SECOND YEAR ENGINEERING: CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –III

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 3.1	Concrete Technology	3	--	2	3	100	25	--	25	--	**150**
CE 3.2	Mechanics of Materials	3	1	2	3	100	25	--	25	--	**150**
CE 3.3	Fluid Mechanics-I	3	1	2	3	100	25	--	--	25	**150**
CE 3.4	Building Materials and Construction	4	--	2	3	100	25	25	--	--	**150**
CE 3.5	Engineering Mathematics -III	3	1	--	3	100	25	--	--	--	**125**
CE 3.6	Managerial Economics	3	--	--	3	100	25	--	--	--	**125**
TOTAL		**19**	**3**	**8**	**--**	**600**	**150**	**25**	**50**	**25**	**850**

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

SECOND YEAR ENGINEERING: CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –IV

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 4.1	Surveying - I	3	--	2	3	100	25	--	25	--	**150**
CE 4.2	Fluid Mechanics-II	3	--	2	3	100	25	--	--	--	**125**
CE 4.3	Building Drawing - I	3	--	3	4	100	25	25	--	--	**150**
CE 4.4	Structural Analysis - I	4	--	--	3	100	25	--	--	25	**150**
CE 4.5	Numerical Techniques in Computer Programming	3	--	2	3	100	25	--	--	--	**125**
CE 4.6	Engineering Geology	3	--	2	3	100	25	--	25	--	**150**
TOTAL		**19**	**--**	**11**	**--**	**600**	**150**	**25**	**50**	**25**	**850**

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

FE 1.3 ENGINEERING MECHANICS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
FE 1.3	Engineering Mechanics	3	--	2	3	100	25	25	--	--	**150**

Course Objectives:

1. To apply principles of statics and dynamics to a rigid body.
2. To impart knowledge of different types of simple lifting Machines.

Course Outcomes:

The student after undergoing this course will be able to:

1. Find resultant and understand the concept of equilibrium of coplanar concurrent and non-concurrent force systems
2. Understand the concept of centroid, area moment of inertia and mass moment of Inertia
3. Understand the basic principles of Engineering Mechanics and applications to beams and trusses
4. Understand the principle of virtual work, application of Work Energy principle, Impulse Momentum equation, and principle to rigid bodies.
5. Study the working principle of some simple lifting machines

UNIT-1 (12 Hours)

Basic Concepts: Concept of a rigid body, Laws of motion, Force systems, Principle of Transmissibility of forces, concurrent and non-concurrent Forces, Resultant of a forces, Composition and resolution of forces, moment of a force, Principle of moments, Equilibrium of forces, Lami's theorem, Free body diagrams, Applications. Types of beams, determinate and indeterminate beams, Types of loads, Types of supports and support reactions of determinate beams.

Graphic Statics: Concept of vector and space diagram, Bow's notation, force polygon and funicular polygon.

UNIT-2 (12 Hours)

Centroid and Moment of Inertia: First moment of an area and Centroid, Locating the centroid of built – up sections. Second moment of area , radius of gyration, Parallel Axes Theorem, Perpendicular axes Theorem, polar moment of inertia, Finding moment of inertia of built up sections. Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis.

Virtual Work Method: Principle and concept of virtual work. Application to determinate beams

UNIT-3 (12 Hours)

Trusses: Introduction, Simple Truss and Solution of Simple truss by Method of Joints and Method of Sections.

Friction: Theory of friction, Types of friction, Static and kinetic friction, angle of friction, Limiting Friction, Laws of friction, Coefficient of friction, Angle of repose, Applications involving rigid body on a horizontal or an inclined plane, ladder and wedge friction.

UNIT-4 (12 Hours)

Simple Lifting Machines: Mechanical advantage, velocity ratio, efficiency of machine, law of machine. Study of simple machines:- Simple wheel and axle, differential wheel and axle, single and double purchase crab and worm and worm wheel.

Kinetics of Rigid Body: Work Energy principle, Impulse Momentum equation, D'Alembert's Principle and related applications.

Recommended readings:

1. S. S. Bhavikatti and K. G. Rajshekarappa; Engineering Mechanics; New Age International Publication.
2. F. P. Beer and Johnson; Vector Mechanics for Engineers: Statics and Dynamics; Tata McGraw Hill Publication.
3. R. C. Hibbeler; Engineering Mechanics: Statics and dynamics; Prentice Hill Publication.
4. I. H. Shames andG. K. RaoMohana; Engineering Mechanics: Statics and dynamics; Pearson Education Publication.
5. A. K. Tayal; Engineering Mechanics; Umesh Publications.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments. The Term Work Marks to be awarded based on the assessment of experiments conducted)

1. To determine support reactions of simply supported beam.
2. To verify parallelogram law of forces.
3. To verify polygon law of forces for concurrent system.
4. To determine coefficient of friction and angle of friction using inclined plane.
5. To verify the principle of moments.
6. To determine law of machine for simple wheel and axle.
7. To determine law of machine for differential wheel and axle.
8. To determination law of machine for single purchase crab.
9. To determine law of machine for double purchase crab.
10. To determine law of machine for worm and worm wheel.

FE 2.5 ENVIRONMENTAL SCIENCES AND SOCIAL SCIENCES

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
FE 2.5	Environmental Sciences and Social Sciences	3	--	--	3	100	25	--	--	--	**125**

Course Objectives:

1. To study the concept of various environmental aspects on scientific basis in the functional area of Engineering and technology.
2. To study and critically assess the approaches to pollution control, environmental and resource management, sustainable development, cleaner technologies, Environmental Legislation based on an understanding of the fundamental, environmental, social and economic dimensions.
3. To know the various types of probable disaster and its mitigation measures.
4. To have the knowledge of ethics and emotional intelligence.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the Present, past and future status of the Environment.
2. Demonstrate the knowledge of core concepts and components inEnvironmental Science.
3. Explain environment management by equitable handling of natural resources, pollution control technologies, biodiversity and ecosystem protection.
4. Identify environmental issues and problems arising due to human activities at local, national and global level and acquire knowledge of mitigation measures and explain the importance of Environmental Legislation and its implementation.
5. Get acquainted for preparedness towards natural disaster.
6. Released the importance of ethics for engineers, emotional intelligence etc.

SECTION I: ENVIRONMENTAL SCIENCE

UNIT-1 (12 Hours)

The Environment: Definition, Objectives, Principles, Importance, ethics and Scope of Environmental education, Need for public awareness. Role of an individual in conservation of natural resources.

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems.

Forest Resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.

Water Resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems.

Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food Resources: World food problem, changes caused by agriculture and overgrazing,effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy Resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

UNIT-2 (12 Hours)

Environmental Pollution: Definition, Causes, effects and control measures of- Air Pollution, Water Pollution, Marine Pollution and Noise Pollution, Fire works - crackers effects and control measures.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, Rain water harvesting, Watershed management.

Disaster Management: Planning, Disaster Preparedness, Response and Recovery. Guidelines of national disaster management division.Rehabilitation policy: Objectives and guidelines.

SECTION II: SOCIAL SCIENCE

UNIT-3 (12 Hours)

Personality : Freudian & humanistic Theory, Personality Development, Notion of successful personality, Emotional Intelligence.

Motivation: Theories of motivation.

Stress Management: cause & effect. Coping mechanisms. Prayer, Meditation, Yoga. Professional work ethic for the engineer.

Team: Leadership ,Team culture. Team Attitudes, Interpersonal skills.

Engineer's Responsibility: individual & social level.

Positivity: Attitudes, lifestyle, living.

UNIT-4 (12 Hours)

Education: Nature. Scope, Limitations.

Concept of Culture: Identity, Conflict, Changes in culture,Acculturation, Enculturation,Cultural diffusion, Globalisation.

Social Issues : Women empowerment, Religious Tolerance.

Business Etiquettes: Policies, Implications.

Civil Society Groups: An emergent social phenomenon.

Recommended readings:

1. S.Deswal, A.Deswal; A Basic Course in Environmental Studies;DhanpatRai& Co Publication.
2. N.K. Uberoi;Environmental Studies, Excel Books Publications New Delhi, first edition; 2005.
3. D.K.Asthana and MeeraAsthana;A Text Book Of Environmental Studies;S.Chand Publications New Delhi, 1st Edition; 2006.
4. MrinaliniPandey; Disaster Management; Wiley Publication.
5. T. G. Miller; Environmental Science; Wadsworth Publication.
6. C. N. Shankar Rao; Principles of Sociology with an introduction to social thoughts; S. Chand and Co.Publication.
7. Robert A. Baron;Psychology; Pearson Pvt. Ltd.

NOTE: Section I and Section II to be answered on separate answer book

CE 3.1 CONCRETE TECHNOLOGY

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th. Duration (Hrs)	Marks					
						Th.	S	TW	P	O	Total
CE 3.1	Concrete Technology	3	--	2	3	100	25	--	25	--	**150**

Course Objectives:

1. To impart knowledge of concrete making materials and their interrelationship
2. To study their physical, chemical and other relationships in addition to combined material as a whole
3. To understand effect of water cement ratio , strength development, age, effect of chlorides, sulphates etc. on concrete
4. To study concrete behaviour over time, subsequent problems faced, remedies, repair and rehabilitation techniques
5. To understand non-destructive testing, understanding mix design and codal provisions related to concrete

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the principles of concrete technology and apply them during construction supervision and testing.
2. Gain Knowledge related to Supervising and managing concrete manufacture and construction.
3. Develop skills in selecting and testing concrete ingredients and concrete for certain specific requirements.
4. Interpret the test results.
5. Plan for quality and economy in concrete construction

UNIT–1 (12Hours)

Introduction: Definition of concrete,Ingredients,properties of concrete, advantages of concrete, uses of concrete in comparison to other building materials.

Cement: physical properties of cement; different types of cements.

Aggregates: Classification of aggregates according to size and shape, Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk

density, water absorption, surface moisture, bulking of sand, deleterious materials, soundness. Grading of aggregates: coarse aggregate, fine aggregate; All-in- Aggregate; fineness modulus; interpretation of grading charts. Water: Quality requirements as per IS: 456-2000.

Properties of Green Concrete: Properties in plastic state, Workability, Segregation, Bleeding and Harshness Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes; Measurement of workability: slump test, compacting factor and Vee Bee Consistometer; recommended slumps for placement in various conditions As per IS: 456-2000 and SPECIFICATIONS-23-1982.

Water Cement Ratio: Principle of water-cement ration law/Duff Abram's Water-cement ratio law: Limitations of water-cement law Workability: Definition, phenomenon of workability, concept of internal friction, segregation and harshness; factors affecting workability

UNIT-2 (12 Hours)

Properties of Hardened Concrete: Properties include Strength, Concrete Creep ,Shrinkage, Modulus of Elasticity, Water tightness (impermeability) and Rate of Strength gain of Concrete their measurement and interpretation.

Making Good Concrete Mixing: Hand mixing, Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers, Maintenance and care of machines. Transportation of concrete: Transportation of concrete using pans, wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.Batching: Batching of Cement, Volume, using gauge box, selection of proper gauge, Batching of aggregate by box, Weight spring balances and by batching machinesMeasurement of water.

Compaction: Hand compaction, Machine compaction - types of vibrators, internal screed vibrators and form vibrators, Selection of suitable vibrators for different situations Finishing concrete slabs - screeding, floating and toweling.

Curing: Objective of curing, methods of curing like ponding, membrane Curing, steam curing etc. Jointing: Location of construction joints, treatment of construction joints, Expansion joints in buildings - their importance and location Defects in concrete: Identification of and methods of repair.

UNIT–3 (12 Hours)

Mix Design -Role of Admixtures: Introduction to admixtures their uses and applications as per IS: 456-2000; Chemical admixtures viz., Plasticizers, Accelerators and Retarders,

Water-reducing admixtures, Air-entraining admixtures Mineral admixtures, Fly ash, Silica fumes, Rice husk ash, Meta Kaolin. New generation admixtures. Mix design as per IS-10262-2009.

Construction Chemicals: Waterproofing compounds, Tile fixing adhesives and joint fillers, Repair and renovation product, Admixturesfor concrete and mortars, Coating and protection products and Construction and workmanship aids.

Non Destructive Testing, Defects, Repairs and Remedies to Concrete: Non-destructive tests- instruments used- applications- interpretation of data on building elements and materials to evaluate the condition of the building and study of most commonly used tests. Main defects and their causes in various building elements. Retrofitting and rehabilitation of structures

UNIT–4 (12 Hours)

Special Concretes and Concreting Conditions: Concreting in cold weather condition, under water concreting, hot weather concreting, fibre reinforced concrete, SFRC, fly ash concrete, silica fume concrete, polymer concrete. Self-compacting concrete, self-levelling concrete, no fines concrete, RMC, Stamped, Textured, coloured, light weight concrete, shotcrete, grouting, guniting.

Durability of Concrete and Advanced Concrete Construction: Durability concept; pore structure and transport processes; reinforcement corrosion; fire resistance; frost damage; sulphate attack; alkali silica reaction; delayed ettringite formation; methods of providing durable concrete; short-term tests to assess long-term behaviour.Quality of mixed concrete: outline of problems involved; control techniques; selection of control procedures. Quality of finished product.

Recommended readings:

1. A. MNeville; Properties of Concrete; London, Pitman ELBS Edition.
2. M.S.Shetty; Concrete Technology; S Chand & Co. Pvt. Ltd.
3. M. L.Gambhir; Concrete Technology; Tata McGraw-Hill Education India.
4. R. S.Varshney; Concrete Technology; Oxford and IBH Publishing.
5. K.T.Krishnamurthy, A. KasundraRao and, A. A.Khandekar; Concrete Technology; DhanpatRai and Sons.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments)

1. To determine the physical properties of Cement as per BIS Codes
2. To determine flakiness and elongation index of coarse aggregates
3. Determination silt in fine aggregate
4. Determination of specific gravity and water absorption of aggregates
5. Determination of bulk density and voids of aggregates
6. Determination of particle size distribution of fine, coarse and all in aggregate by Sieve analysis (grading of aggregate)
7. To determine necessary adjustment for bulking of fine aggregate
8. To determine workability by slump test:
    a) To verify the effect of water, fine aggregate/coarse aggregate ratio and Aggregate/Cement ratio on slump
    b) To test compressive strength of concrete cubes with varying water Cement ratio
9. Compaction factor test for workability
10. Non-destructive test on concrete by:
    a) Rebound Hammer Test
    b) Ultrasonic Pulse Velocity Test
    c) Profometer / covermeter
11. Tests for compressive strength of concrete cubes for various grades of concrete

NOTE: At least one Construction field visit shall be undertaken.

CE 3.2 MECHANICS OF MATERIALS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th. Duration (Hrs)	Marks					
						Th.	S	TW	P	O	Total
CE3.2	Mechanics of Materials	3	1	2	3	100	25	--	25	--	**150**

Course Objectives:

1. To impart knowledge of material behavior under different types of loading condition.
2. To impart knowledge about different types of stresses/ strains to which the material is subjected and the behavior of materials under combination of stresses/ strains.
3. To impart knowledge of behavior of short & long columns under axial & eccentric loads.

Course Outcomes:

The student after undergoing this course will be able to:

1. Learn fundamental concepts of stress, strain and deformation of solids and understand the application of strength of materials approach
2. To analyse simple structural elements subjected to direct tension/ compression/ shear and bending
3. Assess the ability of materials to resist failure
4. Understand the principles of deflection in beams Assess the strength, stability and stiffness of materials

UNIT–1 (12 Hours)

Simple Stress and Strain: Introduction, Propertiesof materials, Stress, Strain, Hook's law, Poisson's Ratio, Principlesof superposition,Stress strain curve for mild steel in tension, Total elongation of tapering barsof circular and rectangular cross sections, Elongation due to self – weight, Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, Relationship among elastic constants, Thermal stresses (including thermal stresses in compound bars).

Principal Stresses and Strains: Introduction, principal planes and principal stresses, stresses on inclined plane due to single axial tensile/compressive force, General two and three dimensional stress system, Construction of Mohr's circle.

UNIT–2 (12 Hours)

Shear Force and Bending Moment: Basic concepts, definition of shear force and bending moment, Point of Contra-flexure, relation between load, SF and BM at any section, SFD and BMD for general loading for determinate beams.

Bending Stress and Shear Stress in Beams: Introduction – Bending stress in beam, Assumptions in simplebending theory, Beam bending equation, Pure bending, Section modulus, Moment of resistance of the section, Flexural rigidity,Flitched beam. Shear stresses in beam, Shear stress diagram for regular cross-sections.

UNIT–3 (12 Hours)

Direct and Bending Stresses: Introduction, Combined direct and bending stresses, Load acting eccentric to one axis and both the axes, condition for no tension at the base, core section, and Retaining walls subjected to water pressure and earth pressure, wind pressure on chimneys.

Columns and Struts: Introduction – Short and long columns, Euler's theory on columns,Effective length slenderness ratio, Radius of gyration,Buckling load, Assumptions, Derivations of Euler's Buckling load fordifferent end conditions, Limitations of Euler's theory, Rankine'sformula and problems.

Springs: Types of springs, Closely coiled helical springs subjected to axial load, Stiffness of a spring, Closely coiled helical spring subjected to axial twist, Springs in series and parallel.

UNIT–4 (12 Hours)

Deflection of Beams: Introduction – Relationship between slope, deflection and radius of curvature, Elastic curve, Sign convention, Slope and deflection for standard loading classes using Double Integration method, Macaulay's method, Moment Area method and Conjugate beam method fordeterminate beams subjected to general loading.

Thin and Thick Cylinders: Introduction, Thin cylindrical shell, Determination of hoop stress and longitudinal stresses, Change in volume of a thin cylindrical shell due to internal pressure, Lame's theory for thick cylinders.

Recommended Readings:

1. R. CHibbeler; Mechanicsof Materials; Pearson Education
2. S. S. Bhavikatti; Strength of Materials; Vikas Publishing House.
3. S. Ramamurtham; Strength of Materials; DhanpatRai Publishing company

4. F. Beer and E. Johnson; Mechanics of Materials; McGrawHill.
5. L. S. Negi; Strength of materials; Tata McGraw Hill, New Delhi

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments)

1. Tension Test on Steel bars.
2. Compression Test on Concrete Cubes /Bricks/Stone etc.
3. Shear Test on Steel bar.
4. Flexure Test on Timber/ Tile.
5. Charpy's Impact Test.
6. Hardness Tests.
7. Spring Test.
8. Verification of Maxwell's Theorem
9. Verification of Principle of Superposition
10. Torsion Test

NOTE: Termwork shall include at least five assignments based on above syllabus.

CE 3.3 FLUID MECHANICS- I

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 3.3	Fluid Mechanics - I	3	1	2	3	100	25	--	--	25	**150**

Course Objectives:

1. To impart knowledge of fluid properties and pressure measuring devices
2. To impart knowledge of fluid statics and dynamics
3. To analyse pipe flows and pipe networks for calculating discharges and losses in various pipes and fittings.
4. To impart knowledge of dimensional and model analysis.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the basic concept of fluid flow and properties of fluids
2. Understand the principles of fluid statics, kinematics and dynamics
3. Analyze fluid flow problems with the application of momentum and energy equations
4. Understand concept of buoyancy, viscosity and importance of viscosity in real flows.
5. Perform dimensional analysis for problems in fluid mechanics

UNIT–1 (12 Hours)

Properties of Fluids: Fundamental Concepts of fluid flow**,** characteristics, Classification of fluids, Fluid properties, Newton's law of viscosity. Surface tension & Capillarity.Vapour pressure and cavitation.

Fluid Statics: Fluid pressure. Pascal's law, Measurement of pressure using simple, differential & inclined manometers, pressure gauges, Pressure force on plane and curved immersed surfaces. Buoyancy; types of equilibrium, stability of submerged bodies and floating bodies; Metacenter and metacentric height.

UNIT–2 (12 Hours)

Fluid Kinematics: Methods of describing fluid motion - Lagrangian and Eulerian approaches - Types of flows, streamline, pathline, streamtube. Three dimensional continu-

ity equation in Cartesian Coordinates - Vorticity and circulation - Velocity and acceleration - Local and convective acceleration - Potential flows - Velocity potential and stream function - Laplace equation - Flownets - Uses and limitations - Methods of analysis of flownet.

Fluid Dynamics : Introduction, Energy possessed by a fluid body. Types of heads, Euler's equation of motion along a streamline and Bernoulli's equation.Assumptions and limitations of Bernoulli's equation.kinetic energy and momentum correction factor Problems on applications of Bernoulli's equation. Sluice gates under free and submerged flow conditions, Momentum equation- problems on pipe bends. - Fluids subjected to uniform horizontal and vertical acceleration**.**

UNIT–3 (12 Hours)

Discharge Measurements: Introduction, Venturimeter, Orificemeter, Rotameter, Venturiflume, Triangular notch, Rectangular notch, Cipolletti notch, Ogee weir and Broad crested weir, Small orifices.

Flow through Pipes: Loss of head in pipes - major & minor losses, Darcy Weisbach equation, Hydraulic gradient and total energy line, Flow through syphon, Equivalent pipe -series &parallel pipes, Flow through nozzle, water hammer in pipes. - Pipe network – Hardy Cross method.

UNIT- 4 (12 Hours)

Laminar Flow: Laminar flow through circular pipes and parallel Plates, Shear stress and velocity distribution, pressure drop and mean velocity.

Dimensional Analysis: Scope of dimensional analysis - Dimensions - Dimensional homogeneity - Dimensional groups - Dimensional analysis using Rayleigh method and Buckingham's π theorem method .Model testing - Similitude - model laws.

Recommended Readings:

1. Modiand Seth; Hydraulics & Fluid Mechanics; Standard Book House publication.
2. R.K.Bansal;Fluid Mechanics and Hydraulic Machines;Laxmi Publications.
3. S.Ramamrutham; Fluid Mechanics and Hydraulic Machines; DhanpatRai publication
4. Fox, McDonald, Pritchard; Fluid Mechanics;John Wiley & Sons publication
5. John Douglas,JanuszGasiorek, John Swaffield;Fluid Mechanics;Pearson Education.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments)

1. To verify Bernoulli's theorem
2. To determine the coefficient of discharge of a venturimeter
3. To determine the coefficient of discharge of an orifice
4. To calibrate a rotameter
5. To determine the coefficient of discharge of a mouthpiece
6. To determine the coefficient of discharge of a triangular notch losses in pipe friction apparatus
7. To determine the coefficient of discharge of a rectangular notch
8. To determine thecoefficient of discharge of a broad crested weir
9. To determine the head loss due to bend and nozzle
10. To determine the velocity at a point in a pipe using Pitot tube
11. To determine coefficient of friction in pipes
12. To determine minor losses in pipes
13. To calculate friction factor in helical coil.
14. Demonstration of Reynold's experiment
15. To Determine the metacentric height of the given ship model
16. Determination of the centre of pressure of a plane surface being subjected to hydrostatic thrust.
17. Experimental verification of momentum equation
18. To draw flow net for irrotational flow using Hele-Shaw apparatus

NOTE: Termwork shall include at least five assignments based on above syllabus.

CE 3.4 BUILDING MATERIALS AND CONSTRUCTION

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th. Duration (Hrs)	Marks					
						Th.	S	TW	P	O	Total
CE3.4	Building Materials andConstruction	4	--	2	3	100	25	25	--	--	**150**

Course Objectives:

1. To know different types of masonry.
2. To know the new construction materials.
3. To know the technical terms used in construction Industry

Course Outcomes:

The students after undergoing this course will be able to:

1. Understand the building materials
2. Understand the various components of building.
3. Understandthe architectural requirements.
4. Understand the sequence of building construction

UNIT-1 (16 Hours)

Introduction to a Building Structure and Foundations: Functions of buildings and structure in general, Super Structure and Substructure- Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil-SPT, Plate load test, Introduction to spread, combined, strap, mat and pile foundations, Setting out Foundation Trenches.

Masonry: Classification of Masonry, Quarrying , Dressing of Stones, Definition of terms used in Masonry,Joints, Introduction to manufacturing process, classification and qualities of bricks, Bonds in Brick work ,Reinforced Brick Masonry, Hallow brick masonry, their properties and uses, Classification of stone masonry, Introduction to load bearing, cavity and partition walls.Mortar and types of mortars,Introduction to Lintel and arches, Types and Classification.

UNIT-2 (16 Hours)

Floors and Roofs: Floors **-** Introduction, essential requirements of a floor, factors affecting selection of flooring material, types of ground floors, brick, flag stone, tiled cementconcrete, granolithic, terrazzo, marble, timber flooring, upper floor- timber, timber

floor supported on RSJ flag stone floor resting on RSJ, jack arch floor, reinforced concrete floor, ribbed floor, pre cast concrete floor. Roofs - Introduction, requirements of good roof technical terms, classification, types of roof coverings for pitched roof. A.C. sheet roofs – fixing of A.C. sheets, laying of big six sheets, G.I. Sheets roofs, slates, flat roof – advantages, dis-advantages, types of flat terraced roofing.

Doors and Windows: Doors - Location, technical terms, size, types, construction, suitabilityand Varieties of materials for doors.Windows - Factors affecting selection of size, shape, location and no. of windows, types, construction, suitability, fixtures and fastenings and Varieties of materials for windows. Ventilators: Ventilators combined with window, exhaust fan etc.

UNIT-3 (16 Hours)

Formwork and Scaffolding: Formwork – Materials, Construction, Methods of removal, Period of removal, Principles of Design of Formwork .Scaffolding – Definition, Component parts, Types of scaffolds.

Stairs: Types and materials for staircase,Layout and design details of Dog legged staircase, Elevators - Types - Traction - Hydraulic operation - Design considerations of passenger elevators - Handling capacity - Arrangement of lifts. Escalators, Ramps: features, operation & arrangement.

UNIT-4 (16 Hours)

Plastering, Pointing and Painting: Plastering: Purpose, Materials, Methods of plastering, Surface preparation, Defects in plastering, Pointing –Preparation of surface for pointing, Types, Defects, Rectification. Introduction to Paintings and types of Painting, Constituents of paints & types, Purpose of Painting, Defects in Painting, Application of Paints to new and old surfaces.

Modern Materials in Construction: Introduction to smart materials and its application-in masonry, flooring and roofing. Damp Proofing - Causes of Dampness, Effects of Dampness, Methods of Damp Proofing. Plumbing-Advanced plumbing materials and plumbing system, Termite Proofing, Sound Insulation, Thermal Insulation, Fire protection, Low cost housing techniques- materials-methods.Pre-cast Construction- Precast components and fabrication.

Recommended Readings:

1. Sushil Kumar; Building Construction; Standard Publication.
2. S. C. Rangawala; Building Construction; Charotar Publishing House Pvt. Ltd.
3. S.K. Sharma; Building Construction; S. Chand & Co. Ltd.

4. Kumar NeerajJha; Formwork for Concrete Structures; Tata Mcgraw Hill Publishing Co Ltd.
5. P. C. Varghese; Building Materials; PHI Learning Pvt. Ltd.,

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.The Term Work Marks to be awarded based on the assessment of experiments conducted)

1. Dimension test on clay burnt bricks and fly ash bricks, laterite stone
2. Water absorption test on clay burnt bricks and fly ash bricks, laterite stone, precast concrete blocks, paver block
3. Compressive strength on clay burnt bricks and fly ash bricks
4. Effloresenceteston clay burnt bricks and fly ash bricks
5. Compressive strength on laterite stone
6. Compressive strength on precast concrete blocks
7. Density test on precast concrete blocksand timber block
8. Moisture content of timber block
9. Surface area and density measurementon paver block
10. Compressive strength on paver block

NOTE: At least one Construction field visit shall be undertaken.

CE 3.5 ENGINEERING MATHEMATICS-III

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 3.5	Engineering Mathematics-III	3	1	--	3	100	25	--	--	--	**125**

Course Objectives:

1. The course is aimed to making students understand fundamentals of Mathematics necessary to formulate, solve and analyze engineering problems.

Course Outcomes:

The student after undergoing this course will be able to:

1. Compute the rank and inverse of a matrix and solve system of linear equations.
2. Compute Eigen values and Eigen vectors of a given matrix, apply Cayley Hamilton theorem.
3. Have a sound knowledge of Laplace transforms and its properties and apply it in solving integral and differential equations.
4. Express a function corresponding to objects following periodic phenomenon as a Fourier series in terms of sine and cosine functions.
5. Model and solve partial differential equations corresponding to vibration and Radiation phenomena.
6. Understand the basic concepts of probability, random variables, mean, variance, standard deviation and probability distributions.

UNIT-1 (12 Hours)

Matrices : Types of matrices, Determinant, inverse of matrix, Elementary transformations, Elementary matrices, Rank of matrix, Reduction to normal form, Canonical form, Rank using elementary transformation, Linear independence and dependence of vectors, System of the form AX = 0, and AX = B, and their solutions,Eigen values, Eigen vectors with properties, Cayley-Hamilton theorem with itsapplications, minimal polynomial, Diagonalization.

UNIT-2 (12 Hours)

Laplace Transforms: Definition. Existence conditions, properties, inverse Laplacetransforms. Laplace transform of periodic functions, Convolution theorem, Laplacetransform of Dirac-Delta function, Application of Laplace transforms in solving lineardif-

ferential equations with initial conditions and system of linear simultaneousdifferential equations.

UNIT - 3 (12 Hours)

Fourier Series : Periodic functions, Trigonometric series, Euler's formulae, Dirichlet'scondition, Even and odd functions, Half range series, Parseval's identity.

Partial Differential Equations: Derivation and solution of one dimensional wave equation using separation of variable method. Derivation and solution of one dimensional heat equation using separation of variable method.

UNIT - 4 (12 Hours)

Probability: Definition, properties,Axioms of probability, conditional probability, theorem on total probability, Baye's theorem; Random variables-discrete & continuous; Expectation and Variance, Standard deviation, Moment Generating Function & properties, Standard distributions: discrete-Binomial, Geometric & Poisson; continuous- Uniform, Normal, exponential.

Recommended Readings:

1. B. S. Grewal;Higher Engineering Mathematics; Khanna Publications, New Delhi.
2. Veerarajan; Engineering Mathematics; Tata McGraw Hill Publications.
3. Erwin Kreyzing; Advanced Engineering Mathematic; New International Limited.
4. P. Kandasamy; Engineering Mathematics; Chand & Co., New Delhi.
5. Srimanta Pal, Subodh C. Bhunia; Engineering Mathematics; Oxford University Press
6. D. S. Chandrasekhraiah;Engineering Mathematics- Part III ; Prism Books Pvt. Ltd.
7. Montgomery, D. C., Probability and Statistics for Engineers; Prentice Hall of India.

CE 3.6 MANAGERIAL ECONOMICS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/ week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th.	S	TW	P	O	Total
CE 3.6	Managerial Economics	3	--	--	3	100	25	--	--	--	**125**

Course Objectives

1. To expose students to basic Economic concepts and inculcate an analytical approach to the subject matter.
2. To apply economic reasoning to problems of business.
3. To be able to recognize, formulate and analyze cash flow models in practical situations.
4. To acquaint the students with standard concepts that they are likely to find useful in their profession when employed

Course Outcomes:

After the successful completion of the course, the student will be able to:

1. Know elements of demand.
2. Understand capital budgeting and working capital management.
3. Understand the various cost concepts.

UNIT-1 (12 Hours)

Demand and SupplyAnalysis: Demand and Supply- Demand curve, Supply curve, Determinants of Demand and supply, Demand schedule and derivation of demand curve, Law of Demand and Supply, Market Equilibrium.

Elasticity of Demand: Individual, firm and market demand and supply, price, income and cross elasticity.

Estimation/Forecasting of Demand: Meaning, importance, methods – trend, exponential smoothing, regression analysis.

UNIT-2 (12 Hours)

National Income Terms: GDP, Real v/s Nominal GDP, Net Domestic Product, GNP, National Income, Per capita income, Disposable Income.

Price Index: Construction of Price Index, Consumer, Wholesale Price Index. Inflation: causes, Theories, Measures to control inflation.

Working Capital Management: Determinants of working capital, financing of working capital, dangers of excessive and shortage of working capital.

UNIT-3 (12 Hours)

Cost Concepts and Classification: Fixed & Variable costs, Direct material costs, Labour& Overhead Costs, Costs & Output relationship- Costs Functions- Linear, Quadratic, Cubic Costs function- Cost output relationship.

Capital Budgeting: Different Methods of Evaluation of Projects- Payback Period, Discounted Cash Flow methods- Net Present Value, Internal Rate of Return.

Financial Statement: Income statement, Balance sheet, Fund Flow statement Understanding and analyzing them using financial ratios – liquidity, leverage and profitability ratios.

UNIT-4 (12 Hours)

Break Even Analysis: Break even chart, Contribution margin, Break-even volume, Break-even revenue, application of Break even analysis.

Depreciation: causes, methods of calculating depreciation.

Pricing & Output Decisions: perfect Competition, Monopoly, monopolistic competition, Oligopoly

Recommended Readings:

1. R. L. Varshney, K L Maheswari; Managerial Economics; Nineteenth, Revised and Enlarged Edition; Sultan Chand and Sons Publications.
2. R. Kesvan, C. Elanchezhian, T. Sunder Selwyn; Engineering Economics And Financial Accounting, University Science Press.
3. H. Craig Petersen, W. Cris Lewis and Sudhir K. Jain; Managerial Economics; Prentice Hall India.
4. Prasanna Chandra; Fundamentals of Financial Management; Third Edition, Tata McGraw-Hill, New Delhi.
5. P. A. Samuelson; Economics; McGraw – Hill, 1998

CE 4.1 SURVEYING- I

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th. Duration (Hrs)	Marks					
						Th.	S	TW	P	O	Total
CE 4.1	Surveying -I	3	--	2	3	100	25	--	25	--	**150**

Course Objectives:

1. To gain ability to use survey equipments to measure angles and distances.
2. To use techniques, skills and modern engineering tools necessary for engineering practice.

Course Outcomes:

The student after undergoing this course will be able to:

1. Use modern surveying instruments and collect field notes
2. Classify errors in surveying measurements based on their sources. Determine their magnitude and apply procedures for balancing the measurements
3. Design and execute the course of leveling circuits and determine the correct elevations of intermediate points
4. Design the course of a traverse, calculate the bearings and azimuths of the sides and calculate the adjusted coordinates of the stations
5. Calculate the area of land parcels with linear, circular or irregular boundary segments
6. Interpret contour maps; acquire data from a map needed for the site selection, development and design of various civil engineering projects
7. Principles of hydrography and GIS.

UNIT-1 (12 Hours)

Introduction to Surveying: Introduction to Surveying, Classification of surveys, Sources and types of errors in survey, accuracy, precision and relative precision of measurements, Principles of Surveying, Introduction to Minor Equipment's used in surveying- hand level, clinometers compass,pentagraph, planimeter and box sextant.Setting perpendiculars - well - conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.Brief overviews of primitive methods of survey such as Plane Table Surveying.

Compass Surveying and Plane Table Surveying : Prismatic compass - Surveyor's compass - Bearing - Systems and conversions – Local attraction - Magnetic declination - Dip - Traversing – Plotting regular geometrical figures - Adjustment of errors – Balancing of Traverse

UNIT-2 (12 Hours)

Hydrograpic Survey: Elements of hydrography and oceanography- Tidal theory and application to marine surveying and navigation -Creation and interpretation of hydrographic charts. Precise marine positioning, navigation and track control using satellite- and shore-based navigation systems. Real time kinetic (RTK) GPS.Maritime boundaries. Choice and establishment of sea level datums for depth sounding. Depth determination: sonar surveys, including multibeam and sidescan, three-dimensional seismic surveying, depth reductions. Planning and specifications for marine survey.

Levelling: Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting

UNIT-3 (12 Hours)

Contouring: Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

Measurements of Areas and Volume: Measurement of area and volume by Trapezoidal and Simpson's rule. Application of methods for engineering surveys.

UNIT-4 (12 Hours)

Introduction to GIS: Fundamentals of Geographic Information System: Basic Concepts: definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS - GIS Data: Spatial and Attribute Data, Information Organization and Data Structures - Raster and Vector data structures, Data file and database - Creating GIS Database: GIS Softwares, file organization and formats, Geo-database, Rectification, Digitization and Map Composition.

Recommended readings:

1. B.C.Punmia;Surveying Volume I; Laxmi Publications.
2. Kanethkar and Kulkarni; Surveying & Levelling Volume I; Vidyarthi Griha Prakashan. Pune.
3. S.K. Duggal; Surveying Volume I; Tata McGraw-Hill.
4. B.C.Punmia; Higher Surveying – Surveying-III; Laxmi Publications.
5. N. N. Basak; Surveying and Levelling; Tata McGraw-Hill.

List of Experiments:

(All 8 experiments should be conducted from the list of experiments)

1. To set out perpendiculars ,angles and regular geometric figures at various points on given line using instruments
2. Measurement of bearing of the sides of a closed traverse & adjustment of closing error by Bowdich method and Transit method
3. To determine the distance between two inaccessible points using & compass, setting out polygons given a bearing and reference line
4. To determine difference in elevation between two points using fly leveling technique & to conduct fly back leveling. Booking of levels using both HI and Rise & Fall methods.
5. Profile leveling and its plotting
6. Capacity contours- plotting
7. Use of GPS in locating and obtaining time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to GPS satellites
8. Develop a site plan using GIS based software such as QGIS

NOTE: At least four sheets to be submitted at the end of the term using standard notations and symbols used and practiced in surveying.

CE 4.2 FLUID MECHANICS- II

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 4.2	Fluid Mechanics -II	3	--	2	3	100	25	--	--	--	**125**

Course Objectives:

1. To impart knowledge of rough and smooth pipes.
2. To impart knowledge of boundary layer theory
3. To impart knowledge of various types of channel flow, methods of energy dissipation, flow profiles for different channel slopes
4. To impart knowledge of different types of turbomachines.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the concept of Turbulent flow
2. Understand the concept of boundary layer formation
3. Understand the application of momentum equation
4. Study the performance characteristics of hydraulic turbine and pumps
5. Understand the working of various hydraulic machines

UNIT-1 (12 Hours)

Turbulent Flow : Characteristics of flow, Shear stresses, establishment of flow, types of boundaries, Shear stress and velocity distribution and mean velocity, Resistance to flow in Smooth and Rough Pipes.

Boundary Layer Theory: Laminar & turbulent boundary, boundary layer thickness, energy thickness and momentum thickness. Von Karman Momentum equation Total drag due to laminar & turbulent layers.Boundary layer separation & its control.

UNIT-2 (12 Hours)

Open Channel Flow: Kinds of open channel flow, channel geometry, types and regimes of flow -Velocity distribution in open channel, wide open channel. Types of Flow in Channels, Uniform flow in open channel, hydraulically efficient Sections- Rectangular, Circular and Trapezoidal. Non –Uniform flow in open channel, Concept of Specific Ener-

gy. - Specific Energy Equations for Rectangular Channels, application of Specific Energy, Channels in transition. Rapidly varied flow- Hydraulic Jump - an Energy Dissipator, its analysis and Classification of Jumps.Equation of Gradually varied flow, Backwater Curve and Afflux.

Impact of Free Jets: Application of momentum equation on stationary, hinged and moving plates placed vertical and inclined - flat and curved vanes. Series of vanes mounted on a wheel.

UNIT-3 (13 Hours)

Turbines: Classification and working of Hydraulic turbines –Impulse and Reaction turbine. PeltonWheel, Francis Turbine, Performance characteristics of Hydraulic turbines, Draft tube-types, specific speed, Surge Tanks, Cavitation. Specific speed, Similarity laws.

Centrifugal Pumps: Classification of pumps, its components and Advantages. Priming of pump,minimum starting speed-Multistage pumps- Pumps in series and parallel-Performance characteristics, Losses and efficiency, Operational Difficulties, NPSH, Cavitation.

UNIT-4 (11 Hours)

Reciprocating Pumps: Components and Classification, working of single and double acting pumps, effect of acceleration and friction of liquids in suction and delivery pipes-application of air vessels and their advantages. Co-efficient of Discharge and slip, Indicator diagram, Cavitation.

Hydropower Plant in India: Introduction- Application-Advantages and Disadvantages-Safety measures in hydropower plants-Comparison of hydropower station with thermal power plants-Hydropower development in India.

Hydraulic Machines: Working of Hydraulic Crane, Air Lift Pump, Hydraulic Ram, Hydraulic Lift, Jet pump, Hydraulic jack.

Recommended Readings:

1. Modi and Seth; Hydraulics & Fluid Mechanics; Standard book House Publication.
2. R. K. Rajput; Fluid Mechanics and Hydraulic Machines; S. Chand Publication.
3. S Ramamrutham; Fluid Mechanics and Hydraulic Machines; DhanpatRai Publication.
4. K. Subramanya; Flow in Open Channels;Tata McGraw Hill Publication.

5. John Douglas, JanuszGasiorek, John Swaffield; Fluid Mechanics; Pearson Education.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments)

1. To determine the characteristics of a hydraulic jump
2. To demonstrate the impulse momentum theorem as it applies to the impact of a water jet on vanes with different geometrical shapes
3. To determine the Darcy's friction factor for the pipes (major losses).
4. To determine Chezy's constant for the given channel section
5. To determine manning's constant for the given channel section
6. To determine the coefficient of discharge for a venturiflume
7. To determine the performance and plot characteristic curves for a Pelton wheel
8. To determine the performance and plot characteristic curves for a Francis turbine
9. To determine the performance and plot characteristic curves for a centrifugal pump
10. To study performance and plot characteristic curves of a reciprocating pump
11. Study of boundary layer velocity profile.

CE 4.3 BUILDING DRAWING – I

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 4.3	Building Drawing -I	3	--	3	4	100	25	25	--	--	**150**

Course Objectives:

1. To know the drafting and producing the plan, elevation, section etc. on paper.
2. To know various rules and regulations of planning.
3. To use software like Auto-CAD in drafting.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the building bye laws.
2. Generate plan, elevation and section of a building.
3. Read and understand the complete architectural drawing.
4. Learn usage of Auto-CAD for various architectural drawing.

UNIT-1 (11 Hours)

Introduction to Building Drawing: scope, relevance, understanding human factors in the design of buildings for Residential purposes. Site Selection and method of Construction. Principles of planning, Orientation and Sun diagram Planning and Development Authority regulations, FAR, Coverage. Building Bye laws.

UNIT-2 (13 Hours)

Drawing of Building Plans: understanding various components like Drawing or Living room, Dining, Kitchen, Store, Bedroom, Bath and Water Closets, Study room, Guest room, Pooja room, Verandah, Stairs, Garage etc.. Derivation of Section, Elevation, Site plan, Roof plan, Area statement, Schedule for doors and windows from the data.

UNIT-3 (11 Hours)

Introduction to perspective drawing: Its importance, scope and uses. One and two point perspective.Rules corresponding to perspective drawing.Relation between Owner, Engineer, Contractor and Architect.Procedure, enclosures and requirements of legal approval.

UNIT-4 (13 Hours)

Interior design and detailing of major building components :Modular kitchen, False ceilings and Air Conditioning etc. Basic requirements of Apartments, Duplex Building.Symbols of Material fittings.Concept of Energy Efficient Buildings.Basic Introduction to Auto-CAD and its usage in Civil Engineering drawing.Knowledge of electrical and plumbing drawings.

Recommended Readings:

1. M.G. Shah , C. M. Kale and S.Y. Patki; Building Drawing;Tata McGraw Hill Publication
2. Y.S. Sane; Planning, designing building; Allies Book Stall.
3. S. V. Deodhar ; Building Science and Planning;Khanna Publication.
4. George Omura ; Mastering Auto CAD 2014;Wiley Publication.
5. S. S. Bhavikatti and M. V. Chitawadagi ; Building Planning and Drawing; I K International Publishing House.

Termwork: The term work shall include:

1. At least 2 sheets on Unit- II- covering load bearing walls, framed structure and sloped roof of which one sheet to be done using AutoCAD.
2. One sheet on perspective drawing unit- III.
3. Minimum five sketches showing details of different building components.

NOTE: The Term Work Marks to be awarded based on the assessment of drawing sheets and sketches.

CE 4.4 STRUCTURAL ANALYSIS – I

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th. Duration (Hrs)	Marks					
						Th.	S	TW	P	O	Total
CE 4.4	Structural Analysis - I	4	--	--	3	100	25	--	--	25	**150**

Course Objectives:

1. To impart knowledge of analysis of indeterminate structures.
2. To impart knowledge of strain energy as applicable to beams and trusses.
3. To impart knowledge of analysis of cables and arches.
4. To impart knowledge of influence of moving loads on structures.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze indeterminate structures.
2. Analyze cables and arches.
3. Apply strain energy concept to beams and trusses.
4. Construct influence line diagram for moving loads.

UNIT-1 (16 Hours)

Structural Systems: Forms of structures, conditions of equilibrium, degree of freedom, one, two, three dimensional structural systems, determinate and indeterminate structures.Static and Kinematic indeterminancy of pin jointed and rigid jointed plane frames.

Analysis of Indeterminate Beams: SFD and BMD forfixed beams for different type of loads. Effect of sinking of supports. Application of Moment Area and Conjugate beam method for fixed beams and Clapeyron's theorem of three moments for continuous beams, SFD and BMD for continuous beams.

UNIT-2 (16 Hours)

Strain Energy: Strain energy for gradually applied, suddenly applied and impact loads, Strain energy due to axial loads, bending, shear and torsion;Castigliano’s theorem, Strain energy and complimentary strain energy, theorem of minimum potential energy, Law of conservation of energy, principle of virtual work, Betti's law, Clarke -Maxwell's

theorem of reciprocal deflection, deflection of beams using strain energy method and deflection of trusses using unit load method.

UNIT-3 (16 Hours)

Redundant Frames: Introduction, Analysis of redundant frames, Maxwell's method for forces in the members, Forces due to error in the length of the member.

Moving Loads and Influence Lines: Introduction to moving loads, concept of influence lines, influence lines for reaction, shear force and bending moment in simply supported beams.Influence line for maximum shear force, maximum bending moment for different types of moving loads- single point load, Two-point loads, several point loads, uniformly distributed load shorter and longer than the span

UNIT-4 (16 Hours)

Cables and Arches: Introduction, Analysis of cables under point loads and UDL, length of cables supports at same levels and at different levels cable passing over guide pulley, cable connected to saddle placed over rollers, suspension bridges with three hinged stiffening girder, Eddy's theorem, Three hinged circular and parabolic arch, two hinged circular and parabolic arches, with supports at same levels and different levels, determination of normal thrust, radial shear and bending moment.

Recommended readings:

1. S. S. Bhavikatti; Structural Analysis Volume-I;Vikas Publications.
2. C. S. Reddy; Basic Structural Analysis; Tata McGraw Hill.
3. J.S. Kinney; Indeterminate Structural Analysis; Oxford & IBH.
4. L. S. Negi and R. S. Jangid; Structural Analysis; Tata McGraw Hill.
5. Hibbeler; Structural analysis; Prentice Hall International.

CE 4.5 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 4.5	Numerical Methods and Computer Programming	3	--	2	3	100	25	--	--	--	**125**

Course Objectives:

1. To teach basic numerical methods required for typical engineering and business applications.
2. To give students experience in understanding the properties of different numerical methods so as to be able to choose appropriate methods and interpret the results for engineering problems that they might encounter.
3. To implement and study some of the numerical methods using C, MATLAB or some other high-level language.

Course Outcomes:

The student after undergoing this course will be able to:

1. Solve an algebraic or transcendental equation using an appropriate numerical method.
2. Approximate a function using an appropriate interpolation method.
3. Use numerical methods for differentiation and integration with engineering applications.
4. Solve boundary value problems using the finite difference method.
5. Calculate a definite integral using an appropriate numerical method.
6. Use numerical methods to solve a linear system of equations.
7. Implement a numerical method using a modern computer language.

UNIT-1 (12 Hours)

Finite Difference and Interpolation: Operators: Forward Difference operator-Δ, backward difference operator-∇, Taylor's operator-D, shift operator-E, averaging operator – μ, Central Difference operator-δ.

Differences: Forward and backward difference, Central differences, Divided differences, Difference tables, Interpolating polynomials, factorial polynomials , Newton Forward

& Backward difference interpolation formula. Newton's Divided difference interpolation formulae: Lagrange's interpolation formula(Derivation, Problem Solving, Algorithm and computer programming).

Central Difference Interpolation Formula: Stirling's and Bessel's interpolation formula.

UNIT-2 (12 Hours)

Solutions of Equations: Solution of non-linear equations of single variable using Bisection method, False position method, Newton-Raphson method, secant method(problem solving, algorithm and computer programming), Order of convergence of these methods,comparison of these methods.

Numerical Integration: Newton- Cote's Quadrature formula, Trapezoidal rule, Simpson's 1/3 & 3/8 rules, Weddle's rule(problem solving, algorithm and computer programming), Romberg's integration (Richardson's Extrapolation). Comparison of the above methods and their error estimation.

UNIT-3 (12 Hours)

Numerical Solution of Differential Equations: (1st order and 2nd order only)Picard's method & Taylor series method, Euler's method & Modified Euler's method, Second order Runge- Kutta method, Fourth order Runge- Kutta method (Problem Solving, Algorithm and computer programming), Milne's Predictor-Corrector method. Solution of system of differential equations.

UNIT-4 (12 Hours)

Numerical Solution of Partial Differential Equations: Solution of Laplace equation, Heat equation & Wave equation by finite difference method.

Solution of Linear Algebraic Equations: Gauss Elimination method, Gauss- Jordan method, Jacobi's iterative Method, Gauss-Seidel iterative method(problem solving, algorithm and computer programming). Concept of ill conditioned and well conditioned system, comparison of the above methods.

Recommended Readings:

1. B. S. Grewal;Numerical Methods; Khanna Publications.
2. P. Kandasamy; Numerical Methods ; S. Chand & Co., New Delhi.
3. E. Balagurusamy; Numerical Methods; Tata McGraw, PHI.

4. Srimanta Pal, Subodh C. Bhunia; Engineering Mathematics; Oxford University Press.
5. Manish Goyal; Numerical Methods and Statistical Techniques using 'C'; Laxmi Publications Ltd.
6. V. Rajaraman; Computer Oriented Numerical Methods, PHI.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments)

1. Newton's forward difference interpolation formula.
2. Newton's backward difference interpolation formula.
3. Lagrange's interpolation formula.
4. Newton's divided difference interpolation formula.
5. Solution of non-linear equations using Bisection method.
6. Solution of non-linear equations using Regula-Falsi method.
7. Solution of non-linear equations using Newton Raphson method.
8. Solution of non-linear equations using Secant method.
9. Solution of linear system of equations using Gauss- Elimination method.
10. Solution of linear system of equations using Gauss Jordan method.
11. Solution of linear system of equations using Gauss Jacobi's method.
12. Solution of linear system of equations using Gauss Seidal method.
13. Solution of differential equations using Euler's method.
14. Solution of differential equations using Modified Euler's method.
15. Solution of differential equations using Runge-Kutta second order method.
16. Solution of differential equations using Runge-Kutta fourth order method.
17. Numerical integration using Trapezoidal rule.
18. Numerical integration using Simpson's 1/3 rule.
19. Numerical integration using Simpson's 3/8 rule.
20. Numerical integration using Weddle's rule.

CE 4.6 ENGINEERING GEOLOGY

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
CE 3.6	Engineering Geology	3	--	2	3	100	25	--	25	--	**150**

Course Objectives:

1. To understand the processes of the agents in modifying the earth's surface
2. To understand the origin of landforms of the earth's crust
3. To understand the origin of various rock types & to identify, classify the various rocks in hand specimen.
4. To understand the structural elements & to identify the types of structures in rocks, classify them.
5. To identify the minerals & crystal models based on their physical properties..
6. To study the industrial uses of various minerals.
7. To understand the principles of stratigraphy, standards stratigraphic scale.

Course Outcomes:

The student after undergoing this course will be able to:

1. Identify various minerals, rocks and their deformations
2. Gauge the effect of weathering, groundwater, rock defects on various civil engineering activities.
3. Identify advantages and disadvantages of geological construction material and geological sites for estimation, design and construction of civil engineering structures.

UNIT-1 (12 Hours)

Mineralogy &Petrology: Introduction, Geology and its importance in civil Engineering, scope and subdivisions.Internal structure and composition of the Earth.Study of physical properties of rock forming minerals and ores. Quartz group, Feldspar group, Mica group, carbonate group, Hornblende, Augite, Olivine, asbestos, Kaoline, Talc, Gypsum, Garnet, Corundum, Magnetite, Hematite, Limonite, Pyrite, Chalcopyrite, Pyrolusite, Psilomelane, Chromite, Galena, Bauxite.

Petrology: Introduction, Main divisions of rocks, rock formation cycle.

Igneous Rocks: origin, mineral composition, mode of occurrence, textures. Reasons for textural variations. Common structures textures of plutonic hypabyssal and volcanic rocks. Classifications of igneous rocks. Study of common igneous rock types prescribed in practical work and their engineering applications.

Sedimentary Rocks: origin classification, textures and structures , study of common Sedimentary rock types prescribed in practical work and their engineering applications.

Metamorphic Rocks: agents, and types of metamorphism, metamorphic textures and structure. Study of common metamorphic rock types prescribed in practical work and their engineering applications.

Building Stones: requirements of good building stones, strength, durability ease of dressing and appearance on mineral composition, texture and field structure, suitability of common rocks as building stones and aggregates.

UNIT-2 (12 Hours)

Structural Geology: Structural Geology - outcrop, dip and strike conformable series, unconformity and Overlap, outlier and inlier, faults, folds, joints, and their important types, Recognition of folds and faults in field , effects of faulting on outcrops. Significance of above structures in civil engineering.

Geodynamics: Mountainstheir types Isostasy introduction to Plate tectonics, coastal zones, coastal land forms, continental shelf, Continental rise, Continental slope, abyssal plain, mid oceanic – ridges, trenches , tsunamis , earthquakes, seismic waves, seismograph causes seismic zones , seismic resistant structures, landslides: causes effects and remedial measures , volcanoes : types , products, effects, and distribution.

UNIT-3 (13 Hours)

Geomorphology, Historical Geology and Environmental Geology:Geomorphology-Weathering, types of weathering. Landforms of river and wind.and their importance in civil engineering.

Groundwater : water table, perched water table, depth zones, types of groundwater, Aquifers, aquicludes and aquitard, Geological action of groundwater, porosity and permeability, water bearing capacity of common rocks, springs, wells, artesian wells. Cone of exhaustion, conservation of groundwater.

Historical Geology: general principles of stratigraphy, geological time scale, physiographic divisions of India, significance of their structural characters in major civil engineering activities.

Environmental Geology: environmental impact of major civil engineering projects like dams. Reservoirs, induced seismicity, quality of groundwater, seawater intrusion, mining & quarrying.

UNIT-4 (11 Hours)

Site Investigation: Preliminary geological exploration surface survey, subsurface survey (introduction to geophysical methods and drilling), preservation of core samples, core recovery, importance of length and number of pieces of core; how to distinguish between joint fractures & mechanical fractures, definition of RQD, JFI & SCR. Angle holes, core loss, percolation tests, core log, litho log, interpretation of information obtained from these, correlation of surface data with results of subsurface exploration, limitations of drilling.

Application of Engineering Geology: Geological investigation, importance of ground water studies, nature of structures and lithology for civil engineering projects such as dams, reservoirs, tunnels, bridges, roads, highways, ground improvement techniques for unfavourable situations.

Recommended Readings:

1. N. ChennaKesavulu; AText Book of Engineering Geology;McMillan India Ltd.
2. Parbin Singh; Engineering Geology; Katson Publishing House.
3. P.K. Mukerjee; Text Book of Geology; World Press Pvt. Ltd.
4. D.K.Todd; Ground Water Geology; John Wiley and sons.
5. M. P. Billings; Structural Geology; Prentice Hall of India Pvt. Ltd.
6. R. B. Gupte;Text Book of Engineering Geology;VidharthiGrahaPrakashan; Pune

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Megascopic Identification and Descriptionincluding the industrial application of Silicate Group of Minerals.
2. Megascopic Identification and Description including the industrial applicationof Non-Silicate Group of Minerals.
3. Megascopic Identification and Description of Ore Minerals.

4. Megascopic Identification and Description including the industrial application of Igneous Rocks
5. Megascopic Identification and Description including the industrial application of Sedimentary Rocks
6. Megascopic Identification and Description including the industrial application of Metamorphic Rocks
7. Exercises on topographical maps for calculating the bearings, trends and understanding the scale.
8. Exercises on geological maps and drawing sections for horizontal and dipping series of beds intruded by dykes.
9. Exercises on geological maps and drawing sections for dipping series traversed by strike and dip faults.
10. Exercises on geological maps and drawing sections for folded series of beds.
11. Exercises on geological maps and drawing sections for two series of beds seperated by an unconformity.
12. Graphical solution of structural problems on strike, dip, thickness and width of outcrop of rock strata
13. Study of landforms in Aerial Photographs (Basics)