of laminar and turbulent flow in circular pipes. Hagen-Poiseuille equation; frictional losses in pipes. Darcy's equation. Estimation of Darcy's friction factor. Empirical formulae and Moody's chart.

Boundary Layer Theory: development of laminar and turbulent boundary layers on a flat plate, pressure gradient, and phenomenon of separation. Fluid flow over an aerofoil, flow around a cylinder at rest, rotational flow around a cylinder at rest, lift and drag forces, and coefficients; circulation and Magnus effect.

UNIT – V

Compressible fluid flow: Concepts of compressible flow, continuity, momentum and energy equation of compressible flow. Velocity of sound in compressible and incompressible fluids. Mach Number. Classification of compressible flow; adiabatic flow in perfect gas, stagnation pressure and temperature. Temperature, pressure, density ratios as functions of Mach number.

Suggested Reading

1. K. L. Kumar, *Engineering Fluid Mechanics,* Eurasia Publishing House, 1997.
2. R. K. Rajput, *Fluid Mechanics and Hydraulic Machines,* S. Chand & Co., 2003.
3. P. N. Modi and S. M. Seth, *Hydraulic and Fluid Mechanics*, Standard Book House, Delhi, 1995.
4. V. L. Streeter, *Fluid Mechanics*, McGraw-Hill Co. Ltd., 2002.

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. III/IV (REGULAR)

CIVIL ENGINEERING

SEMESTER - I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instructions		Scheme of Examination		
			Periods per Week		Duration in Hrs	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessionals
		THEORY					
1.	CE 301	Reinforced Cement Concrete	4	2	3	75	25
2.	CE 302	Fluid Mechanics -II	4	--	3	75	25
3.	CE 303	Theory of Structures-I	4	2	3	75	25
4.	CE 304	Building Technology and Drawing	2	3	3	75	25
5.	CE 305	Transportation Engineering	4	--	3	75	25
6.	CM 371	Managerial Economics & Accountancy	4	--	3	75	25
		PRACTICALS					
1.	CE 331	Fluid Mechanics Lab.-II	--	3	3	50	25
2.	CE 332	Transportation Engineering Lab	--	3	3	50	25
3.	CE 333	Surveying Camp	--	--	--	--	50*
		Total	**22**	**13**	**--**	**550**	**250**

*Only sessional marks

WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

CE 301

REINFORCED CEMENT CONCRETE

Instruction	4 Theory + 2 Drawing
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

(Note: All relevant IS codes necessary for teaching this course may be introduced and referred in detail by the Faculty concerned)

UNIT-I

Concrete: Constituent Materials-Specifications for field and laboratory tests, water cement ratio and strength, workability of concrete and its assessment by different methods, curing of concrete, durability of concrete, concrete admixtures, various types of reinforcements and their characteristics.

Design philosophies: Development of design philosophies- Working stress method, Ultimate load method, and Limit state method-concepts and basic principles-relative merits. Characteristics loads and strengths, Partial safely factors. Stress-strain relationship for concrete and steel; stress blocks (generalized, rectangular, parabolic and Whitney's).

Working stress method: Theory of bending in RCC beams, Balanced, under-reinforced and over reinforced sections; Analysis and design of singly and doubly reinforced rectangular and flanged sections.

UNIT-II

Limit state of collapse in flexure: Assumptions, Analysis and design for flexure- failure in tension and compression- singly reinforced, doubly reinforced rectangular and flanged beams. Anchorage and development length.

UNIT-III

Limit state of collapse in shear and torsion: Analysis and design for shear and torsion, **Limit states of serviceability:** Check for deflection and cracking.

UNIT-IV

Analysis and design of slabs: Yield line theory- Assumptions in yield line theory, yield line patterns, plastic theorems -lower bound, upper bound and uniqueness theorems, Relationships between collapse load and plastic load by virtual work method and equilibrium method (one way, two way rectangular and circular slabs only) for uniformly distributed loads. IS code method-Design of solid rectangular slabs as per IS 456, Detailing of reinforcement in slabs, Check for serviceability of slabs.

UNIT-V

Analysis and design of columns: Assumptions, axially loaded circular, square and rectangular columns, Uniaxial and biaxial bending- interaction diagrams. Design of isolated square, rectangular and circular footings as per IS code.

Suggested Reading:

1. A.K. Jain, *Limit State Design of Reinforced Concrete*, Nem Chand & Bros., 2002
2. Sinha N.C. and Roy S.K; *Fundamentals of Reinforced Concrete*, S.Chand & Co., 2001.
3. Sushil Kumar, *Treasure of R.C.C. Designs*, Standard Book House, 1998.
4. Varghese P.C; *Limit State Design of Reinforced Concrete*, Prentice Hall of India, 2002.
5. D.S. Prakash Rao, *Design Principles and Detailing of Concrete Structures,* Tata McGraw Hill Publishing Co. Ltd., 1995.

WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

CE 302

FLUID MECHANICS - II

Instruction	4	Periods
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Steady uniform flow through open channels: Descriptions and definitions, difference between pipe flow and channel flow, velocity and pressure distributions in channel cross section, energy and momentum correction coefficients, friction to flow in open channels, uniform flow, Manning and Chezy formulae, most efficient channel cross-section, specific energy, concept and applications of critical depth.

UNIT-II

Gradually varied flow: Significance of Froude Number, dynamic equation of gradually varied flow, classification of gradually varied flow profiles, computation of flow profiles and characteristics of flow profiles. Hydraulic Jump- Momentum equation for a jump in horizontal rectangular channel, energy dissipation in hydraulic jumps and surges in open channels, elementary surge analysis.

UNIT-III

Unsteady flow in pipes: Water hammer phenomenon, pressure rise due to gradual and sudden valve closure, critical period of the pipeline. Boundary layer-Definition, laminar and turbulent boundary layers, boundary layer growth and separation, Drag and lift forces, Principle of stream lining.

UNIT-IV

Dimensional analysis and models studies: Dimensional analysis as a tool in experimental hydraulics, Buckirigham's pi-theorem, applications, geometric, Kinematics and dynamic similarity, similarity laws; significance of Reynold's, Froude and Mach Numbers, Different types of models and their scale ratios.

UNIT-V

Hydraulic turbines: Classification, specific speed, unit quantities velocity triangles and principles of design of reaction and impulse turbines, characteristics curves.

Centrifugal Pumps: Component work done and efficiency, minimum starting speed, Euler head equation, specific speed and characteristics curves of centrifugal pumps.

Suggested Reading:

1. P.N. Modi and S.M: Seth, *Fluid Mechanics*, Standard Book House, 2001.
2. R.K. Rajput, *Fluid Mechanics and Hydraulic Machines*, S. Chand & Co., 2002.
3. A.K. Mohanty, *Fluid Mechanics*, PHI, 2000.
4. S.K. Som & G. Biswas, *Introduction to Fluid Mechanics and Fluid Machines*, TMH Publications, 2004.

WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

CE 303

THEORY OF STRUCTURES - I

Instruction	4	Theory + 2 Tutorial/ Drawing
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Slope deflection method: Application to continuous beams with and without sinking of supports, single bay - single storeyed portal frames with and without side sway (with degree of freedom not exceeding three), loading on each span may be point load(s) and uniformly distributed load, shear force and bending moment diagrams.

UNIT - II

Moment distribution method: Analysis of continuous beams with and without sinking of supports, single bay single storeyed portal frames with and without side sway- loading on beam/portal frame shall be point load(s) and uniformly distributed load- shear force and bending moment diagrams.

UNIT-III

Kani's method: Applied to continuous beams and single bay single storey portal frames -loading on beam/portal frame shall be point load(s) and uniformly distributed load- shear force and bending moment diagrams.

UNIT – IV

Strain energy method: Deflections of simple plane pin-jointed trusses and frames using Castingliano's theorem.

Redundant pin-jointed trusses: Analysis of plane trusses with one of degree of redundancy (internal / external), Assembly and temperature effects.

UNIT – V

Unsymmetrical bending: Review – product of inertia, transformation laws for moment of inertia, and product of inertia, principal axes. Stresses

due to unsymmetrical bending, determination of maximum stresses in rectangular, I and channel section.

Shear Centre: Concept and importance of shear center - shear flow and determination of shear center of simple sections such as rectangular - I, T and Channel sections.

Graphic Statics: Williot's diagram for deflection of plane trusses, Mohr's correction. Forces in members of knee braced trusses and French roof trusses.

Suggested Reading:

1. S.B. Junarkar and Shah, *Mechanics of structures*, Charotar Pub. House, 2001.
2. D.S. Prakash Rao, *Structural Analysis - A Unified Approach*, University Press, 1996
3. B.C. Punmia, Ashok Jain and Arun K. Jain, *Theory of Structures*, Laxmi Publications, 2000.
4. S.P. Gupta and G.S.Pandit, *Theory of Structures*, Tata McGraw Hill, 1999.
5. D.S. Prakash Rao, *Graphical Methods in Structural Analysis*, University Press, 1997.

CE 304

BUILDING TECHNOLOGY AND DRAWING

Instruction	4	Theory + 3 Drawing
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

PART-A
BUILDING TECHNOLOGY (30 MARKS)

UNIT-I

Planning of building: Relevant building bylaws, site selection for buildings, common errors in planning. Principles to be considered in judging plans, circulation diagrams prop for common areas like corridors, stairs, toilets etc. Study and design of small units. Data collection relating to different buildings.

Ventilation in buildings: General principles of ventilation (Natural and artificial). Properties of air, air movements, temperature, humidity and quality of air. Design considerations for comfort.

UNIT-II

Acoustics of buildings: Reverberation, determination of absorption coefficient, acoustic intensity, acoustic measurements. Factors affecting the acoustics of buildings. Sound distribution in an auditorium. Sound absorbent materials. Requisites for good acoustics. .

Building services: Lifts and Escalators, communication services (Telephone and intercom facilities) fire protection (its importance, development of fire, reduced spread of fire, fire resistance in structural elements, means of escape). Water supply, (Water quality, water treatment, water distribution and plumbing fixtures), power supply systems.

PART-B
BUILDING DRAWING (45 MARKS)

UNIT-III

Drawing of plans; elevations and sections of two storeyed buildings with staircase. Drawing of Plans, Elevations and Sections of simple buildings given line plan and specifications. Complete drawings of a building, given the site details and accommodation details.

UNIT-IV

Introduction to 3-D drafting: HEIGHT, EXTRUDE commands. UNION, SUBTRACT, AND INTERSECT Commands, SLICE, SECTION AND INTERFERENCE Commands. Complete 3-D drafting of a single storey and a double storey residential building showing the plan Elevation, section and perspective/isometric view. RENDERING of the view.

Suggested Reading:

1. S.P. Arora and S.P. Bindra, *A Text book on Building Construction*, Dhanpat Rai & Sons, 1993.
2. V.S. Shahane, *Planning and Designing Building*, Poona, Allies Book Stall, 3rd Edn.

CE 305

TRANSPORTATION ENGINEERING

Instruction	4 Theory
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Highway alignment and geometric design : History of highway engineering, factors to be considered for highway alignment, engineering surveys, obligatory points. Geometric design - Highways classification as per IRC and its standard dimensions, carriageway, shoulders, medians, right of way, footpaths, cycle tracks, service roads, frontage roads, sight distance, stopping sight distance, overtaking sight distance. Camber, horizontal curves, super-elevation, transition curve, extra widening, gradient, grade compensation and design of vertical curves.

UNIT- II

Traffic engineering: Objectives of traffic studies, traffic characteristics, volume, speed, density, headways and relationship among them. Traffic volume studies, speed and delay studies, intersection delay studies, highway capacity and level of service concept as per HCM 2000, origin and destination studies, intersection improvement studies at grade, need of grade separated intersections, channalisation, rotary planning and design, concept of signal design, parking and accident studies.

UNIT-III

Highway materials: Highway materials characterization-Road aggregate properties-strength, hardness, toughness, abrasion, water absorption, soundness, shape and specific gravity. Bitumen properties - bitumen and tar, grade of bitumen, penetration. ductility, viscosity, softening point, flash and fire point. Cutback bitumen. emulsion, prime coat and tack coat, stripping value of aggregate etc. soil classification, liquid limit and plastic limit, compaction and densities, california bearing ratio value and its significance in pavement design.

Pavement design: Pavement types, factors to be considered for pavement design, structural difference between flexible and rigid pavement design. Flexible pavement design - concept of layer theory, design wheel load, ESWL, EALF, vehicle damage factor, design by CBR

developed by US corps of engineers, IRC cumulative standard axles method (IRC - 37: 2002). Rigid pavement design - concept, wheel load stresses analysis by Westergaard. Sub-grade, dry lean concrete, radius of relative stiffness. modulus of sub grade reaction and other characteristics of concrete, critical wheel load and temperature stresses. Longitudinal and transverse joints, contraction joints, expansion joints, construction joints, dowel bars and tie bars functions.

UNIT-IV

Railway engineering : Introduction to Railways, permanent way component parts and its functions. Rails - various types, functions, creep in rails, creep measurement, coning of wheels and rail fixations. Sleepers - various types. merits and demerits, ballast, various types and sub grade preparation. Railway alignment and geometric design - alignment. super-elevation, negative super elevation, cant deficiency. example problems. Points and crossing. layout of left and right hand turnouts. Construction and maintenance of permanent way.

UNIT–V

Airport engineering: Introduction to air transportation, history and international organizations role in development of airports, air craft types and its characteristics. General lay-out of an airport and its component parts. Site selection of an airport as per ICAO, orientation of runway by wind rose diagrams, basic runway length determination, corrections to basic runway length, geometric design, types of airports as per landing & take-off and dimensions.

Suggested Reading:

1. Khanna, S. K. and Justo, C. E. G (1994), *"Highway Engineering"*, Nemchand & Bros, New Delhi. India.
2. McShane, W.R., Roess, R.P. and Prassas, E.S., *Traffic Engineering.* Prentice Hall, Englewood Cliffs, 1997.
3. Highway Capacity Manual, *Transportation Research Board*, National Research Council. Washington, D.C., 2000.
4. Khanna. S. K. Arora, M. G. and Jain. S. S. (1994) *"Airport Planning and Design"* Fifth edition. Nem Chand & Bros, Roorkee, India.
5. Chandra, S and Agarwal, M. M. (2007) *"Railway Engineering"* Oxford Higher Education, University Press New Delhi.

CM 371

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Instruction	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to economics and its evolution: Managerial Economics its scope, importance and relation to other sciences, its usefulness to engineers - Basic concept of Managerial economics.

UNIT-II

Demands: Analysis-concept of demand, determinants, law of demand, its assumption, elasticity of demand, price, income and cross elasticity, demand forecasting - markets competitive structures, price-output determination under perfect competition and Monopoly. (theory questions and small numerical problems can be asked).

UNIT-III

Theory of Production: Firm and industry - production function - input-out relations -laws of returns - internal and external economics of scale. cost analysis- Cost concepts - fixed and variable costs - explicitly and implicitly costs - out of pocket costs and imputed costs - opportunity cost - cost output relationship - break-even analysis. (Theory and Problems)

UNIT-IV

Capital management: Significance, determinates and estimation of fixed and working capital requirements, sources of capital. Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems.

(Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked).

UNIT-V

Book-keeping: Principles and significance of double entry book keeping, journal, subsidiary books, ledger accounts, trial balance concept and preparation of final accounts with simple adjustments - analysis and interpretation of financial statements through ratios.

(Theory questions are numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios)

Suggested Reading:

1. Varshney RL and KL Maheswari, *Managerial Economics*, Sultan Chand.
2. JC Pappas and EF Brigham, *Managerial Economics.*
3. Grawal T.S. *Introduction to Accountancy.*
4. Maheswari S.N. *Introduction to Accountancy.*
5. Panday I.M. *Financial Management.*

CE 331

FLUID MECHANICS LABORATORY-II

Instruction	3 Periods
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1.	Open Channel coefficient.	Determination of Manning's rugosity
2.	Open Channel Bend	Determination of super elevation
3.	Hydraulic Jump	Determination of force on waves
4.	Impact of Jets	Determination of force on waves
5.	Centrifugal Pump	Determination of efficiency and performance characteristics
6.	Centrifugal Pump Test Rig	Determination of efficiency and performance characteristics under varying loads.
7.	Pelton Wheel	Determination of efficiency of performance characteristics.
8.	Franics Turbine	Determination of efficiency and performance characteristics
9.	Kaplan Turbine	Determination of efficiency and performance characteristics
10.	Hele Shaw's Apparatus	Study of stream line patterns

CE 332

TRANSPORTATION ENGINEERING LABORATORY

Instruction	3 Periods
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

A) Tests on bitumen

1. Penetration Test
2. Ductility test
3. Softening point test
4. Specific gravity test
5. Viscosity test
6. Flash and fire point test

B) Tests on road aggregates

7. Aggregate crushing value test
8. Los Angeles abrasion test
9. Aggregate impact value test
10. Aggregate shape test(flakiness & elongation)
11. Specific Aggregate
12. Water Absorption
13. Soundness

C) Tests on bituminous mixes

14. Marshal stability test

D) Miscellaneous Tests

15. Determination of C.B.R.
16. Preparation of representative sample by coning and quartering.
17. Benkelman beam test
18. Bitumen extraction test
19. Stripping value test
20. Stone polishing vaue test

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. III/IV (REGULAR)

CIVIL ENGINEERING

SEMESTER - II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instructions		Scheme of Examination		
			Periods per Week		Duration in Hrs	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessionals
		THEORY					
1.	CE 351	Soil Mechanics	4	--	3	75	25
2.	CE 352	Steel Structures	4	2	3	75	25
3.	CE 353	Theory of Structures-II	4	2	3	75	25
4.	CE 354	Structural Engg.-Design & Detailing-I (RCC)	4	2	3	75	25
5.	CE 355	Water Resources Engg. and Management-I	4	--	3	75	25
6.	CE 356	Water & Waste Water Engineering	4	--	3	75	25
		PRACTICALS					
1.	CE 381	Soil Mechanics Lab	--	3	3	50	25
2.	CE 382	Environmental Engineering Lab	--	3	3	50	25
3.	CE 383	Industrial Visit / Study	--	--	--	--	Gr*
		Total	24	12	--	550	250

*Excellent/Good/Satisfactory/Unsatisfactory

CE 351

SOIL MECHANICS

Instruction	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Physical properties of soils: Physical parameters of soil, void ratio, porosity, degree of saturation, water content, densities, relative density; classification and identification tests, specific gravity (pycnometer and specific gravity bottle method), water content determination (oven dry method, pycnometer); Grain size distribution curves, consistency limits, density determination (core cutter method, sand replacement method), classification and identification of soils according to IS code 1948-1970.

UNIT-II

Permeability of soils: Darcy's. law of seepage water through soils, determination of coefficient of permeability (a) constant head permeameter, (b) variable head permeameter, (c) pumping out test for permeable soils, (d) pumping out test for artesian case, (e) pumping in test with and without pressure.

Capillarity in soils: Capillary rise in narrow tubes, surface tension and capillary rise in soil, suction in soils, PF values.

Seepage in Soil: Principles of drawing flownet for homogenous section of earth dam by using Kozeny's parabola, computation of seepage quantities by using flownet. Effective and neutral stresses and quick sand phenomena, critical hydraulic gradient.

UNIT-III

Compaction: Water content and density relationship, difference between proctor's test and AASHO test, IS specifications for light and heavy compaction, field compacting equipment, tandem rollers, sheep foot rollers, frog hammers, smooth rollers with vibrating equipment, field control of compaction.

Consolidation: Spring analogy for consolidation, assumptions in Terzaghi's theory of consolidation and derivation of differential equation of coefficients of consolidation and volumetric change settlement computation due to consolidation.

UNIT-IV

Shear strength: Shear parameters cohesion and angle of internal friction on Coulomb's law of shear strength, shear test (i) direct test,(ii) unconfined test,(iii) triaxial compression test, (iv) vane shear test; factors affecting shear strength of soils.

UNIT-V

Earth pressure: Definition of active earth pressure, earth pressure at rest and passive earth pressure, computation of active and passive earth pressure on the back of the retaining wall in cohesionless and cohesive soils, Coulomb's wedge of earth pressure and Rebhan's construction for cohesionless soil. Stability of earth retaining structures.

Slope stability: Concept of factor of safety for stability of earth' slopes, method of slices for homogeneous slope section, stability number and factor and their use in computation of factor of safety.

Suggested Reading:

1. C. Venkatramaiah, *Geotechnical Engineering*, New Age International Publications, 1995.
2. B.C. Punmia, *Soil Mechanics and Foundation Engineering*, Laxmi Publication, 1998.
3. K.R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Publishers, 1997.
4. Gopal Ranjan and AS Rao, *Basic and Applied Soil Mechanics*, Wiley Eastern Limited, 1996.

CE 352

STEEL STRUCTURES

Instruction	4 Theory + 2 Drawing
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

(Note: All relevant IS codes necessary for teaching this course may be introduced and referred in detail by the Faculty concerned)

UNIT–I

Standard sections: Properties, selection of working stresses as per IS code.

Riveted and welded joints: Riveted joints- Modes of failure and efficiency of a joint, design of lap and butt joints. Welded joints- Different types of welds, permissible stresses; design of butt and fillet welds.

Design of simple and compound beams

UNIT–II

Design of tension members and splices: Permissible stresses, types of tension members, connection.

Connections: Design of riveted and welded eccentric bracket connection, stiffened and unstiffened beam end connections.

UNIT-III

Compression members: Slenderness ratio, different forms of compression members, plain and built-up stanchions; IS formula for design. Design of built up columns with battens and lacing; splicing of columns. Design of slab and gusseted bases for columns.

UNIT–IV

Roof trusses: Types of trusses for different spans, kinds of end supports, economic spacing of trusses, estimation of loads for different roof coverings, self weight of truss, wind effects, design of purlins for dead loads, live load and wind loads. Detail design of a roof truss including joints and connections.

UNIT – V

Plastic analysis: Basic principles of plastic theory of flexure, plastic modulus, shape factor, load factor, analysis of fixed beams, continuous beams and propped cantilevers with degree of redundancy not exceeding two.

Suggested Reading:

1. A.S. Arya and J.L. Ajmani, *Design of Steel Structures*, Nem Chand Publishers, 1996
2. Ramchandra, *Design of steel Structures*, Standard Book House, 1992.
3. S.K.Duggal, *Design of Steel Structures*, Tata McGraw Hill Publishing Co. Ltd., 2000
4. B.C. Punnia et al, *Design of Steel Structures*, Laxmi Pub. 2001.

CE 353

THEORY OF STRUCTURES-II

Instruction	4	Theory + 2 Tutorial/ Drawing
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Moving loads: Influence line for reaction, bending moment and shear force.Determination of maximum bending moment and shear force for moving load systems on simply supported girders.

Curves of maximum bending moment and shear force for simply supported girders traversed ,by (i) single point load, (ii) two point loads, (iii) uniformly distributed load longer than span, and (iv) uniformly distributed load shorter than span, enveloping parabola and EUDLL.

UNIT – II

Elastic theory of arches: Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading, influence lines for horizontal thrust, bending moment, normal thrust and radial shear.

Two hinged arches: parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

UNIT-III

Moving loads on trusses/girders: Influence lines for forces in members of statically determinate plane framed structures under moving loads for warren girder, Pratt truss, and curved flange truss, counter bracing.

Suspension bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static loading. Influence lines for horizontal and vertical components of tension in the cable, tension in the cable, bending and shear force.

UNIT-IV

Column analogy method: Stiffness and carry-over factors for prismatic and non-prismatic beams with stepped haunches; Analysis of fixed beams, single bay - single storeyed symmetric portal frames and closed frames.

UNIT-V

Approximate methods of analysis: Analysis of portal frames by Portal and Cantilever methods.

Graphic statics: Line of thrust diagram for three hinged arches, influence lines for horizontal thrust, bending moment, normal thrust and radial shear in three hinged parabolic and segmental arches.

Suggested Reading:

1. S.B. Junarkar and Shah, *Mechanics of structures*, Charotar Pub, House, 2001
2. D.S. Prakash Rao, *Structural Analysis – a Unified Approach*, University Press, 1996.
3. B.C. Punmia, Ashok Jain and Arun K. Jain, *Theory of Structures*, Laxmi Publication, 2000
4. S.P. Gupta and G.S. Pandit, *Theory of Structures*, Tata Mc Graw Hill, 1999.
5. D.S. Prakash Rao, *Graphical Methods in Structural Analysis*, University Press, 1997.

CE 354

STRUCTURAL ENGINEERING DESIGN & DETAILING - I (RCC)

Instruction	4	Theory + 2 Drawing
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

(Note: All relevant IS codes necessary for teaching this course may be introduced and referred in detail by the Faculty concerned)

UNIT – I

Footings and Retaining walls: Limit state design & detailing of combined rectangular and trapezoidal footings and retaining walls - cantilever and counter fort types.

UNIT – II

Water tanks: Elastic Design & Detailing for RCC circular and rectangular ground level and over-head tanks- Design of staging. Design of Intze tanks.

UNIT – III

Bridges: IRC loadings; Elastic design and detailing of (i) RC bridge deck slab using effective width method and Pigeaud's method, (ii) Slab Bridges, and (iii) T-beam bridges.

Suggested Reading:

1. S. Ramanatham, *Design of Reinforced Concrete Structures*, Dhanpat Rai & Sons, 2002.
2. Vazirani and Ratwani, *Concrete Structures*, Khanna Publishers, 1998.
3. N. Krishna Raju, *Structural Design and Drawing : Reinforced Concrete*, Universities Press, 1992.
4. D.S. Prakash Rao; *Design Principles and Detailing of Concrete Structures*, Tata McGraw-Hill Publishing Co. Ltd., 1995.

CE 355

WATER RESOURCES ENGINEERINGAND MANAGEMENT

Instruction	4	Theory + 2 Drawing
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Hydrology : Scope of hydrology in civil engineering, hydrologic cycle, rainfall, measurement of rainfall and estimation of mean rainfall over a catchment, infiltration, evaporation, runoff, factors affecting runoff, peak flow estimation, unit hydrograph method, Gumbel's method.

Aquifers : Types aquifer parameters, steady radial flow into confined and unconfined aquifers, yield of an open well.

UNIT-II

Irrigation: Duty, delta and base period of crops, methods of irrigation, irrigation efficiencies depth of irrigation, wilting point, consumptive use, types of canals, canal sections, balancing depth of cutting, Kennedy's and Lacey's theories, design of lined and unlined canals.

UNIT-III

Diversion head works: Components, causes of failures, difference between weir and barrage, Bligh's creep theory, Khosla's theory and method of independent variables, design principles of vertical drop weir.

UNIT-IV

Regulation works : Canal falls, types, design principles of trapezoidal notch fall, types of regulators, functions of cross regulator and head regulator, Cross drainage works, types, selection and design principles, types of outlets, flexibility, sensitivity and proportionality of outlets.

UNIT-V

Water resources development and management: Types of water resources development projects, functional requirements of multipurpose projects, project formulation, project evaluation, management strategies, water management problems, systematic canal operation, Warabandhi system, farmers' participation in water management, integrated water management.

Suggested Reading:

1. *Irrigation and Hydraulic Structures* by S.K. Garg.
2. *Irrigation and Water Power Engineering* by Punmiya and Lal.
3. *Design of Water Power Structure* by Varshney.
4. *Engineering Hydrology* by K. Subramanya.
5. *Hydrology – Principles, Analysis & Design* by H.M. Raghunath.
6. *Watershed Management* by J.V.S. Murthy.

WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

CE 356

WATER AND WASTE WATER ENGINEERING

Instruction	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Public health engineering: Necessity of protected water supply and sanitation role of Civil Engineer. Water demand and per capita consumption, factors affecting population forecasts.

Water supply: Sources of water and quality parameters, standards of potable water, infiltration pipes & galleries, intake structures pipes, joints, valves & pumps. Water distribution systems and solution of a simple network using hardy cross method.

UNIT-II

Treatment of water: Clarification sedimentation - Principles. Design of sedimentation tanks, coagulation and flocculation, design of a clari-flocculator. Filtration - Types of filters and filter media. Design principles of slow and rapid sand filters. Backwash mechanisms. Pressure filters. Disinfections - Necessity and methods, Chlorination of water supplied, action of chlorine, break point chlorination. Ozone and U-V radiations, Removal of hardness, tastes & odour control.

UNIT-III

Domestic sewage: Quantity estimation, quality parameters - BOD, COD and TOC. Sewerage systems, ultimate disposal of sewage. Land and water bodies. Sewage conveyance - Sewer types and appurtenances. Velocity in sewers, Design of a simple sewerage system. Storm water sewers - Storm water estimation by rational method.

UNIT-IV

Waste water treatment: Preliminary treatment, screens, grit chambers. Primary treatment - Sedimentation - rectangular and circular sedimentation tanks. Secondary treatment - sewage filtration - trickling design. Activated sludge process - design parameters, secondary clarifier. Design aspects of a sewage treatment facility.

UNIT-V

Sludge: Sludge digestion and disposal methods - septic tanks- design parameters and working principles. Low cost waste treatment - oxidation ponds, RBC.

Solid waste: - Types, source and composition of solid waste. Methods of collection, transportation and disposal.

Suggested Reading:

1. G.S. Birdi, *Water Supply and Sanitary Engineering*, Dhanpat Rai & Sons; 2002.
2. BSN Raju, *Water Supply and Sanitary Engineering*, Tata McGraw Hill, 1998.
3. Venugopala Rao, *Text Book of Environmental-Engineering*, Prentice Hall of India, 2003.
4. BC Punnia, *Water Supply and Waste Water Engineering*, Laxmi Pub., 1998.

WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

CE 381

SOIL MECHANICS LABORATORY

Instruction	3 Periods
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. Determination of specific gravity by specific gravity bottle method.
2. Determination of specific gravity and water content by pycnometer bottle method.
3. Determination of grain size distribution by sieving.
4. Determination of liquid limit, plastic limit and shrinkage factors of soil.
5. Determination of field density by sand replacement method and core cutter method.
6. Determination of permeability by constant head and falling head methods.
7. Determination of compaction properties.
8. Determination of unconfined compressive strength of soil.
9. Determination of shear by vane shear test.
10. Determination of shear strength by direct shear test.
11. Determination of shear strength by triaxial test.