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

'A' GRADE ACCREDITED BY NAAC

Evaluation Scheme & Syllabus For

B.Tech Civil Engineering
(2nd Year)
(Effective from the Session: 2025-26)

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

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

Scheme of Studies and Examination

B.Tech (Civil Engineering) – 3rd Semester

w.e.f. 2025-26

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Basics Science Courses	BSC-MCE-201A	Mathematics- III	3	1	0	4	4	40	60		100	3
2	Humanities and Social science including Management Courses	HSMC-02A	Economics for Engineers	3	0	0	3	3	40	60		100	3
3	Professional Core Courses	PCC-CE-201A	Building Construction and Material	3	0	0	3	3	40	60		100	3
4	Professional Core Courses	PCC-CE-203A	Fluid Mechanics	3	0	0	3	3	40	60		100	3
5	Professional Core Courses	PCC-CE-205A	Surveying	3	0	0	3	3	40	60		100	3
6	Engineering Science Courses	ESC-CE-209A	Engineering Mechanics	3	0	0	3	3	40	60		100	3
7	Mandatory Courses	MC-201A*	Environmental Science*	2	0	1	3	-	40	60		----	3
8	Professional Core Courses / (Lab Course)	LC-CE-207A	Building Drawing Lab	0	0	2	2	1	25		25	50	3
9	Engineering Science Courses (Lab Course)	LC-ME-209A	Engineering Mechanics Lab	0	0	2	2	1	25		25	50	3
10	Professional Core Courses (Lab Course)	LC-CE-211A	Fluid Mechanics Lab	0	0	2	2	1	25		25	50	3
11	Professional Core Courses (Lab Course)	LC-CE-213A	Surveying Lab	0	0	2	2	1	25		25	50	3
		TOTAL CREDIT						**23**				**800**	

Note:*MC-201A is a mandatory non –credit course in which the students will be required passing marks in theory.

Scheme of Studies and Examination
B.Tech (Civil Engineering) – 4th Semester
w.e.f. 2025-26

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Humanities and Social science including Management Courses	HSMC-01A	Fundamental of Management and Organizational Behaviour	3	0	0	3	3	40	60		100	3
2	Professional Core Courses	PCC-CE-202A	Hydraulic Engineering	3	0	0	3	3	40	60		100	3
3	Professional Core Courses	PCC-CE-204A	Structural Analysis	3	1	0	4	4	40	60		100	3
4	Professional Core Courses	PCC-CE-206A	Advanced Surveying	3	0	0	3	3	40	60		100	3
5	Professional Core Courses	PCC-CE-208A	Material Testing and Evaluation	3	0	0	3	3	40	60		100	3
6	Professional Elective Courses	----------	Refer Table-I	3	0	0	3	3	40	60		100	3
7	Professional Core Courses (Lab Courses)	LC-CE-210A	Hydraulic Engineering Lab	0	0	2	2	1	25		25	50	3
8	Professional Core Courses (Lab Courses)	LC-CE-212A	Structural Analysis Lab	0	0	2	2	1	25		25	50	3
9	Professional Core Courses (Lab Courses)	LC-CE-214A	Advanced Surveying Lab	0	0	2	2	1	25		25	50	3
10	Professional Core Courses (Lab Courses)	LC-CE-216A	Material Testing and Evaluation Lab	0	0	2	2	1	25		25	50	3
		TOTAL CREDIT						**23**				**800**	

Note 1:

At the end of the 4th semester, each Civil Engineering student must undergo practical training related to core civil engineering areas such as construction site management, surveying, building materials testing, structural detailing, transportation works, or water supply projects. The training should be completed in a relevant organization like a construction company, government department, or engineering firm, with a minimum of 30 contact hours over 4 to 6 weeks. Students must submit a typed report and a training certificate from the organization, which will be evaluated in the 5th semester

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR (DELHI-NCR)
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Course Code	**BSC-MCE-201-A**					
Category	Basic Science Courses					
Course Title	**Engineering Mathematics-III**					
Scheme and Credits	L	T	P	**Credits**	**Semester-III**	
	4	0	0	**4**		
Course Objectives	The objectives of this course are to make the students • Determinate structures under static and moving loads by analytical/experimental techniques and software tools. • Acquire the ability to interpret and evaluate experimental results.					
Course Pre-requisite	Mathematics up to 12th Standard and Engineering Mathematics-I & II					
Assessment	40 Marks					
End Semester Examination	60 Marks					
Total	100Marks					
Duration of Exam	03 Hours					

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

COs	Skills Demonstrated
CO1	Recall fundamental concepts and formulas related to Laplace transforms, algebraic structures, and methods for solving equations in discrete and continuous domains.
CO2	Explain the classification of partial differential equations, principles of interpolation, and properties of algebraic structures such as groups and monoids.
CO3	Apply numerical techniques such as Newton-Raphson, Simpson's rule, and Newton's interpolation methods to solve polynomial and transcendental equations and to approximate definite integrals.
CO4	Analyze and solve first and second-order partial differential equations using Charpit's method and the method of separation of variables, with applications to heat and wave equations.

Note: : Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2from each unit/section) of 1.5 marks each and remaining eight questions of 12marks each to beset 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 solutionsonly)
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	**Discrete Maths:** Pigeon-hole principle, Permutation, Combination, Algebraic structures with one binary operation- Semi group, Monoid and Group, Cosets, Lagrange's theorem, Cyclic group, Normal subgroup

Suggested Readings:

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, One dimensional heat equations and Two dimensional heat flow	**https://youtu.be/kEN_Ze8QNdM?si=wv6-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/OA1OJrfpP20?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_8HyZkyRlLVUPfb
	Solving ordinary differential equations by Laplace transform method	https://youtu.be/KaRx67h5xzk?si=otp94t8VjHzzE_in
Unit IV	Permutation and Combination, the Division algorithm:	https://youtu.be/BI84sbsOtGQ?si=ZTFN88-qrGlOwquH
	Pigeon-hole principle	https://youtu.be/a-O-ioYy1rI?si=_bIKGfCet8sM8csj
	Algebraic Structures with one Binary Operation	https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI
	Groups	https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI

Course Code	**HSMC-02A**				
Category	Humanities and Social Science including Management Courses				
Course Title	**Economics for Engineers**				
Scheme and Credits	L	T	P	**Credits**	**Semester-III**
	3	0	0	3	
Course Objectives	The objectives of this course are to • Introduce the basic concepts of economics and their relevance to science, engineering, and national development. • Develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures. • Equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions. • Familiarize students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization.				
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	Describe economic concepts, the connection between economics with engineering and technological development, along with economic laws relevant to resource based decision making in society.	Level 1: Remember
CO2	Explain economic growth theories and illustrate the role of engineering and technology in supporting economic development.	Level 2: Understand
CO3	Apply theories of consumption and production to the design and development of engineering products.	Level 3: Apply
CO4	Analyze market conditions, evaluate cost structures and financial aspects to assess the feasibility of engineering projects.	Level 4: Analyse

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-I

Definition of Economics: Various Definitions, Types of Economics, Micro and Macro Economics, Nature of Economic Problem, Production Possibility Curve, Economic Laws and their Nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand: Meaning of Demand, Law of Demand, Elasticity of Demand, Meaning, Factors affecting the Elasticity of Demand, Practical Application and Importance.

Unit-II

Production: Meaning of Production and Factors of production, Law of Variable Proportions, Returns to Scale, Internal and External Economies and Diseconomies of Scale, Various concepts of Cost of Production- Fixed Cost, Variable Cost, Money Cost, Real Cost, Accounting Cost, Marginal Cost, Opportunity Cost, Shape of Average Cost, Marginal Cost, Total Cost etc. in short run and long run.

Unit-III

Market: Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).
Supply: Supply and Law of Supply, Role of Demand and Supply in Price Determination and Effect of Changes in Demand and Supply on Prices.

Unit-IV

Indian Economy: Nature and Characteristics of Indian Economy as underdeveloped, developing and mixed economy (brief and elementary introduction).
Privatization: Meaning, Merits and Demerits.
Globalization of the Indian Economy: Merits and Demerits
Banking: Concept of a Bank, Commercial Bank, Central Bank, Functions of a Bank, Difference between Commercial and Central Bank.

Suggested Readings:

- Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
- Indian Economy by S.K. Misra & V.K. Puri, Himalaya Publishing House
- Indian Economy : Principles and Policies by Srirangam, SriRam, ; Rohit Deo, Pearson Education
- Managerial Economics by R. Cauvery et al., S. Chand & Company Pvt. Ltd.
- Microeconomic Theory by Andreu; Whinston, Michael D; Green, Jerry R, Oxford University Press.
- Principles of Economics by Case, Karl E; Fair, Ray C ; Oster, Sharon E, Pearson Education

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Fundamental concepts of microeconomics, including definitions, types, and the nature of economic problems.	https://www.youtube.com/watch?v=IFtOcNbej0o&list=PLFNFJbo2hfBGRTCMuroZGykNzacwmAH2L
Unit-II	Production and Cost of production	https://www.youtube.com/watch?v=VU1zySe-8NA
Unit-III	Theory of Markets	https://www.youtube.com/watch?v=HylqSa58lqQ
Unit-IV	Nature and characteristics of the Indian economy, highlighting aspects of underdevelopment and development.	https://www.youtube.com/watch?v=ME-0GOhhZcs&list=PLFW6lRTa1g83winAoIK92HL4xTytJaW7S

Course code	**PCC-CE-203A**				
Category	**Professional Core Courses**				
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 • To provide the students an overview of the profession of Civil Engineering. • To give the students an illustration of the Civil engineering, properties of various building material, basic requirements of a building and explain the building construction aspects.				
Class work	40 Marks				
Exam	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 basic concepts and terminology related to civil engineering, masonry, stones, timber, paints, and varnishes.	Level 1: Remember
CO2	Explain the functions and importance of various building components such as roofs, floors, doors, windows, cavity walls, and foundations.	Level 2: Understand
CO3	Apply appropriate construction methods and materials for specific building components like masonry work, damp-proofing, and fire protection based on site conditions.	Level 3: Apply
CO4	Analyze the environmental, social, and economic impact of civil engineering practices and select sustainable materials and green building solutions.	Level 4: Analyze

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

COURSE CONTENT

Unit-I

Module 1: Masonry Construction

Introduction and history to masonry construction, and terminology, Classification and properties of bricks: traditional and fly ash bricks, hollow bricks, AAC blocks, Bonds in brickwork, Laying and curing practices, Defects in masonry, Stone masonry: types, structural applications, finishes, Composite masonry and applications, Glass block masonry: uses. Introduction to green building concept.

Module 2: Stones and Tiles

Stones: Classification, requirements of good structural stone, quarrying, blasting, dressing of stones and seasoning of stone; Tiles: Manufacturing of tiles: ceramic, vitrified, and cement-based, Use of terracotta and faience in modern construction.

Unit-II

Module 3: Timber, paints and varnishes

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, Plywood and fiber boards, Important Indian timbers; Basic constituents of paints, types of paints, constituents of varnishes, characteristics and types of varnishes.

Module 4: Roofs and Floors

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. Doors and Windows: Locations, sizes, types of doors and windows including UPVC, fixtures and fasteners for doors and windows.

Unit-III

Module 5: Cavity, Partition Walls and Foundations

Cavity walls and its position, advantages of cavity wall, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. Types of foundations, sub-surface investigation, Foundation in water logged areas, Masonry wall foundation, Introduction to deep foundations.

Module 6: Stairs & Stair cases

Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators.

Unit-IV

Module 7: Damp-Proofing, Water-Proofing and Fire protection

Dampness and its causes, prevention of dampness, materials used, Damp-proofing treatment in buildings; Water proofing: water- proofing treatment of roofs including Latest Materials; Fire protection: Fire resisting construction, fire protection requirements for buildings.

Module 8: Sound insulation and Acoustics

Classification, measurement and transmission of sound, sound insulation of buildings, Acoustical materials and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other emerging materials including properties and uses.

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.	Topics	Links
1	**Basics of Civil Engineering**	https://youtu.be/CsKddkqgwVk?si=6EFtfcMai-Q30sMm&t=97
2	**seasoning of timber**	https://youtu.be/tjYDnrMSHX0?si=b03FVrA0Gv3o_I-f
3	**Types of doors and windows**	https://youtu.be/VqveWrgpT0g?si=aHaAZpTW2M4JQhZl
4	**Damp-Proofing**	https://youtu.be/rkO9eqvFG-4?si=4xBa38PhH8fdQWza

Course code	**ESC-CE-209A**				
Category	**Engineering Science courses**				
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 • Students should be able to identify and analyse the basic structural elements. • Students can apply the concepts of analysis for the design of various civil engineering structures. • Covers the relationship between stress and strain on deformable solids, principal stresses, maximum shearing stress, and the stresses acting on a structural member. • To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 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 fundamental concepts of stress, strain, material properties, and various types of loading conditions.	Level 1: Remember
CO2	Interpret shear force and bending moment diagrams, Mohr's Circle, and stress-strain behavior under different conditions.	Level 2: Understand
CO3	Apply analytical methods to solve problems on axial loads, bending, torsion, and buckling in structural members.	Level 3: Apply
CO4	Analyze plane trusses and evaluate structural safety using different failure theories and principal stresses.	Level 4: Analyze

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

COURSE CONTENT

Unit-I

Module 1: Force Systems and Friction

System of forces, Free-body diagrams (FBDs), Equilibrium equations for 2D and 3D systems, Internal forces in structures (axial force, shear force, bending moment), Friction and its applications.

Module 2: Simple and Compound Stresses and Strains

Properties of Materials, i.e. tensile test, idealized stress- strain diagrams, isotropic, linear, elastic, Concept of stresses and strains, relationship between elastic constants, Poisson's Ratio, Hoop stress, Stress and extension of uniform bar and tapered bar under its own weight and due to load, stresses produced in compound bars due to axial loads, Factor of Safety, Thermal stress and strain calculations, Shear stresses and shear strain.

Normal stress, tangential Stresses, Stresses induced due to Uniaxial loads, stresses induced by state of simple shear, stresses induced due to biaxial loads, Mohr's Circle (Graphical Method), Principal stresses and principal planes, Maximum shear stresses, Proof stress.

Unit-II

Module 3: Shear Force and Bending Moment in Beams and Frames

Type of loads, Shear force and bending moment, relation between Shear force and bending moment, Definition and Sign conventions, axial force, Shear force and Bending moment diagrams

Module 4: Bending stresses and Shear stresses in Beam

Pure bending, bending stresses, combined bending and direct stresses, Middle Third rule, composite beams, Variation of shear stresses for various cross-sections of a beam.

Unit-III

Module 5: Torsion and Thin Cylinder

Torsion equation, its applications to the hollow and solid circular shafts, comparison of solid and hollow Shafts, shafts in series and parallel. Combined torsion and bending of circular shafts. Introduction to thin cylinder, Stresses in thin cylinder vessels subjected to internal pressure Circumferential stresses (Hoop Stresses), longitudinal stress.

Module 6: Column and Strut

Criteria for stability of columns, Buckling of columns, Euler's formula for various end restraints, Rankine's formula, eccentrically loaded struts, struts with initial curvature, struts with lateral loading.

Unit-IV

Module 7: Analysis of Plane Trusses

Different types of trusses, Analysis of plane determinate trusses by method of joints, method of sections and analysis of Space Trusses using Tension Coefficient Method.

Module 8: Failure Theories

Theories of failure: maximum principal stress theory, maximum principal strain theory, maximum shear stress theory, maximum strain energy theory, distortion energy theory, comparison of the failure theories.

Suggested Readings:

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

Useful Video links:

Unit No.	Topics	Links
1	**Simple Stresses and Strains**	https://youtu.be/DzyIEz3dKXQ?si=_k7krOEATzbR uU1Z
2	**Compound stress and strains**	https://youtu.be/EDdUiNHLF2o?si=- qcKtD_1pof_AEA4
3	**Buckling of columns**	https://youtu.be/vhXJ6ZcKb5c?si=jHZ2- 2e595JXXwSC
4	**Different types of trusses**	https://youtu.be/ef- 5HtnBubU?si=pqpXD05mgSuGrabd

Course code	**PCC-CE -205A**				
Category	**Professional Core courses**				
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 the concepts of fluid mechanics useful in Civil Engineering applications. • To provide the students a first level exposure related to fluid statics, kinematics and dynamics. • To provide the knowledge for measurement of pressure, computations of hydrostatic forces on structural components, concepts of Buoyancy and their applications in many engineering problems. • Topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 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 the basic fluid properties, definitions, and fundamental principles of fluid statics and dynamics.	Level 1: Remember
CO2	Explain concepts of hydrostatic pressure, buoyancy, fluid kinematics, and their applications in engineering.	Level 2: Understand
CO3	Apply Bernoulli's equation, continuity equation, and Euler's equation to solve real-life problems related to fluid motion and flow measurement.	Level 3: Apply
CO4	Analyze boundary layer behavior, flow separation, and develop fluid models using dimensional analysis and similarity principles.	Level 4: Analyze

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

COURSE CONTENT

Unit-I

Module 1: Basic Concepts and Definitions

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, cavitations; surface tension, capillarity, Bulk modulus of elasticity, compressibility, types of fluids

Module 2: Fluid Kinematics
Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; rotation and circulation; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates, Flow Net.

Unit-II

Module 3: Fluid Statics
Fluid Pressure: Pressure density height relationship, pressure at a point, Pascal's law, gauge and absolute pressure, Pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, pressure gauges,

Module 4: Hydrostatic pressure and force
Hydrostatic pressure and force: horizontal, vertical and inclined surfaces, centre of pressure. Buoyancy and stability of floating bodies, metacentric height

Unit-III

Module 5: Fluid Dynamics
Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; limitations of Bernoulli's equation, Practical applications of Bernoulli's equation: Venturimeter and Orifice meter , Pitot tube, notiches and Weirs. Orifice and mouth piece.

Module 6: Dimensional Analysis and Hydraulic Similitude
Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modelling, similar and distorted models.

Unit-IV

Module 7: Boundary Layer Analysis
Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries, Local and average friction coefficients Separation and Control.

Module 8: Drag and Lift
Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil, flow around a sphere-Stokes' law.

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.	Topics	Links
1	Kinematic and dynamic viscosity	https://youtu.be/fa0zHI6nLUo?si=7Ha_VvTzah3yEtNw
2	U-Tube Manometer	https://youtu.be/sHmjE21Fp9w?si=ro7UE417K2Z7cTli
3	laminar and turbulent flow	https://youtu.be/jwSdYP17PAY?si=Pd1Pg3ZxWpjqY6Ta
4	Buckingham theorem	https://youtu.be/whsqICmFA_Y?si=7EHW8H91wiACHcfv

Course code	**PCC-CE-207A**				
Category	**Professional Core courses**				
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 • To understand the importance of surveying in Civil engineering. • To study the basics of linear, angular and direction measurements using chain/tape, theodolite and compass. • To study the method of determination of height of points using various levelling method and tacheometer. • To study the significance of Plane Table surveying in preparation of map and setting of different types of curves.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 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 principles, definitions, instruments, and techniques used in linear and angular measurements in surveying.	Level 1: Remember
CO2	Explain methods of compass traversing, plane table surveying, levelling, and contouring along with associated corrections and adjustments.	Level 2: Understand
CO3	Apply surveying instruments and methods for measuring distances, elevations, and angles in the field including closed traverse adjustments.	Level 3: Apply
CO4	Analyze field data for curve setting, tacheometric surveying, and assess errors in survey observations to ensure accuracy.	Level 4: Analyze

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

COURSE CONTENT

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: Levelling and Geodetic Trigonometric levelling

Terms used in levelling, 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, geodetical 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 of tacheometric surveying, different instrument used in tacheometry, stadia and tangential method of tacheometry, tacheometric 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:

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

Useful Video links:

Unit. No.	Topics	Links
1	**Basics of Surveying and Linear measurement**	https://youtu.be/chhuq_t40rY?si=O-rZ0GyeQRQ0I1Ht
2	**Terms used in leveling**	https://youtu.be/La5A5PLQjaQ?si=e6zg_3GViavxOn
3	**methods of plane table surveying**	https://youtu.be/COldgKBaiqw?si=8ONvMgLWwjP8Ql2p
4	**Tachometric surveying**	https://www.youtube.com/watch?v=HuJMSS3T070&list=PL5UuHQx1lpk3VBalpNcdAgxXSwG9QGyZp

Course code	**LC-CE-211A**				
Category	**Lab Course**				
Course title	**Building Drawing Lab.**				
Scheme and Credits	L	T	P	**Credits**	**Semester-III**
	0	0	2	1	
Course Objectives:	The objectives of this course are to • To understand the principles of planning and bylaws. • To draw plan, elevation and section of bond in brick work, walls and foundations, load bearing and framed structures. • To prepare detailed working drawing for different parts of a building.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 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 basic components and symbols used in building drawings such as bonds, doors, windows, ventilators, and staircases.	Level 1: Remember
CO2	Explain the purpose and construction details of different structural elements like cavity walls, floors, roofs, and foundations.	Level 2: Understand
CO3	Prepare building plans, elevations, and sectional views for residential and public buildings as per architectural standards.	Level 3: Apply
CO4	Analyze different types of construction drawings to assess their suitability, functional layout, and structural efficiency.	Level 4: Analyze

LIST OF EXPERIMENTS

1. Different Bonds in brick work.
2. Plan and Sectional Elevation of different Doors and Windows. different Ventilators
3. Plan and Sectional Elevation of Floors.
4. Plan and Sectional Elevation of different roofs.
5. Plan and Sectional Elevation of different Stair-Cases.
6. Cavity and partition Wall.
7. Grillage foundation.
8. Preparation of building drawing as per vastu and building norms , mentioning its salient features including the following details: a) Ground floor plan b) Two Sectional Elevations c) Front and Side Elevations

Useful Video links:

Exp. No	Topics	Links
1	Different Bonds in brick work.	English Bond Brick Work explained with mini Bricks | types of brick bonds | Architecture Attack
2	Plan and Sectional Elevation of different Stair-Cases.	https://www.youtube.com/watch?v=NzKenIvnrWI
3	Plan and Sectional Elevation of different Doors and Windows.	https://www.youtube.com/watch?v=RZ7YD_kmof0 https://www.youtube.com/watch?v=HCmhL6BBek4
4	Plan and Sectional Elevation of Floors.	https://www.youtube.com/watch?v=snhnB6BQZS0

Course code	**LC-ME-213A**				
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 • Structural Analysis experiments help to understand, to know the practical behaviour of the physical structures like beams, roof truss etc. • A proper structural analysis of these structures helps the students to solve the practical problems. • Different structural apparatus like Simply Supported Beam, Curved Member of different shape, Pin Joint Truss are studied in the laboratory.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 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 basic mechanical properties and behaviors of structural elements like beams, rods, and trusses under various loading conditions.	Level 1: Remember
CO2	Explain the concepts of stress, strain, torsion, elasticity, and deflection as observed in standard structural experiments.	Level 2: Understand
CO3	Conduct experiments on beams, struts, and trusses to determine deflections, stresses, and elastic constants and compare with analytical results.	Level 3: Apply
CO4	Analyze experimental results of structural members like elastically coupled beams and pin-jointed trusses under different boundary conditions.	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	Topics	Links
1	To determine elastic properties of a beam.	https://www.youtube.com/watch?v=nC0Sk36SZ0w
2	To determine and analyse deflection of curved beams.	https://www.youtube.com/watch?v=cGTebUY2xQc
3	Experimental and analytical study of behaviour 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-CE-215A**				
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 • To understand the physical processes of fluid more closely. • Various apparatus like, Verification of Bernoulli's theorem apparatus, venturimeter & Orifice meters, orifice & mouth piece apparatus Flow over notches apparatus, vortex flow apparatus etc helps to understand different process.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 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 basic hydraulic and flow measuring devices such as notches, venturimeter, orifice meter, and pressure gauges.	Level 1: Remember
CO2	Explain the principles of fluid statics and dynamics including Bernoulli's theorem, metacentric height, and hydrostatic forces.	Level 2: Understand
CO3	Conduct experiments on notches, meters, and fluid containers to determine discharge, coefficients, and forces acting on surfaces.	Level 3: Apply
CO4	Analyze experimental data from fluid flow and pressure measurement devices to evaluate flow characteristics and performance parameters like Cd, Cv, and Cc.	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 Cd, Cv, and Cc

Useful Video links:

Exp. No	Topics	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=ILY4QMQIY5s
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-CE-217A**				
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 • To use of Chain for linear measurement and traversing. • To use of different compass for determination of directions and for traversing. • To use different levels and determine the reduced levels, elevation and depressions of ground. • To prepare maps using plane table by applying different methods.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 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 basic instruments and methods used in chain, compass, and levelling surveys.	Level 1: Remember
CO2	Explain the principles of plane table surveying, levelling, and contouring for ground measurements.	Level 2: Understand
CO3	Conduct field surveys using chain, compass, levelling, and plane table to prepare plans, profiles, and contour maps.	Level 3: Apply
CO4	Analyze survey data to determine heights, positions, and layout of features using resection and tangent clinometer methods.	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	Topics	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	**HSMC-01A**				
Category	Humanities and Social Science including Management Courses				
Course Title	**Fundamental of Management and Organizational Behaviour**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	3	0	0	3	
Course Objectives	The objectives of this course are • Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework. • Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings. • Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively. • Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations.				
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	Define fundamental management concepts, functions, organizational processes, and organizational behavior elements.	Level 1: Remember
CO2	Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations.	Level 2: Understand
CO3	Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges.	Level 3: Apply
CO4	Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development.	Level 4: Analyse

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-I

Introduction of Management: Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.
Functions of Management: Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration.

Unit-II

Introduction of Organization: Meaning and Process of Organization, Management v/s Organization.

Fundamentals of Organizational Behavior: Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB**.**
Individual Processes and Behavior: Personality, Concept, Determinants and Applications.
Perception: Concept, Process and Applications
Learning: Brief Introduction
Motivation: Concept, Techniques and Importance

Unit-III

Interpersonal Processes: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict-Concept, Sources, Types, Management of Conflict.
Leadership: Concept, Function, Styles, Qualities of Leadership.
Communication: Meaning, Process, Channels of Communication, Importance and Barriers of Communication.

Unit-IV

Organizational Processes: Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.
Organizational Culture: Elements, Types and Factors affecting Organizational Culture.
Organizational Change: Concept, Types and Factors affecting Organizational Change, Resistance to Change.

Suggested Readings:

- Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
- Organizational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
- Management concept practice and cases by Ghuman Karminder, Aswathappa K., Tata McGraw Hill, New Delhi
- Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
- Organizational Behaviour by Stephen P Robin, Pearson Education.
- Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
- Organizational Behaviour by FC Sharma, Shree Mahavir Publications.

Useful Video Links:

Unit No.	Topics	Links
1	Nature and Scope of Management	https://nptel.ac.in/courses/110105146
2	Perception and Personality	https://nptel.ac.in/courses/110103433
3	Group Dynamics	https://archive.nptel.ac.in/courses/110/106/110106145/
4	Organizational Change, Resistance to Change.	https://nptel.ac.in/courses/110105146

Course code	**PCC-CE-202A**				
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 introduce the students to various hydraulic engineering problems like laminar flow, open channel flows, flow through pipes, hydraulic jump and its applications. • At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering				
Class work	40 Marks				
Exam	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**Explain** the differences between laminar and turbulent flow in pipes and open channels.	Level 2: Understand
CO3	**Calculate** head losses, flow rates, and energy gradients in pipe networks and open channels.	Level 3: Apply
CO4	**Analyze** flow using Reynolds number, critical depth, and specific energy.	Level 4: Analyze
CO6	**Design** efficient pipe systems and open channel sections for given hydraulic conditions.	Level 6: Create

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

Unit-I

Module 1: Laminar Flow

Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity.

Module 2: Turbulent Flow

Reynolds experiment, Transition from laminar to turbulent flow, Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes

Unit-II

Module 3: Flow through Pipes

Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy. equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, siphon, power transmission through pipes, Analysis of pipe networks: water hammer in pipes and control measures, branching of pipes.

Unit-III

Module 4: Open Channel Flow: Uniform flow

Definition, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channel flow.

Uniform Flow- Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient 'n', Most economical section of channel, Computation of Uniform flow, Normal depth.

Module 5: Open Channel Flow: Non-Uniform Flow

Specific energy, Specific energy curve, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Channel Transitions, Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile.

Unit-IV

Module 6: Hydraulic Jump

Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump.

Module 7:

Surges, Positive and negative surges, Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation.

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.	Topics	Links
1	Laminar flow	https://youtu.be/jwSdYP17PAY?si=mGMDPnUAtCJoSDb
2	Loss of head through pipes	https://youtu.be/G3fVsnFf8Fo?si=ay7IciEIN3GoATWJ
3	Uniform flow	https://youtu.be/Q8BDFh_XqX8?si=bdkzKyT3PVLy4nGI
4	Hydraulic Jump	https://youtu.be/oWYVaho9jK0?si=h9lt84zgvZI89b6n

Course code	**PCC-CE-204A**				
Category	**Professional Core courses**				
Course title	**Structural Analysis**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	3	1	0	4	
Course Objectives:	The objectives of this course are • To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and Design Engineering Systems. • Covers the relationship between stress and strain on deformable solids, principal stresses, maximum shearing stress, and the stresses acting on a structural member. • Applies analysis to members subjected to axial, bending, and Torsional loads. • Learn to evaluate internal forces, moments and corresponding stresses in beams through problem solving sessions using different methods. • This course provides foundation knowledge, skills and their application which are relevant to subsequent courses in Civil Engineering.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**Understand** methods for deflection analysis in beams, frames, and trusses.	Level 2: Understand
CO3	**Apply** influence lines and moving load concepts to determine critical forces.	Level 3: Apply
CO4	**Analyze** arches, cables, and indeterminate structures using classical methods.	Level 4: Analyze
CO5	**Evaluate** beams and frames using structural methods.	Level 5: Evaluate

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

Unit-I

MODULE 1: Deflection of Statically determinate structures

Deflection of determinate beams by Double Integration Method, Conjugate Beam Method and Moment Area Methods, Principle of Virtual work (Unit load method) and Castigliano's theorem.

MODULE 2: Deflection of Statically determinate Frame & Truss

Deflection of determinate pin jointed trusses and rigid jointed frames by principle of virtual work, Strain Energy and Castiglino's theorem. Williot Mohr diagram method and Maxwell's laws of reciprocal theorem

Unit-II

MODULE 3: Travelling Loads

Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying following moving loads: A Single Concentrated Load, Uniformly Distributed Load, Two Concentrated Loads, fixed distance apart Series of Concentrated Loads, Enveloping parabola, equivalent UDL for BM and SF in each of the above cases.

MODULE 4: Influence Line

Influence lines for reactions, BM & SF for simply supported beam and Panelled Girders.

Influence lines for forces in trusses with top horizontal and curved both, Reversal of stresses, Use of influence lines for calculating design forces due to dead load and moving live loads. Influence lines using Muller Breslau principle.

Unit-III

MODULE 5: Arches

Concept of arches as structural elements, classification of arches – three-hinged, two-hinged, fixed arches, determination of horizontal thrust, bending moment and shear force diagrams for three-hinged arches (parabolic and circular – subjected to point loads and uniformly distributed loads), determination of horizontal thrust for two-hinged arches, brief introduction to fixed arches

MODULE 6: Column Analogy Method & Cable and Suspension Bridge

Elastic centre, properties of analogous column, application to beam & frames. Introduction of Cable and suspension Bridge uniformly loaded cables, Temperature stresses, and three hinged stiffening Girder and two hinged stiffening girder

Unit-IV

MODULE 7: 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 8: Kani's Method

Analysis of continuous beam and simple frames, Analysis of frames with different column lengths and end condition of the bottom storey.

Suggested Readings

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

Useful Video links:

Unit No.	Topics	Links
1	Deflection of determinate beams by Double Integration Method	https://youtu.be/ajGlZCND4rM?si=aoKNyj9Pt3wtx4
2	Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying moving loads	https://youtu.be/zYEjDnVnnHs?si=QeeacW9- z1E3ngNd
3	Determination of horizontal thrust, shear force and bending moment diagram for archs	https://youtu.be/F8u5zgdo_C4?si=UDm2Z14drPxvNf_d
4	Indeterminate Structures & Deflection methods	https://youtu.be/8nGgpKz07yk?si=xcYNj-Qxs3NUVnHm

Course code	**PCC-CE-206A**				
Category	**Professional Core courses**				
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 understand the principle of surveying on very large scale by locating precise horizontal controls. • To learn about • surveying applications in setting out works. • To learn about determining absolute positions of a point using celestial measurements. • To learn about different types of errors in measurements and their adjustment. • To introduce the basic concept of photogrammetry, Remote sensing, and GIS.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**Understand** triangulation, trilateration, and survey adjustments.	Level 2: Understand
CO3	**Apply** astronomy and photogrammetry concepts in surveying.	Level 3: Apply
CO4	**Analyze** remote sensing data and interpret spectral signatures.	Level 4: Analyze
CO5	**Evaluate** remote sensing data and EMR behavior.	Level 5: Evaluate

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

Unit-I

Module 1: Triangulation and Trilateration

Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work 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, method of correlates, normal equation, adjustment of triangulation figures by method of least squares.

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: equation of time-its cause and effect,

Unit-III

Module 4: Elements of Photogrammetry

Introduction, types of photographs, aerial camera, scale of a photograph, height displacements of vertical photographs, flight planning and its uses, crab and drift, number of photographs, relief displacements, Stereoscopic vision and stereoscopes, height determination
from parallax measurement, flight planning, principle of photo interpretation, photogrammetric monitoring.

Unit-IV

Module 5: Introduction to remote sensing

Definition of Remote Sensing, types of remote sensing, remote sensing system and components. EMR source and characteristics, active and passive remote sensing, EMR propagation through medium, Role of atmosphere, Atmospheric windows, EMR interaction with objects, Spectral signature, EMR interaction with vegetation, soil and water. Satellite orbits and platforms: Geostationary and sun synchronous satellites, Resolution, Applications of remote sensing in civil engineering.

Module 6: Geographic Information System (GIS) and Global Positioning System(GPS) Definition and objectives of GIS, components of GIS, spatial data models: raster and vector, data inputting in GIS, linkage between spatial and non-spatial data, spatial data analysis: vector and raster-based spatial data analysis, integration of Remote Sensing (RS) and GIS data, Digital Elevation Model (DEM), GIS software packages, Introduction to GPS – Working Principle of GPS, components, types of GPS receivers, Error in GPS, applications in civil engineering.

Suggested Readings

1. Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill
2. Punmia, B.C. 2005: Surveying I and II, Luxmi Publications
3. Charles D. Ghilani: Adjustment Computations: Spatial Data Analysis (Fifth Edition)
4. Paul R Wolf: Elements of Photogrammetry
5. G S Srivastava: An introduction to Geoinformatics
6. Basudeb Bhatta: Remote Sensing and GIS
7. G. L. Hosmer: Text-book on Practical Astronomy

Useful Video links:

Unit No.	Topics	Links
1	Triangulation systems	https://www.youtube.com/watch?v=-23Rvzey1Ko
2	Definitions of astronomical terms, celestial coordinate systems	https://youtu.be/14-YsGiCNwI?si=Vf44PAY6qm_u3wg9
3	Elements of Photogrammetry	https://youtu.be/qDmu_r12TU8?si=B6U5pXihH35NZ-dI
4	Introduction to remote sensing	https://youtu.be/cn5CWu_zt_s?si=HF-xcIbvPwahitgF

Course code	**PCC-CE-208A**				
Category	**Professional Core 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 provide the students an knowledge about various engineering materials. • To understand the properties of ingredients of concrete. • To study the behaviour of concrete under different states. • To study about the concrete design mix. • To understand special concrete and their use. • To know various heavy construction projects and the equipments used for these.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO1	**Recall** types and properties of engineering materials like cement, steel, and concrete**.**	Level 1: Remember
CO2	**Understand** mix design principles and behavior of fresh and hardened concrete.	Level 2: Understand
CO3	**Apply** testing methods for construction materials and evaluate results.	Level 3: Apply
CO4	**Analyze** material performance in structural applications and heavy construction**.**	Level 4: Analyze

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

Unit-I

Module 1: Introduction to Engineering Materials

Cements, M-Sand, Concrete – plain, reinforced, steel fibre/glass fibre-reinforced, lightweight concrete, High Performance Concrete, Polymer Concrete, Ceramics and Refractories, Bitumen and asphaltic materials, Glass and Plastics, Structural Steel and other Metals, Emerging Construction Materials – Geopolymer Concrete, Self-Healing Concrete, Bacterial Concrete, Ultra-High Performance Concrete (UHPC), 3D-Printed Concrete

Module 2: Limes, cement and mortars

Lime: classification of lime, manufacturing, testing of lime, storage of lime, Cement: cements composition, types of cement, manufacturing of ordinary portland cement, special types of cement, storage of cement, testing of cement. Mortars: Proportions of lime and cement mortars, mortars for masonry and plastering.

Unit-II

Module 3: Concrete making materials

Proportions of cements, aggregates, water and admixtures; properties of fresh and hardened concrete, variability of concrete strength, extreme weather concreting, prestressed concrete; Durability of concrete - alkali aggregate reaction, reinforcement corrosion, freezing and thawing, etc.

Module 4: Mix Design

Principles of concrete mix design, basic considerations, Factors in the choice of mix design, outline of mix design procedure, ACI mix design practice, USBR method, British mix design method IS guidelines.

Unit-III

Module 5: Steel and its testing

Types of steel, mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; tensile test – standards for different material (brittle, quasi-brittle, elastic and so on); Bending and torsion test, procedure and standards, Strength of ceramic, Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; concept of fracture mechanics; fracture toughness testing.

Unit-IV

Module 6: Testing and Evaluation Procedures

Testing of concrete mixes, description for various concrete, steels, aggregates ; Elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Shrinkage, Creep.

Module 7: Construction equipments and Heavy Construction

Construction of large structures, dams, bridges, multi storeyed buildings etc, Construction Equipments - crushers, hot mix, plants, dozers etc, Introduction to heavy construction equipment.

Suggested Readings

1. Handbook of mix design - BIS
2. Concrete Technology by M.S. Shetty.
3. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth- Heinemann
4. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
5. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
6. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
7. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
8. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

Useful Video links:

Unit No.	Topics	Links
1	Introduction to Engineering Materials	https://youtu.be/gqp3cNOp5yQ?si=qwMzQKxgcsh3T9Sf
2	Durability of concrete	https://youtu.be/2Q7-o0HZTOE?si=mzkEcjsC_0N_oH2y
3	Steel and its testing	https://youtu.be/DxTu9HsjQKg?si=OzRhirDJtbdQy5zn
4	Testing of concrete mixes	https://youtu.be/2SaZlCn4uxI?si=iGQO-Lx2by7WmL1B

Course code	**LC-CE-210A**				
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 understand the flow measurement in a pipe flow. • To determine the energy loss in pipe flow. • To study the loss due to pipe fittings. • To measure the discharge in a open channel flow etc.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**(Understand):** Explain key fluid flow phenomena like cavitation, hydraulic jump, and scouring.	Level 2: Understand
CO3	**(Apply):** Perform experiments to measure drag, discharge, and head loss.	Level 3: Apply
CO4	**(Analyze):** Identify flow regimes and analyze critical Reynolds number and flow patterns.	Level 4: Analyze
CO5	**(Evaluate):** Assess scouring effects around hydraulic structures for design considerations.	Level 5: Evaluate

LIST OF EXPERIMENTS

1. To determine the coefficient of drag by Stokes law for spherical bodies.
2. To study the phenomenon of cavitations 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	Topics	Links
1	To determine the coefficient of drag by Stokes law for spherical bodies.	https://youtu.be/lneevkjxlUQ?si=x3hVDLUmLTCkaV3A
2	To study the phenomenon of cavitations in pipe flow.	https://youtu.be/wo1sWgjJ06w?si=FrBKpBkBqaOoPY7J
3	To determine the critical Reynolds number for flow through commercial pipes.	https://youtu.be/KDCtmq3q6_c?si=-hlPeTytwf1dFfr5
4	To determine the coefficient of discharge for flow over a broad crested weir.	https://youtu.be/5dJ5or3lXb4?si=qDTVA9DE8tM9Ohna

Course code	**LC-CE-212A**					
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 • Structural Analysis experiments help to understand, to know the practical behaviour of the physical structures like beams, different arches, roof truss etc. • A proper structural analysis of these structures helps the students to solve the practical problems. • Different structural apparatus like Two-Hinge Arch, Three-Hinge Arch are studied in the laboratory.					
Class work	25 Marks					
Exam	25 Marks					
Total	50 Marks					
Duration of Exam	03 Hours					

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**(Understand):** Explain structural behavior concepts like slope, deflection, and reciprocal theorems.	Level 2: Understand
CO3	**(Apply):** Conduct experiments on arches, beams, and frames to observe structural responses.	Level 3: Apply
CO4	**(Analyze):** Compare experimental and analytical results for arches, cantilevers, and frames.	Level 4: Analyze
CO5	**(Evaluate):** Assess the influence of unsymmetrical loading and sway on structural stability.	Level 5: Evaluate

LIST OF EXPERIMENTS

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

Useful Video links:

Exp. No	Topics	Links
1	To verify moment area theorem regarding slope and deflection in a beam	https://youtu.be/zXpWmyWEScs?si=tL1HtBYb2y0dMAEx
2	To verify Maxwell's Reciprocal Theorem.	https://youtu.be/dce7cO4q45U?si=kjIfjI0H9vb4ESQF
3	Begg`sdeformeter- verification of Muller Breslau principle	https://technicalcivil.com/muller-breslau-principle-video/
4	Experiment on a two – hinged arch for horizontal thrust and influence line for horizontal thrust	https://youtu.be/OPsKQvcp9Qw?si=yLYUm7mxO-27Uktm

Course code	**LC-CE-214A**				
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 study and use of theodolite for angle measurements • To use tacheometer for horizontal and vertical distances. • To draw simple circular curves. • To measure base line measurement. • To study total station and its use for measuring distance, elevation and coordinates.				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**(Understand):** Describe the functions of theodolite and total station.	Level 2: Understand
CO3	**(Apply):** Measure angles, distances, and elevations using surveying instruments.	Level 3: Apply
CO4	**(Analyze):** Compute elevations and distances using tacheometry and triangulation.	Level 4: Analyze
CO5	**(Evaluate):** Solve curve setting and special surveying problems using total station.	Level 5: Evaluate

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	Topics	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=gdgUlGi5hWAVo1aP
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-CE-216A**					
Category	**Lab Course**					
Course title	**Material Testing and Evaluation Lab.**					
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**	
	0	0	2	1		
Course Objectives:	The objectives of this course are • To determine important properties of cement with different tests. • To study the various test on aggregates and concrete					
Class work	25 Marks					
Exam	25 Marks					
Total	50 Marks					
Duration of Exam	03 Hours					

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO1	Describe key properties of cement, aggregates, and concrete.	Level 1: Remember
CO3	Conduct standard tests on cement and concrete materials.	Level 3: Apply
CO4	Interpret test data to assess material performance.	Level 4: Analyze
CO5	Evaluate concrete quality using destructive and non-destructive methods.	Level 5: Evaluate

LIST OF EXPERIMENTS

1. Standard consistency of cement using Vicat`s apparatus.
2.
   A) Fineness of cement by Sieve analysis and Blaine`s air permeability method.
   B) Fineness modulus of coarse and fine aggregates.
3. Soundness of cement by Le-Chatelier`s apparatus.
4. Setting time of cement, initial and final of cement.
5. Compressive strength of cement.
6.
   A) Measurement of specific gravity of cement.
   B) Measurement of Heat of Hydration of cement.
7. Moisture content and bulking of fine aggregate.
8. Workability of cement concrete by (a) Slump test (b) Compaction factor test (c) Flow table test.
9. Compressive strength of concrete by (a) Cube test, (b) Cylinder test
10. Indirect tensile strength of concrete-split cylinder test.
11. Modules of rupture of concrete by flexure test.
12. Bond strength between steel bar and concrete by pull-out test.
13. Non-destructive testing of concrete.

Useful Video links:

Exp.No.	Topics	Links
1	Standard consistency of cement using Vicat`s apparatus	https://youtu.be/QUfWcEQzMsw?si=PtT3y4W0eSqz79OP
3	Soundness of cement by Le- Chatelier`s apparatus.	https://youtu.be/XoG4yq30htQ?si=mDGlY5wse_3MR8xc
4	Setting time of cement, initial and final of cement.	https://youtu.be/sQ4SJrE1oyA?si=4ZFdFKUgafPffhE S
5	Compressive strength of cement.	https://youtu.be/bG88DAOreVA?si=WLjxoq-nMx_odmxw
7	Moisture content and bulking of fine aggregate.	https://youtu.be/Odfz20NkzGo?si=B2OQdbhbSvu_kTGa
8	Workability of cement concrete by Slump test	https://youtu.be/yzpWGrh9j6Y?si=1gMAvlxQBl7q9DCR

Course code	**PEC-CE-218A**				
Category	**Professional Elective Courses**				
Course title	**Design of Concrete Structure**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	3	0	0	3	
Course Objectives:	The objectives of this course are • The aim of this course is to provide students with a thorough understanding of the design of reinforced concrete structures. • To become familiar with professional and contemporary issues in the design and fabrication of reinforced concrete members. • Be able to identify and interpret the appropriate relevant industry design codes. • The course focuses on understanding the behaviour of reinforced concrete components and systems subjected to gravity as well as lateral loads. • Topics covered will include: design of beams, Column and slabs, detailing of reinforcement, design of foundation and retaining wall.				
Class work	40 Marks				
Exam	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

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

CO	Skill Demonstrated	RBT Level
CO2	**Understand** design methods and code provisions for RCC structures.	Level 2: Understand
CO3	**Apply** design procedures for beams, slabs, columns, and footings.	Level 3: Apply
CO4	**Analyze** structural members for shear, bond, torsion, and serviceability.	Level 4: Analyze
CO6	**Design** complete RCC elements like retaining walls, slabs, and foundations.	Level 6: Create

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

Unit-I

Module 1: Design methodology in Reinforced Concrete & Working stress Method Working stress and limit state methods, Limit state v/s working stress method, Building codes, Normal distribution curve, Characteristic strength and Characteristics loads, Design values, Partial safety factors and Factored loads, Stress-Strain relationship for concrete and steel. Working Stress Method: Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

Module 2: Limit State Method

Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement and design examples. Continuous Beams both method -Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear.

Unit-II

Module 3: Concrete Reinforcement and Detailing

Requirements of good detailing, Cover to reinforcement, Spacing of reinforcement, Reinforcement Splicing, Anchoring reinforcing bars in flexure and shear, Curtailment of reinforcement. 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.

Module 4: Serviceability Limit State

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-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: Retaining Walls

Classification, Forces on retaining walls, Design criteria, Stability requirements, Proportioning of cantilever retaining walls, counter fort retaining walls, criteria for design of counter forts, 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.Reinforced Concrete Design by S.N.Sinha, Tmh Pub.,N.Delhi.
4. Sp-16(S&T)-1980, Design Aids For Reinforced Concrete to IS:456, BIS, N.Delhi.
5. Reinfirced cement concrete design by Neelam Sharma , S.K.Kataria & sons, N.Delhi.
6. Sp-34(S&T)-1987 Handbook on Concrete Reinforcement And Detailing`, BIS, N.Delhi.

Useful Video links:

Unit No.	Topics	Links
1	Working stress and limit state methods	https://youtu.be/ba3mZhOpsTM?si=cR5Ec7Nhv6-dHT2l
2	Concrete Reinforcement and Detailing	https://youtu.be/aJJedgPfFVI?si=mYBTzapnJBW1Ksba
3	Design of one way and two ways slabs	https://youtu.be/PDJPcQq3PZE?si=2dEvG1hldX9Y2yvn
4	Minimum eccentricity in column	https://youtu.be/ukIrYcFLyoc?si=FJLU2ajoaNQOg-y1