventional and Advanced Techniques Available for Strengthening, Seismic Retrofit of Concrete Structures- deficiencies in structure requiring seismic retrofit and its design philosophy, Latest Techniques to Enhance the Seismic Resistance of Structures.
Unit-IV	Protection & maintenance of structures :Importance of Protection & Maintenance, Categories of Maintenance, Building Maintenance, Corrosion Mitigation Techniques Structural health monitoring (SHM) :Definition and Motivation for SHM, Basic Components of SHM and its Working Mechanism, SHM as a Tool for Proactive Maintenance of Structures

Suggested Readings

- Concrete microstructure, Properties and materials – P Kumar Mehta and Paulo J.M. Monterio.
- Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.
- Concrete Technology by M.L. Gambhir, Tata McGraw-Hill Education, Third Edition
- V. M. Malhotra, Nicholas J. Carino 2004 “Handbook on Nondestructive Testing of Concrete”
- “Repair and Strengthening of Concrete structures” , FIP guide, Thomas Telford, London.
- Concrete Structures, Protection, Repair and Rehabilitation by R.Dodge Woodson.
- Repairs and rehabilitation of concrete structures by P. I. Modi & C. N. Patel, PHI Publication.

Useful Video Links

Unit No.	Topic	Link
Unit-I	Need for Repairs and Upgrading of Structures	https://youtu.be/x9noZ4xEXyg?si=fsAcIHU5CS-pVnoa
	Causes of Deterioration	https://youtu.be/lxFjLHOCgqw?si=i18xg0dUm9fDUVhj
Unit-II	Types of Cracks	https://youtu.be/3pcvb9cnih8?si=mT27C1-Ltuy8Se2o
	Non-Destructive Test	https://youtu.be/qjwYcEQcJ3I?si=AEVE5fPJJEfs7Vw
Unit-III	Selection of repair materials	https://youtu.be/JuRUXEV6Qmw?si=51hGoXj3JoXIHCwC
	Need for Retrofitting	https://youtu.be/1935UK8EU0U?si=RwEcG9MOp95pOCl
Unit-IV	Importance of Protection & Maintenance	https://youtu.be/NUdvZcMnud8?si=oOVnOwHavxGWfflU
	Basic Components of SHM and its Working Mechanism	https://youtu.be/sahuqWQO2-0?si=Br7LeULFcsbLE8hz

Course code	PEC-CE-222 B				
Category	Professional Elective Courses				
Course title	Climate Hazards and Disaster Mitigation				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are • Introduce fundamental concepts of climate science, climate change, and extreme weather events relevant to civil engineering. • Familiarize students with tools and techniques for observing, measuring, and analyzing climate extremes using climate data and models. • Develop analytical skills to detect trends, assess risks, and estimate return periods of extreme events affecting infrastructure systems.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated	RBT Level
CO1	Recall the basic principles of climate science.	Level 1: Remember
CO2	Understand the basic principles of climate science.	Level 2: Understand
CO3	Apply climate data analysis techniques and concepts.	Level 3: Apply
CO4	Analyze uncertainties in climate extremes using different methods.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Climate Change and Natural Hazards: Weather and Climate, Climate Change and Global Warming, Causes and Effects of Climate Change, Natural Hazards and Disasters, Floods, Droughts, Cyclones, Heat Waves, Cold Waves, Cloudbursts, Landslides, Climate Hazards in India. Module 2: Hazard Assessment and Infrastructure: Hazard, Vulnerability and Risk, Basic Hazard Assessment, Weather Forecasting and Early Warning Systems, Effects of Climate Hazards on Buildings, Roads, Bridges, Dams, Water Supply and Drainage Systems, Urban Flooding, Introduction to Climate-Resilient Infrastructure.
Unit-II	Module 3: Mitigation and Adaptation Measures: Structural and Non-Structural Mitigation Measures, Flood Control Measures, River Training Works, Slope Protection, Coastal Protection Measures, Drought Management, Water Conservation, Rainwater Harvesting, Nature-Based Solutions, Climate Adaptation. Module 4: Disaster Management: Disaster Management Cycle, Preparedness and Emergency Planning, Evacuation Planning, Basic Search and Rescue, Relief, Rehabilitation and Reconstruction, Build Back Better (BBB), Community Participation in Disaster Management.

Unit-III	Module 5: Disaster Management Framework: Disaster Management in India, National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs), National Disaster Management Plan (NDMP), Role of Government and Local Bodies, Sustainable Development Goals (SDGs). Module 6: Technology in Disaster Management: Role of Technology in Disaster Management, Sensor-Based Monitoring, Mobile-Based Warning Systems, Geographic Information System (GIS) Basics, Internet of Things (IoT) Applications, Artificial Intelligence (AI) Applications, Digital Communication during Emergencies.
Unit-IV	Module 7: Climate-Resilient Civil Engineering: Climate-Resilient Buildings, Roads and Bridges, Flood-Resilient Drainage Systems, Sustainable Construction Practices, Urban Resilience, Planning of Disaster-Resilient Infrastructure. Module 8: Case Studies: Case Studies of Major Climate Hazards (Floods, Cyclones, Heat Waves and Landslides) in India and Around the World, Impacts on Civil Infrastructure, Infrastructure Performance and Failures, Engineering Lessons and Best Practices for Disaster Mitigation.

Suggested Readings

- Intergovernmental Panel on Climate Change (IPCC). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). Cambridge University Press.
- Wilks, D. S. Statistical Methods in the Atmospheric Sciences. Academic Press.
- Coles, S. An Introduction to Statistical Modeling of Extreme Values. Springer.
- Kundzewicz, Z. W. (Ed.). Flood Risk in a Changing Climate. IAHS Press.
- Smith, K., & Petley, D. Environmental Hazards: Assessing Risk and Reducing Disaster. Routledge.
- Burroughs, W. J. Climate Change: A Multidisciplinary Approach. Cambridge University Press.

Useful Video Links

Unit No.	Topic	Link
I	Climate Science Basics.	https://youtu.be/dbJz1KBYVbg
II	Climate Data Sources and Observational Tools.	https://youtu.be/aeu95dlnwm4?si=ejHFSZ0Y8MHt9pRD
III	Case Studies on Recent Extreme Events.	https://youtu.be/ouQOuIavOzM?si=JaimE14L96p0oRa8
IV	Advances in Climate Extremes Research	https://youtu.be/-x35OzfPgRE?si=1cINNc77vV2hs019

Course Code	PEC-CE-224B					
Category	Professional Elective Courses					
Course Title	Material Testing and Evaluation					
Scheme and Credits	L	T	P	Credits	Semester-IV	
	3	0	0	3		
Course Objectives	The objectives of this course are • To understand testing procedures of construction materials. • To determine mechanical properties of materials. • To evaluate material performance for structural applications. • To develop skills in interpreting laboratory test results.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

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

COs	Skills Demonstrated	RBT Level
CO1	Define properties of materials.	Level 1: Remember
CO2	Understand behavior of materials under different loading conditions	Level 2: Understand
CO3	Apply the testing procedures of materials.	Level 3: Apply
CO4	Analyze test results of materials.	Level 4: Analyze

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 09 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Module 1: Engineering Materials and Performance Characteristics: Engineering properties of construction materials, Physical, Mechanical and Durability properties, Cement, Lime, Aggregates, Bricks, Blocks, Timber, Structural steel, Bituminous materials, Glass, Ceramics, Polymers, Composite materials, Material selection for engineering applications. Module 2: Testing of Cementitious Materials: Sampling procedures, Field identification, Laboratory testing of cement, Fineness, Standard consistency, Setting time, Soundness, Compressive strength, Testing of lime, Cement mortars, Lime mortars, Acceptance criteria, IS specifications.
Unit-II	Module 3: Testing of Aggregates and Masonry Units: Sampling techniques, Sieve analysis, Specific gravity, Water absorption, Bulk density, Aggregate crushing value, Aggregate impact value, Los Angeles abrasion, Flakiness and elongation index, Testing of bricks, Fly ash bricks, Concrete blocks, AAC blocks, Acceptance criteria. Module 4: Concrete Testing and Quality Evaluation: Properties of fresh concrete, Slump test, Compaction factor test, Vee-Bee consistometer test, Flow table test, Air content test, Properties of hardened concrete, Compressive strength test, Split tensile strength test, Flexural strength test, Modulus of elasticity, Water permeability test, Acceptance criteria as per IS specifications.

Unit-III	Module 5: Testing of Steel, Timber and Bituminous Materials: Mechanical properties of steel, Tensile, Bend, Re-bend and Hardness tests, Testing of structural steel sections, Timber testing, Moisture content, Bituminous material testing, Penetration, Softening point, Ductility, Viscosity, Flash and fire point tests. Module 6: Concrete Mix Design and Durability Assessment: Objectives of mix design, IS 10262 mix design procedure, Water-cement ratio, Aggregate grading, Workability requirements, Selection of admixtures, Sulphate attack, Chloride attack, Alkali-aggregate reaction, Carbonation, Corrosion of reinforcement, Durability enhancement measures.
Unit-IV	Module 7: Non-Destructive Testing and Structural Evaluation: Principles of NDT, Rebound hammer, Ultrasonic Pulse Velocity, Cover meter, Half-cell potential, Pull-out test, Core sampling, Interpretation of test results, Structural condition assessment, Residual strength evaluation, Limitations of NDT. Module 8: Laboratory Quality Management and Advanced Material Evaluation: Laboratory safety practices, Sampling and specimen preparation, Calibration of testing equipment, Precision and accuracy in testing, Recording and reporting of test results, Interpretation of test results, Acceptance criteria as per relevant IS specifications, Evaluation of recycled construction materials.

Suggested Readings

1. Handbook of mix design - BIS
2. Concrete Technology by M.S. Shetty.
3. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, Highway Materials and Pavement Testing, Nem Chand & Bros, Fifth Edition
4. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
5. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

Useful Video Links

Unit No.	Topic	Link
Unit-I	Introduction to Engineering Materials	https://youtu.be/gqp3cNOp5yQ?si=qwMzQKxgcsh3T9Sf
	Types of cement and uses	https://youtu.be/oouvvhVPnuqY?si=1AabzMz4U6x5Bkv2
Unit-II	Properties of fresh and hardened concrete	https://youtu.be/T4pjWFzd3rA?si=xaIqebkLO23CoIdk
	ACI mix design practice, USBR method	https://youtu.be/bHT1SySn6z4?si=Ob5S3FRnEk0v37lx
Unit-III	Types of steel	https://youtu.be/xaP0jaYoFvw?si=6SnKbQZfM2roP3L7
	Elasticity – principle and characteristics	https://youtu.be/bj9hE1L57mc?si=VvmBidzNcQQUBkh-
Unit-IV	Testing of concrete mixes	https://youtu.be/WfOsywEJGHU?si=pQDYzEeCw5SM2nIR
	Construction Equipments	https://youtu.be/2B7DhQvL8kw?si=4E0abrtJh0G9pA6X