SYLLABUS IN CIVIL ENGINEERING
(2nd YEAR TO 4th YEAR)

Department of Civil Engineering
Andhra University College of Engineering(Autonomous)
Visakhapatnam-530 003
Andhra Pradesh, India

B. E. II / IV (CIVIL)

SCHEME OF INSTRUCTION

1st Semester :

		L	T	P	Total	Univ. Exam. Hrs	Univ. Exam. Marks	Sels. Marks	Total Marks	Credits
CE211	Engineering Mathematics – III	4			4	3	70	30	100	4
CE212	Engineering Mechanics	4	2		6	3	70	30	100	4
CE213	Structural Analysis-I	3	2		5	3	70	30	100	4
CE214	Building Materials and Building Construction	5			5	3	70	30	100	4
CE215	Surveying – I	4			4	3	70	30	100	4
CE216	Engineering Geology	4		2	6	3	70	30	100	4
CE217	Strength of Materials Laboratory			3	3	3	50	50	100	2
CE218	Survey Field Work-I			3	3	3	50	50	100	2
		24	**4**	**8**	**36**		**520**	**280**	**800**	**28**

2nd Semester :

		L	T	P	Total	Univ. Exam. Hrs	Univ. Exam. Marks	Sels. Marks	Total Marks	Credits
CE221	Engineering Mathematics-IV	4			4	3	70	30	100	4
CE222	Structural Analysis-II	4	2		6	3	70	30	100	4
CE223	Fluid Mechanics-I	4	2		6	3	70	30	100	4
CE224	Surveying-II	4	1		5	3	70	30	100	4
CE225	Building Planning & Design	3		3	6	3	70	30	100	4
CE226	Environmental Studies	4			4	3	70	30	100	2
CE227	Survey Field Work-II			3	3	3	50	50	100	2
CE228	Fluid Mechanics Lab. – I			3	3	3	50	50	100	2
		23	**5**	**9**	**37**		**520**	**280**	**800**	**26**

B. E. III / IV (CIVIL)

SCHEME OF INSTRUCTION

1st Semester :

		L	T	P	Total	Univ.Exam Hrs	Univ.Exam Marks	Sels. Marks	Total Marks	Credits
CE311	Reinforced Concrete Structures – I	4	1		5	3	70	30	100	4
CE312	Steel Structures – I	4	1		5	3	70	30	100	4
CE313	Fluid Mechanics – II	4	1		5	3	70	30	100	4
CE314	Geotechnical Engg. – I	4	1		5	3	70	30	100	4
CE315	Environmental Engg. – I	4			4	3	70	30	100	4
CE316	Elective-I	4	2		6	3	70	30	100	4
CE317	Environmental Engg. Lab			3	3	3	50	50	100	2
CE318	Geotechnical Engg. Lab. – I			3	3	3	50	50	100	2
CE319	Soft Skills			2	2			100	100	1
FE 01	Free Elective -I	4	-	-	4	3	70	30	100	4
		28	**6**	**8**	**42**		**590**	**410**	**1000**	**33**

2nd Semester :

		L	T	P	Total	Univ.Exam Hrs	Univ.Exam Marks	Sels. Marks	Total Marks	Credits
CE321	Structural analysis – III	4	2		6	3	70	30	100	4
CE322	Reinforced Concrete Structures – II	4	2		6	3	70	30	100	4
CE323	Steel Structures – II	4	2		6	3	70	30	100	4
CE324	Geotechnical Engg. – II	4	1		5	3	70	30	100	4
CE325	Fluid Mechanics – III	4	2		6	3	70	30	100	4
CE326	Elective -II	4	2		6	3	70	30	100	4
CE327	Geotechnical Engg. Lab. II			3	3	3	50	50	100	2
CE328	Concrete Laboratory			3	3	3	50	50	100	2
	Industrial Training	To be held during summer vacation and evaluated[@] in the 1st Semester of IV year								
		24	**11**	**6**	**41**		**520**	**280**	**800**	**28**

@ Assessment as indicated along with the requirements given in the syllabus part.

ELECTIVE – I (COURSE NO. CE 316)

- CE316 A Estimating and Quantity surveying
- CE316 B Repair and Rehabilitation of structures
- CE316 C Disaster Management

FREE ELECTIVE – I.

ELECTIVE – II (COURSE NO. CE 326)

- CE326 A Environmental Impact Analysis.
- CE326 B Structural Dynamics
- CE326 C River Engineering
- CE326 D Remote Sensing and Geographical Information Systems (G.I.S.)
- CE326 E Environmental Impact assessment and Management of Water Resources Projects
- CE326 F Optimization Techniques

B. E. IV / IV (CIVIL ENGINEERING)

SCHEME OF INSTRUCTIONS

1st Semester :

		L	T	P	Total	Univ.Exam Hrs	Univ.Exam Marks	Sels. Marks	Total Marks	Credits
CE411	Water Resource Engineering – I	3	2		5	3	70	30	100	4
CE412	Transportation Engineering – I	3	1		4	3	70	30	100	4
CE413	Project Planning and Management	4	2		6	3	70	30	100	4
CE414	Environmental Engineering – II	4	2		6	3	70	30	100	4
CE415	Computer applications in Civil Engineering (Lab)	3		3	6	3	50	50	100	4
CE416	Elective - III	4	2		6	3	70	30	100	4
CE417	Transportation Engineering Lab.			3	3	3	50	50	100	2
CE418	Fluid Mechanics Lab. – II			3	3	3	50	50	100	2
CE419	Industrial Training@							100	100	2
		21	**9**	**9**	**39**		**500**	**400**	**900**	**30**

@ Assessment as indicated along with the requirements given in the syllabus part.

2 nd Semester

		L	T	P	Total	Univ.Exam Hrs	Univ.Exam Marks	Sels. Marks	Total Marks	Credits
CE421	Transportation Engineering II	3	1		4	3	70	30	100	4
CE422	Water Resources Engineering II	3	2		5	3	70	30	100	4
CE423	Elective – IV	4	2		6	3	70	30	100	4
CE424*	Irrigation Structures – Design & Drawing (Internal exam)			4	4			50*	50	2
CE425	Project Work			6	6	--	50	50	100	8
FE 02	Free Elective-II	4			4	3	70	30	100	4
		14	**5**	**10**	**29**		**330**	**220**	**550**	**26**

ELECTIVE – III (COURSE NO. CE 416)

- CE416 A Industrial Structures
- CE416 B Multistorey Structures
- CE416 C Elements of Solid Waste management
- CE416 D Soil Dynamics & Machine Foundation
- CE416 E Principles of Water Quality Management
- CE416 F Port and Harbour Engineering

ELECTIVE – IV (COURSE NO. CE 423)

- CE423 A Advanced Concrete Structures
- CE423 B Prestressed Concrete
- CE423 C Air Pollution Control
- CE423 D Ground Improvement Techniques
- CE423 E Coastal Engineering
- CE423 F Hydraulic Structures

CE 424* Irrigation Structures, Design and Drawing: The fifty makrs allocated for the Subject shall be considered as Semester end examination marks conducted by internal examiner only.

SYLLABUS

B. E. II / IV (CIVIL) 1 st SEMESTER

CE211 ENGINEERING MATHEMATICS – III

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 0 T Sessional Marks: 30

UNIT –I : VECTOR CALCULUS :

Differentiation of Vectors, Curves in Space, Velocity and acceleration, relative velocity and acceleration, scalar and vector point functions, vector operator. $\vec{\nabla}$ V, $\vec{\nabla}$ applied to scalar point functions, gradient, V applied to vector point functions, divergence and curl. physical interpretations of $\vec{\nabla}$ .F and $\vec{\nabla}$ xF, $\vec{\nabla}$ applied twice to point functions, $\vec{\nabla}$ applied to products of point functions, integration of vector, line integral, circulation, work surface integral-flux, Green's theorm in the plane, Stoke's theorem, volume integral, divergence theorem, irrotational and solenoidal fields, Green's theorem, Introduction of orthogonal curvilinear coordinates: Cylindrical, spherical and polar coordinates.

UNIT –II : INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS :

Formation of partial differential equations, solutions of PDEs, equations solvable by direct integration, linear equations of first order, homogeneous linear equations with constant coefficients, rules for finding the complimentary function, rules of finding the particular integral, working procedure to solve homogeneous linear equations of any order, non homogeneous linear equations.

UNIT –III : APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS :

Method of separation of variables, Vibrations of a stretched string-wave equations, one-dimensional and two-dimensional heat flow equations, solution of Laplace equation, Laplace equation in polar co-ordinates.

UNIT –IV : INTEGRAL TRANSFORMS ;

Introduction, definition, Fourier Integral, Sine and Cosine Integrals, Complex forms of Fourier Integral, Fourier Transform, Fourier Sine and Cosine Transforms, Finite Fourier Sine and Cosine Transforms. Properties of F-Transforms, Convolution Theorm for F-Transforms, Parseval's Identity for F-Transforms, Fourier Transforms of the derivatives of a function, applications to boundary value problems, using inverse Fourier Transforms only.

TEXT BOOK :

1. Higher Engineering Mathematics (34th edition 1998) by B.S. Grewal

REFERENCES:

1. A Text Book on Engineering Mathematics by M.P. Bali et al.
2. Higher Engineering Mathematics by M.K. Venkata Raman
3. Advanced Mathematics for Engineering Students, Vol-2 & 3, by Narayanan et al.
4. Advanced Engineering Mathematics by Erwin Kreyszig.
5. Engineering Mathematics by P.P. Gupta.
6. Advanced Engineering Mathematics by V.P. Jaggi and A.B. Mathur.
7. Engineering Mathematics by S.S. Sastry.
8. Advanced Engineering Mathematics by M.L. Dass.

CE212 ENGINEERING MECHANICS

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Basic Concepts : Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple.
Resultants of Force Systems, Possible resultants of different types of force systems – Resultant of a concurrent, coplanar force system – Resultant of a non-concurrent coplanar force system – Resultant of a concurrent non-coplanar force system – Resultant of a parallel, non-coplanar force system – Resultant of a system of couples in space – Resultant of non-concurrent, non-coplanar, non-parallel force system – screw of Wrench.
Equilibrium : Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar non-parallel force system.

UNIT – II : Centroids and Centres of Gravity : Centre of gravity of parallel forces in a plane – Centre of gravity of parallel forces in space – centroids and centres of gravity of composite bodies – Theorems of Pappus – Distributed Loads on Beams.
Moments of Inertia, Definition – Parallel axis theorm for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas – Parallel axis and parallel plane theorems for masses – Moments of inertia of masses by integration – Radius of gyration of mass – Moments of inertia of composite masses.

Friction : Nature of friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction – Problems involving frictional forces – Frictional forces on flexible bands and belts – Rolling friction.
Method of Virtual Work: Principle of virtual work – Equilibrium of ideal system – Stability of equilibrium.

UNIT III : Kinematics : Absolute Motion : Introduction – Recapitulation of basic terminology of mechanics – Newton's Laws – Introduction to Kinematics of Absolute Motion – Rectilinear motion of a particle – Angular motion of a line – Curvilinear motion of a particle using rectangular components – Motion of projectiles – Curvilinear motion using Radial and Transverse Components – (Simple Problems only) – basics of simple harmonic motion (Simple problems) – Motion of rigid bodies.
Kinematics: Relative Motion : Introduction to kinematics of relative motion – Relative displacement – Relative velocity – Instantaneous centre – Relative acceleration.

UNIT IV : Kinetics : Introduction to Kinetics – Force, Mass and Acceleration approach – Newton's Laws of motion – Equation of motion for a particle. Motion of the mass centre of a system of particles – D Alembert's principle – Rectilinear translation of a rigid body – Curvilinear translation of a rigid body – Rotation of a rigid body – Plane motion of a rigid body – Reserved effective forces and couples and their use in Dynamic Equilibrium method.
Kinetics : Work and Energy approach – Work done by a force – Work done by a couple – Work done by a force system – Energy: Potential energy – Kinetic energy of a particle – Kinetic energy of a rigid body – Principle of Work and kinetic energy – Conservation of energy – Power and efficiency.
Impulse – Momentum approach – Linear impulse – Linear momentum – Principle of linear impulse and linear momentum – Conservation of linear momentum – Elastic impact – Angular impulse – Angular momentum – Principles of angular impulse and angular momentum.

TEXT / REFERENCES :

(1) Engineering Mechanics by Singer.
(2) Engineering Mechanics by Timoshenko and D.H. Young.
(3) Engineering Mechanics by J.L. Meriam
(4) Mechanics for Engineers Statics and Dynamics by F.B. Beer and E.R. Johnston
(5) Applied Mechanics by I.B. Prasad.

CE213 STRUCTURAL ANALYSIS – I

University Examination: Duration 3 hrs. Marks: 70

No of Periods per Week : 3 L+ 2 T Sessional Marks: 30

UNIT I : Duties / obligations Accountability of structural engineer for the design of a structure : a)economy b)safety: (i) strength consideration (ii) stiffness consideration. Need for assessment of strength of a material – analysis for strength requirement for design purposes – Review of IS code provisions.
Effects of force : tension, compression and shear. Stress as internally elastic resistance of a material – strain – property of elasticity – Hookes law – stress-strain diagrams. Characteristic strengths, Factors of safety and working stresses for materials and various types of application of load. Elastic strain – energy, stress due to gradually applied load, sudden load, impact load and shock load. Lateral strain, Poisson's ratio. Complementary shear stress, shear strain, shear modulus. Relation between modulus of elasticity, modulus of rigidity and bulk modulus. Stresses in composite assemblies due to axial load and temperature change.

UNIT II : Effect of transverse force, Shear force, Bending moment and Axial thrust diagrams for a) Cantilever b) Simply supported and c) Over hanging beams for various patterns of loading. Relation between (i) intensity of loading (ii) Shear force and (iii) Bending moment at a section. Theory of simple bending : flexural normal stress distribution. Flexural shear stress distribution for various shapes of cross section.

UNIT III : (a) Stresses on oblique plane – Resultant stress – Principle stress and maximum shear stress and location of their planes. Mohr's circle for various cases of stresses; (b)Theory of pure torsion for solid and hollow circular sections – torsional shear stress distribution, effect of combined torsion, bending and axial thrust – equivalent B.M and T.M. (c) Longitudinal and Hoop stresses in thin cylinders subjected to internal pressure. Wire wound thin cylinders.

UNIT IV : Deflections of Beams : (i) Cantilever (ii) simply supported and (iii) over hanging beams, using (a) double integration and (b) Macaulay's method. Analysis for forces in members of a truss (having 9 members or less) by tension coefficient method only.

UNIT V : Graphic Statics a) Determination of Resultants of Systems of Coplanar Forces ; b) Locating Centroids of Sections of various Shapes ; c) S.F. & B.M. Diagrams for (i) Cantilever, (ii) Simple Supports, (iii) Over –hanging Beams; d) Determination of Forces in Members of Trusses (having 9 members or less) by Maxwell Diagram

TEXT BOOKS :

(1) Elements of strength of materials by Timoshenko and Young.
(2) Introduction to mechanics of solids by Popov.
(3) Structural Analysis by Pundit & Gupta
(4) Strength of materials by Hyder.
(5) Elementary mechanics of solids by P.N. Singer and P.K. Jha.
(6) Strength of materials by Ramamrutham.
(7) Strength of materials by Vazirani and Ratwani.

CE 214 BUILDING MATERIALS AND BUILDING CONSTRUCTION

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 5 L+ 0 T Sessional Marks: 30

UNIT – I

(A) BUILDING STONES AND BRICKS, CLAY PRODUCTS::

Cements : Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC). Chemical and Physical analysis of OPC, various field and Lab. Tests on OPC as per IS code. Storing of cement in the field and godowns.

Modern renovation materials : Cement bound, polymer cement bound and pure polymer bound materials, their properties & uses.

Acousting and Insulating Products : Acoustic tiles, pulp, plaster etc., assembled units, sprayed on acoustical materials and their requirements. Thermal insulation and its requirements, types of insulating materials etc.

UNIT –I I

(A) WOOD, WOOD BASED PRODUCTS : GLASS AND ITS PRODUCTS

Wood: Various ways of tree classifications, cross section details of trees, various methods of timber classification including punched card system, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, felling and conversion, various Mechanical Properties of timber, Decay of timber, preservation methods, common Indian trees and their uses.

Wood based Products : Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards. Synthetic resins.

Glass and its Products : Raw materials for glass, properties of glass, manufactured glass, types of glass, their uses, glass blocks and solid glass bricks (i.e., commercial forms of glass)

(B) PAINTS, VARNISHES, ASBESTOS, ASPHALT, BITUMEN, TAR AND PLASTICS:

PAINTS AND VARNISHES: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents of varnishes, uses of varnishes, different kinds of varnish, polishes, Lacquer etc.

ASBESTOS & ASPHALT BITUMEN & TAR

Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

PLASTICS : Chemistry of plastics, raw materials, manufacturing, classification of various plastics, and their Civil Engg. uses and modern developments in plastics.

UNIT – I I I

(A) Foundations : Different types of soils, Types of Foundations : Strip, Isolated, Strap, Combined Footings, RAFT – MAT – Slab and BEAM RAFT, BOX TYPE RAFT, inverted arch foundations, SHELL foundations, Grillage foundations, Different type of pile foundations and their brief description with usual dimensions. Under reamed piles – Minimum depth of Foundation – Bearing capacity of soils.

(B) Masonry : Different types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, elevation and Section of Brick Bonds upto Two Brickwall thickness – Partition walls – Different types, Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

UNIT – IV

(A) MORTAR JOINTS : Plastering – Pointing – Other Wall Surface Finishes – Pebble dash – dadooing with stones, Tiles etc.

Floorings : Brief description with dimensions of different types – Ellis pattern, Granolithic, Flag stone floorings with locally available stones such as Cuddapah, Betamcherla, Shabad etc., Marble Flooring, Terrazo (Mosaic) Flooring, Rubber Flooring.

(B) CONCRETE TECHNOLOGY AND MIX DESIGN,

Cement and Polymer Concrete : Types of cement concrete, ingradients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & Transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and its uses.

UNIT – V

(A) Roofing : Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminium G.I. Sheet roofings.
Trusses : King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details.

(B) Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnishes wood work finishing types.

(C) Wooden Doors and Windows – Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminium, PVC, Steel doors, windows and ventilators, various types of windows, Glazing – different varieties.
Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

REFERENCE BOOKS SUGGESTED :

1. "Civil Engg. Materials", by Technical Teachers' Training Institute, Chandigarh, Tata-Mc Graw-Hill Publishing Company Ltd., New Delhi.
2. "Materials of construction", by R.C. Smith, McGraw-Hill Company, New York.
3. "Engineering Materials", 5th edition, By Surindra Singh,, Konark Publishers Pvt. Ltd., New Delhi.
4. "Materials of construction", by D.N. Ghose, Tata-McGraw-Hill Publishing Company Limited..
5. "Engineering Materials", By Sushil Kumar, Metropolitan Book Co., Private Ltd., New Delhi.
6. "Building Construction" Vol.II & III By W.B. Mckay, E.L.B.S. and Longman, London, U.K.
7. Building Materials by S.K. Duggal New Age International Publishers.
8. Building Construction by B.C. Punmia. Laxmi Publications.
9. Construction Technology by R. Chudly Vols I & II 2nd Edition Longman, UK.

CE215 SURVEYING – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 0 T Sessional Marks: 30

UNIT – I :Chain Survey : Classification of surveying-Principles of Surveying. Sources of errors-Linear measurements, Direct measurement. Instrumentation for chaining – Errors due to incorrect chain-Chaining on un-even and sloping ground-Errors in chaining-Tape corrections – Problems :Base line measurement-Chain Triangulation – Checklines, Tie lines, Offsets. Basic problems in chaining-obstacles in chaining-Problems-Conventional signs.

UNIT – II:Compass Survey : (a) Introduction to compass survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic bearing – Arbitrary Meridian, R.B. & B.B of lines – Designation of bearings – W.C.B. & R.B. – Conversion of bearings from one system to the other Related problems – Calculation of angles for bearings, Calculation of bearing for angles, Related problems – Theory of Magnetic compass (i.e. Prismatic compass) – Magnetic dip-Description of Prismatic compass. Temporary adjustments of compass-Magnetic Declination – Local attraction-Related Problems-Errors in compass survey.
(b) Traverse Surveying : Chain and compass traversing-Free or loose needle method – Fast needle method-Checks in closed and open traverse-Plotting methods of traverse Survey - Closing error-Balancing the traverse-Bowditch's method-Transist method, Gale's Travers table.

UNIT III : Plane table surveying: Introduction-Advantages, Accessories-Working operations such as fixing the table to tripod, levelling-centering-orientation by back-sighting. Methods of plane tabling-Plane table traversing-Three point problem – Mechanical method – Graphical method – Two point problem-Errors in plane tabling.

UNIT IV :Levelling : Definitions of terms-Methods of levelling-Uses and adjustments of dumpy level-Temporary and permanent adjustments of dumpy level levelling staves-Differential leveling, Profile levelling-Cross sections-Reciprocal levelling. Precise levelling-Definition of BS, IS, FS, HI, TP-Booking and reduction of levels, H.I. methods-Rise and fall method-Checks-Related problems-Curvature and Refraction Related Problems-Correction-Reciprocal levelling-Related problems-L.S & C.S Levelling-Problems in levelling-Errors in levelling.

UNIT V : Minor instruments : Uses and adjustments of the following minor instruments:
Line Ranger, Optical Square, Abney level, Clinometer, Ceylon Ghattracer, Pantagraph, Sextant and Planimeter.

Contouring: Definitions-Interval, Characteristics of contours-methods of locating contours-Direct and indirect methods-Interpolation of contours-Contour gradient-Uses of contour maps.

TEXTBOOKS :

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol.1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.

CE216 ENGINEERING GEOLOGY

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2P Sessional Marks: 30

Unit-1: **General Geology**:
Importance of geology from civil engineering point of view. Branches of geology. Weathering and soils: Soil profile, Erosion and soil formation, types of Indian soils. Land forms produced by, running water, and glaciers. Land forms produced by wind, sea waves and currents. Ground water: origin, groundwater table, porosity and permeability. Aquifers and groundwater moment and water bearing properties of rocks.

Unit – 2: Petrology&Minorlorgy
Petrology: Definition of rock and rock formation. Rocks- classification, Structure, texture and mineralogical composition. Types of rocks-Ingenious rocks: Granite, synite, dolerite, gabro, diorite, basalt. Sedimentary rocks, dykes and sills: Breccia, conglomerate, Sandstone, Shale, limestone. Metamorphic rocks: Gneiss, khondalite, schist, slate, marble, quartzite, charnokite. Engineering properties of rocks. Weathering of rocks.
Mineralogy: physical properties: form, color, luster, cleavage, fracture, hardness and specific gravity. Study of important rock forming minerals: Silicate sturcutres, Quartz, feldspars, pyroxenes, amphiboles, micas and clays.

Unit – 3: Statigraphy & Structural geology
Statigraphy: Time scale, Major geological formations of India. Achaeans, Cuddapahs, Vindyans, Gondwanas and Deccan Traps. Mineral resources of Andhra Pradesh. **Structural geology**: Elements of structural geology- Strike, dip, plunge. Clinometer compass and Brunton Compass. Classification of folds, faults and joints. Geological methods of Investigations: Geological formations, preparation of geological maps, structural features and groundwater parameters. Natural Hazards: Earthquakes origin and distribution. Volcanoes, Landslides and mass moment. Tsunamis.

Unit – 4: Remote sensing and Geophysical methods
Remote sensing: Introduction, electromagnetic spectrum, aerial photo, types of aerial photos and flight planning. Aerial mosaics. Elements of photo interpretation. Satellite remote sensing. Satellites, sensors and data products. Principles of GIS. RS and GIS applications to Civil Engineering -Town planning, dams and reservoirs, linear structures and environmental monitoring.
Geophysical methods: principles of geophysical methods, electrical, Seismic, Gravity and magnetic. Principle of Resistivity method and configurations. Applications of Resistivity method in prediction of soil profile, hard rock and ground water table. Principles of Seismic refraction and reflections methods and their applications to Civil Engineering problems.

Unit – 5. Geological applications to Civil Engineering Structures.
Role of engineering geologist in planning, design and construction stages in Civil Engineering works. Geological investigations for dams and reservoirs. Geological investigations for bridges and Multi- storied structures. Geological investigations for highways, air fields and railway lines. Geological investigations for tunnels and coastal structures(Seawalls, groins an bulkheads). Environmental geology.
Text books:

1. Principles of Engineering Geology by KVGK Gokhale. B.s.Publications-2005
2. Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd. 2005

3. A. txt book of Gelogy – Mukherjee.
4. Engineering and general geology by Parbin Singh – Katson Publishing house
5. Fundamentals of Remote sensing by George Josesph. University Press (India) Private limited.
6. Engineering Geology by K.M.Bangaru

CE217 STRENGTH OF MATERIALS LABORATORY

University Examination: Duration 3 hrs. Marks :50
No of Periods per Week : 0 L+ 3P Sessional Marks: 50

(1) Tension test on Mild/HYSD bars
(2) Compression test on wood (parallel and perpendicular to grains)
(3) Tests on springs for the determination of rigidity modulus and spring constant
(4) Brinell's and Rockwell hardness tests.
(5) Charpy and Izod impact tests.
(6) Double shear test on mild steel specimen.
(7) Bending test.: Load deflection test for the determination of young's modulus on simply supported and cantilever beam for wood and steel.
(8) Study of forces in coplanar force system.

CE218 SURVEYING FIELD WORK – I

University Examination: Duration 3 hrs. Marks:50
No of Periods per Week : 0 L+ 3FW Sessional Marks: 50

1. Chain Surveying
    a. Introduction of instruments used for chain survey, Folding and unfolding of chain-Line ranging (direct method)-Pacing.
    b. Chain traversing –Preparation of plan of a residential building by making use of chain, ranging rods, by oblique off-set method, introduction of check line.
    c. Preparation of residential building by perpendicular offset, introduction of tie lines.
    d. Finding the distance between inaccessible points by making use of chain, cross staff, tape, ranging rods; Arrows and field problems of obstacles to chaining.
2. Compass Survey.
    a. Introduction to prismatic compass-Temporary adjustments.
    b. Finding the distance between inaccessible points by making use of compass, tape and ranging rods.
    c. Compass traversing-plotting of a residential building.
3. Plane Table Survey.
    a. Introduction to plane table-Use of its accessories: Two & Three Point Problem.
    b. Finding the distance between inaccessible points by making use of plane table, its accessories-Ranging rods and tape.
4. Levelling.
    a. Introduction to dumpy level, levelling staff. Reading of level staff, temporary adjustments of dumpy level.
    b. Introduction to fly levelling-Booking the readings by height of collimation method.
    c. Introduction to fly levelling-Booking the readings by rise and fall method-To find closing error.
    d. Check levelling.- L.S. & C.S. of a road profile.
    e. Preparation of contour plan for an open area by taking level of the site.

Field work examination, for sessional marks.

B. E. II / IV (CIVIL) 2 nd SEMESTER

CE221 ENGINEERING MATHEMATICS – IV

University Examination: Duration 3 hrs. Marks: 70
No of Periods per Week: 4 L+ 0 T Sessional Marks: 30

UNIT –I: FUNCTIONS OF A COMPLEX VARIABLE : Continuity concept of f(z), derivative of f(z), Cauchy-Riemann Equations, Analytic funtions, Harmonic Functions, Orthogonal System, applications to flow problems,

integration of complex functions, Cauchy's theorem, Cauchy's integral formula, statements of Taylor's and Laurent's series without proofs, singular points, residues and residue theorem, calculation of residues, evaluation of real definite integrals, geometric representation of f(z), conformal transformation, some standard transformations: (1)w = z+c, (2) w=1/z, w=(az+b)/(cz+d), $w=z^2$, and $w=e^z$.

UNIT –II: STATISTICS : Review of probability distributions(not to be examined).
Sampling Theory: Sampling distribution, standard error, Testing of hypothesis, Level of significance, Confidence limits, Simple sampling of attributes, sampling of variables-large samples, and small samples, Student's t-distribution, χ^2-distribution, F-distribution, Fisher's Z-distribution.

UNIT –III: DIFFERENCE EQUATIONS AND Z-TRANSFORMS : Z-transforms, definition, some standard Z-transforms, Linear property, Dampling rule, some standard results, shifting rules, initial and final value theorems, Convolution theorem, Evaluation of inverse transforms, definition, order and solution of a difference equation, Formation of difference equations, Linear difference equation, Formation of difference equations, Linear difference equations, Rules for finding C.F. Rules for finding P.I. Difference equations reducible to linear form, Simultaneous difference equations with constant coefficients, Application to deflection of a loaded string, Application of Z-transform to difference equations.

TEXT BOOK : Higher Engineering Mathematics (34^{th} edition 1998) by B.S. Grewal.

REFERENCES :

1. A text book on Engineering Mathematics by N.P. Bali et al.
2. Higher Engineering Mathematics by M.K. Venkataraman.
3. Advanced Mathematics for Engineering Students Vol-2 and Vol-3 by Narayanan et al.
4. Advanced Engineering Mathematics by Erwin Kreyszig.
5. Engineering Mathematics by P.P. Gupta.
6. Advanced Engineering Mathematics by V.P. Jaggi & A.B. Majumdar.
7. Engineering Mathematics by S.S. Sastry
8. Advanced Engineering Mathematics by H.K. Dass
9. Engineering Mathematics Vol-2 by Terit Majumdar.

CE222 STRUCTURAL ANALYSIS – II

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT I : Strain – energy due to (i) Axial load, (ii) Shear force, (iii) Bending Moment and (iv) Torque;
Deflections of statically determinate structures :

(a) Beams using
  (i) Moment area method,
  (ii) Conjugate beam method,
  (iii) Unit load method,
  (iv) Conservation of energy method and
  (v) Castigliano's theorm – 1.

(b)Single storey, single bay rectangular portal frames using
  (i) Unit load method,
  (ii) Castigliano's theorm –1.

(c) Trusses (having 9 members or less) using
  (i) Unit load method,
  (ii) Castigliano's theorem-1.
  (iii) Williat Mohr Diagram.

UNIT II : Shear force and Bending moment diagrams for (a) fixed beams, (b) three span continuous beams using (i) Theorm of three moments, (ii) Slope deflection method and (iii) Moment distribution method.

UNIT III : Columns and Struts : Combined bending and direct stresses – kern of a section – Euler's theory – end conditions. Rankine – Gordon formula – other empirical formulae – Eccentrically loaded columns – Perry's formula. Secant formula.

UNIT – IV: Open and closed coiled helical springs subjected to axial load. Thick cylinders –lamme's theory, Compound tubes – Theory of failure (a) Principal Stress theory, (b) Principal Strain theory, (c) Maximum Shear Stress theory and (d) Maximum strain energy theory.

UNIT V : Moving loads: Maximum Shear force and Bending moment diagrams for different types of loads. Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads. Equivalent uniformly distributed live load for Shear force and Bending moment. Reversal of nature of Shear force, focal length, counter bracing for truss panels, Influence lines for (i) Beams and (ii) members of Warren and Pratt trusses.

REFERENCES :

(1) Structural Analysis By Pundit & Gupta.
(2) Strength of Materials – Ramamrutham.
(3) Elementary strength of materials – Timoshenko and Young.
(4) Strength of materials – Singer.
(5) Strength of materials – Jain and Arya.
(6) Analysis and Design of structures – Vazirani and Ratwani

CE223 Fluid Mechanics - I

University Examination: Duration 3 hrs. Marks: 70
No of Sessional Marks: 30

Periods per Week : 4 L+ 2 T

UNIT I: Fluid Properties and Fluid Statics.	
(1) Introduction & Physical Properties of Fluids.	Definition of Fluid, Fluid as Continuum; Mass Density, Specific Weight, Specific Gravity, Specific Volume, Relative Density, Bulk Modulus, Compressibility, Vapour Pressure.
(2) Viscosity, Capillarity and Surface Tension.	Viscosity- Newton's Law of Viscosity- Dynamic or Absolute Viscosity- Kinematic Viscosity-Rheological Diagram - No Slip Condition- Practical Problems associated with Viscosity- Capillarity and Surface Tension.
(3) Fluid Statics, Pressure and its measurement.	Forces Acting on a Fluid Element- Surface & Body Forces, Normal & Tangential Stresses- Body Force Potential ; Definition of Pressure Force Gradient- Variation of Pressure in Static Fluid- Hydrostatic Law of Pressure Variation- Absolute, Gauge and Total Pressure- Pressure Measurement, Pressure Gauges, Piezometers, Manometers, Micro- manometers.
(4) Forces on Immersed Bodies in Static Fluids.	Force on a Plane Surface- Centre of Pressure, Pressure Diagram, Forces on Curved Bodies, Forces on radial Crest Gates and Lock Gates.
(5) Buoyancy & Floatation.	Archimedes Principle- Buoyancy & Floatation - Stability of Floating Bodies- Centre of Buoyancy- Metacentric Height and its Determination.
(6) Liquids in Relative Motion.	Pressure of Liquids in a Container Subjected to Linear Acceleration and Rotation.

UNIT II: Fluid Kinematics.	
(7) Types of Fluid Flow & Methods of Fluid Flow Analysis.	Methods of Describing Fluid Motion; Types of Flow- Steady & Unsteady Flows, Uniform & Non-uniform Flows, Laminar & Turbulent Flows; Eularian & Laggrangian Approaches; Streamline, Pathline, Streakline- Stream Surface, Stream Tube.
(8) Fluid Kinematics.	Translation, Deformation and Rotation of a Fluid Element in Motion; Translation, Deformation of a Fluid Element; Local, Convective and Total Acceleration; One, Two & Three Dimensional Analysis of Flows.
(9) Ideal Fluid Flow.	Stream Function, Velocity Potential- Rotational & Irrotational Flows- Vorticity & Circulation, - Laplace Equation in terms of Stream Function and Velocity Potential Flow Net.

UNIT III: Fluid Dynamics – Conservation of Mass & Energy.	
(10)Principle of	Concepts of System and Control Volume- Principle of Conservation of Mass in three

Conservation of Mass.	dimensional Cartesian coordinates and cylindrical coordinates. Continuity Equation for Stream tube flow.
(11) Principle of Conservation of Energy.	Equation of Motion for Ideal Fluids, Euler's Equation in Streamline Coordinates- Derivation of Energy Equation through integration of Euler's Equation - Bernoulli's Principle- Energy Correction Factor.
(12) Application of Energy Principle- Flow Measurement in Pipes.	Measurement of Static, Stagnation and Dynamic Pressures and Velocity- Pitot Tube- Prandtl Tube ; Measurement of Discharge through a Pipe using Flow Meters- Venturi Meter, Flow Nozzle Meter and Orifice Meter.
(13) Flow through Tanks and Reservoirs	Measurement of Discharge from Tanks and Reservoirs- Steady and Unsteady Flow through Orifices and Mouthpieces-Small & Large Orifices Different types of Mouthpieces- C_d, C_v C_c. Discharge from tanks through Drowned Orifices, Time of Emptying Tanks, Discharge from a Tank with Inflow, Kinematics of Free Jet- Vortex Motion and Radial Flow.
(14)Flow Measurement in Channels.	Flow Measurement in Open Channels- Flow Past Weirs and Notches- Sharp Crested and Broad Crested Weirs- Weirs with and without end contractions- Ventellation of Weirs- Triangular Notches- Cippoletti Weir.

UNIT IV: Fluid Dynamics – Momentum Principle.	
(15) Principle of Conservation of Momentum.	Momentum of Fluids in Motion - Impulse Momentum Equation- Momentum Correction Factor.
(16) Forces on Pipe Bends, Pipe Fittings plane Surfaces	Forces on Pipe Bends and Reducers, Flow through a Nozzle, Forces on Plates and Curved Vanes, Moving Vanes.
(18) Jet Propulsion	Momentum Theory for Propellers, Jet Propulsion, Rocket Mechanics.
(19) Angular Momentum for fluid flows	Angular Momentum Equation- Torque and Work done by series of Moving Vanes; Sprinkler Problems.

UNIT V: Steady Flow through Pipes.	
(20) Introduction to Pipe Flow and Laws of Friction	Reynolds Experiment- Steady Turbulent Flow through Pipes- Laws of Friction- Darcy- Weisbach Equation.
(21) Total Energy and Hydraulic Gradient	Energy and Hydraulic Gradient Lines- Minor Losses in Pipes, Pipe Line Problems with Pumps and Turbines. Pipes in Series and Parallel- Equivalent Length of Pipe.
(22) Practical Problems & Hydraulic transmission of power	Flow between Two reservoirs- Three Reservoir Problems –Distribution Mains- Working Pressures, Design Pressure and Test Procedures, Choice of Pipe Material– Siphon Problem. Pipe Network- Hardy- Cross Method of Analysis. Hydraulic Power Transmission through Pipes and Nozzles

Text Books

(1) Engineering Fluid Mechanics by K.L. Kumar, S. Chand & Co
(2) Fluid Mechanics by A.K. Jain, Khanna Publishers
(3) Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth, Standard Book House

CE224 SURVEYING – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

UNIT I : Theodolite- Types of theodolites – Temporary Adjustments, Measurement of horizontal angle – Method of repitition, Method of reiterition – Uses of theodolities – Errors in theodolite or Permanent adjustments of a theodolite – Identification – Rectifying the errors.

UNIT II : Theodolite traversing – Open and closed traverse – Closing errors, Balancing the error – Bowditch method – Transit method, Omitted measurements – Gales traverse table or Trigonometric levelling – Elevation of top of the tower - same plane - Different planes – Axis signal correction.

UNIT III : Tacheometry – Principle of techeometry – Stadia methods – Fixed hair method – Movable hair method – Tangential method – Subtanse bar – Beaman's stadia, Arc – Reduction diagrams or Triangulation – Classification-intervisibility of station – Signals and towers-base line measurements – Corrections – Satellite station and Reduction to centre – Basenet.

UNIT IV : Curves – Simple curves – Elements of simple curves – Methods of setting simple curves – Rankines method – Two theodolite method – Obstacles in curve setting – Compound curves – Elements of compound curves or Reverse curves – Elements of reverse curve – Determination of various elements – Transition curves – Ideal shape – Spiral transition curves - length of transition curve - Setting out methods.

UNIT V: Introduction to geodetic surveying, Total station and global positioning system- Introduction to Geographic Information System (GIS)

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol.1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
4. Principles of GIS for land resource assessment by P.A. Burrough –Clerendon Press, Oxford.

CE225 BUILDING PLANNING AND DESIGN

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 3 L+ 3P Sessional Marks: 30

UNIT I :
Residential Buildings : Different types of Residential Buildings Selection of Site for Residential Building. Brief Information of Housing Colonies for Different Income Groups in India-Sizes of Plots - Public Spaces, Evolutionary Housing Concept.

UNIT II :
Climatology: Elements of Climate : Sun, Wind, Relative Humidity, Temperature effects, Comfort Conditions for House, various types of Macro Climatic Zones. Design of Houses and Layouts with Reference to Climatic Conditions. Orientation of Buildings. Solar Charts, Ventilation. Principles of Planning Anthropometric Data

Unit III :
Preliminery Drawings : (a) Conventional signs of materials various equipment used in a Residential Building (copying exercise) (b) Plan section and Elevation of a small House (one room and varandah) (copying exercise) (c) Plan section and Elevation of Two Bed Room House (copying exercise) (d) (e) (f) Plan section and Elevation of three bed room house in Hot and Humid zone, Hot and Arid zone, cold zone (copying exercises)

UNIT IV :
(a) Design of Individual rooms with particular attention to functional and furniture requirements. Building regulations and Byelaws of Residential Buildings;
(b) Drawing the Plan Section and Elevation of flats (Not included in the examination).

UNIT V : Drawing the Plan Section and Elevation of Houses with given Functional requirements and climatic data. (Emphasis may be given to Hot and Humid zones.)

Text Books

1. Building Planning and Drawing by Dr.N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors.
3. Civil Engineering Drawing Series 'B' by R.Trimurty, M/S Premier Publishing House.
4. Building Drawing with an integrated approach to Built environment by M.G.Shah, C.M.Kale and S.Y.Patki, McGraw-Hill Publishing Company Limited, New Delhi.

CE226 ENVIRONMENTAL STUDIES (COMMON TO ALL BRANCHES)

University Examination: Duration 3 hrs. Marks: 70

No of Periods per Week : 4 L+ 0 T Sessional Marks: 30

Module 1 : Introduction.

- Definition, scope and importance.
- Measuring and defining environmental development; indicators. (1 Lecture)

Module 2 : Ecosystems.

- Introduction, types, characteristic features, structure and functions of ecosystems.
  - Forest
  - Grass Land
  - Desert
  - Aquatic (Lake, rivers and estuaries) (2 Lectures)

Module 3 : Environmental and Natural Resources Management.

  - Land resources
  - Land as resource
  - Common property resources
  - Land degradation
  - Soil erosion and desertification
  - Effects of modern agriculture, fertilizer –pesticide problems.
- Forest resources.
  - Use and over-exploitation.
  - Mining and dams – their effects on forest and tribal people.
- Water resources.
  - Use and over- utilization of surface and groundwater.
  - Floods, droughts.
  - Water logging and salinity.
  - Dams –benefits and costs.
  - Conflicts over Water.Energy resources
- Energy resources.
  - Energy needs.
  - Renewable and non renewable energy sources.
  - Use of alternative energy sources.
  - Impact of energy use on environment (8 Lectures)

Module 4 : Bio-diversity and its conservation.

- Value of bio-diversity -consumptive and productive use, social, ethical, aesthetic and option values.
- Bio-geographical classification of India – India as a mega diversity habitat.
- Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc.
- Conservation of bio-diversity – Insitu and Ex-situ conservation. (3 Lectures)

Module 5 : Environmental Pollution –Local and Global Issues.

- Causes, eeefffects and control measures.
  - Air pollution.
  - Indoor air pollution.
  - Water pollution.
  - Soil pollution.
  - Marine pollution.
  - Noise pollution.
  - Solid waste management, composting, vermiculture.

- Urban and industrial wastea, recycling and re-use.
- Nature of thermal pollution and nuclear hazards.
- Global warming.
- Acid rain.
- Ozone depletion. (8 Lectures)

Module 6 : Environmental Problems in India.

- Drinking water, sanitation and public health.
- Effects of the activities on the quality of environment.
  - Urbanization.
  - Transportation.
  - Industrialization.
  - Green revolution.
- Water scarcity and groundwater depletion.
- Controversies on major dams – resettlement and rehabilitation of people: problems and concerns.
- Rain water harvesting, cloud seeding and watershed management. (5 Lectures)

Module 7 : Economy and Environment.

- The economy and environment interaction.
- Economics of development, preservation and conservation.
- Sustainability: theory and practices.
- Limits to growth.
- Equitable use of resources for sustainable life styles.
- Environmental Impact Assessment. (4 Lectures)

Module 8 : Special issues and Environment.

- Population growth and environment.
- Environmental education.
- Environmental movements.
- Environment vs Development. (2 Lectures)

Module 9 : Institutions and Governance.

- Regulation by Government.
- Monitoring and enforcement of Environmental regulation.
- Environmental acts.
  - Water (Prevention and control of pollution) act.
  - Air (Prevention and control of pollution) act.
  - Environmental Protection act.
  - Wild life Protection act.
  - Forest conservation act.
  - Coastal zone regulations.
- Institutions and policies relating to India.
- Environmental Governance.

Module 10 : International conventions.

- Stockholm Conference 1972.
- Earth Summit 1992.
- World Commission for Environmental Development (WCED) (2 Lectures)

Module 11 : Case Studies.

- Chipko movement.
- Narmada Bachav Andolan.
- Silent Valley Project.
- Madhura Refinery and Taj Mahal.
- Industrialisation of Patancheru.
- Nuclear reactor at Nagarjuna Sagar.
- Tehri dam.
- Ralegaon Siddhi (Anna Hazare).
- Kolleru lake. –aquaculture.
- Florosis in Andhra Pradesh. (3 Lectures)

Module 12 : Field work.

- Visit to a local area to document and mapping environmental assets –river / forest / grass land / hill / mountain.
- Study of local environment- common plants, insects, birds.
- Study of simple ecosystems –pond, river, hill, slopes etc.
- Visits to industries, water treatment plants, affluent treatment plants. (5 Lectures)

CE227 SURVEYING FIELD WORK – II

University Examination: Duration 3 hrs. Marks: 50

No of Periods per Week : 0 L+ 3 FW Sessional Marks: 50

1. Measurement of Horizontal Angles by Repitition and Reiteration methods.
2. Distance between two inaccessible points by making use of theodolite.
3. Measurement of vertical angles, heights and distances.
4. Tachometry.
5. Finding the gradients.
6. Setting out of curves by deflection angles method and by making use of two theodolites.
7. Exercises on use of G.P.S. & Total Station.

CE228 FLUID MECHANICS LABORATORY – I

University Examination: Duration 3 hrs. Marks :50

No of Periods per Week : 0 L+ 3P Sessional Marks: 50

1. Calibration of Small orifice, by constant head method and Time of emptying a tank through a small orifice.
2. Calibration of Cylindrical mouthpiece by constant head method. and and Time of emptying a tank through a Cylindrical mouthpiece.
3. Calibration of Convergent mouthpiece by constant head method.
4. Calibration of Borda's mouthpiece by constant head method.
5. Calibration of Venturi meter.
6. Calibration of Orifice meter.
7. Calibration of Flow nozzle meter.
8. Calibration of sharp – crested full width and contracted weirs.
9. Calibration of V-notch and Trapezoidal notch
10. Calibration of Broad-crested weir.

B. E. III / IV (CIVIL) 1 st SEMESTER

CE311 REINFORCED CONCRETE STRUCTURES – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

General : Loading standards as per IS 875, Grades of steel and cement, Stress-Strain characteristics of concrete and steel, Limit State Method (L.S.D.) of design.
Limit State of Collapse of in Flexure : Central Value measures, Measures of distribution, Normal distribution curve. Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

UNIT – I Limit State of Collapse: Flexure of R.C.C. beams of rectangular section. Under reinforced, Balanced and over reinforced sections. Compression stress block, Estimation of ultimate moment by strain compatibility. Guide lines for choosing width, depth and percentage of reinforcements in beams.
Analysis and design of singly reinforced rectangular beams and doubly reinforced beams, design by using SP 16 and Torsteel Design Aids By K.T.S. Iyyangar and Viswanatha (Sessional Work Only)
Design of flanged beams (T and L), Effective flange width, Basis of analysis and design, Minimum and Maximum steel in flanged beams, SP 24 in design of beams.

UNIT – II : Design of one way and two way slab : Simply supported slabs on all four sides, Moment in two way slabs with corners held down. Choosing slab thickness. Design of restrained slabs (with torsion at corners) I.S.

code provisions. Detailing of reinforcement. Load from slabs on supporting beams. Different kinds of loads on slabs including partition walls, Shear in slabs.

UNIT III : SHEAR, TORSION AND BOND : Limit state of collapse in shear, types of shear failures. Truss analogy, shear span / depth ratio. Calculation of shear stress, types of shear reinforcement. General procedure for design of beams for shear. Enhanced shear near supports. Shear in slabs, steel detailing. Analysis for torsional moment in a member. Torsional shear stress in rectangular and flanged sections. Reinforcement for torsion in RC beams. Principles of design for combined bending shear and torsion. Detailing of torsion reinforcement – Concept of bond, development length, anchorage, bond, flexural bond.

UNIT – IV : Columns : Short and Long columns, Minimum eccentricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial and biaxial moments.
Footings : Analysis and design of isolated rectangular footings.
Design of stair case, Mix design by I.S. Code method only.

UNIT - V Working Stress Method – General Introduction, Fundamental Assumptions, Method of Transformed Sections, Stress- Strain relationship. – Rectangular Sections in Bending with Tension Reinforcement only – Under-reinforced, Idealy reinforced Balanced and Over-reinforced Sections – Design of Rectangular sections in Bending with Tension Reinforcement only and with both Tension & Compression reinforcement. – Non-rectangular sections in Bending (T and L sections)

TEXT BOOKS :
Limit State of Design of Reinforced Concrete – P. C. Vergheese
Reinforced Concrete Limit state Design – A.K. Jain.
R.C.C Design – Unnikrishna Pillai and Vasudeva Menon.
REFERENCES :
Reinforced Concrete Limit state Design - P. Dayaratnam
- Purushothaman
- Park and Paulay
- James G. Mac Gregor

CE 312 STEEL STRUCTURES – I

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

Note: All the designs should be taught in the limit state design method as per IS 800-2007

UNIT – I:
Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel.

Bolted connections: Behavior of bolted joints, Desing strength of ordinary black bolts, high strength friction grip bolts, Pin connections, Simple connections, Moment resistant connections.

UNIT – II:
Welded Connections :Advantages of welding,Types and properities of welds, Types of joints,wled specifications Design of welded joints subjected to axial load, Eccentric welded connections.

UNIT – III:
(a)Tension members: Types of tension members, Design of strands, slenderness ratio, displacement of tension members, behavior of tension members, modes of failure, factors affecting strength of tension members, angles under tension, design of tension members, Lug angles, splices.

(b)Compression members: Possible failure modes, classification of cross-section, behavior of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in

compression, Design of axially loaded compression members, Built up compression members, Laced and Battened columns, eccentrically loaded columns, Column splices.

UNIT – IV:
(a) Beams: Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, Laterally supported and unsupported beams, Design of built up beams..

(b) Roof trusses : Types of trusses, Economical spacing of roof trusses, loads on roof trusses, Estimation of wind load on roof trusses as per IS : 875. Design of members of roof truss and joints, Design of purlins.

UNIT – V
(a) :Column bases and Foundations : Allowable stress in bearing, Slab base, Gusset base and Grillage foundations.
(b) Introduction to pre-engineered structures, concepts and advantages, disadvantages.

REFERENCES :

Design of Steel structures – N. Subramanian, Oxford University Press.
Design of steel structures – Ramchandra (Vol. I & II)
Limit State Design of steel structures IS: 800-2007-V.L. Shah and Veena Gore, Structures Publications, Jai – Tarang, 36 Parvati, Pune.
Design of steel structures by imit State Method as per IS: 800-2007 – S.S. Bhavikatti IK Internatinoal Publishing House, Bangalore – 560 001.

CE313 - Fluid Mechanics – II

University Examination: Duration 3 hrs. Marks :70
No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

Unit I Viscous Effects on Fluid Motion.	
(1) Laminar Flow and N.S. Equations.	Equation of Motion for Real Fluids- Modifications in Equation of Motion- Stress Strain Relationships -Tangential Stress Terms- Development of Navier-Stokes Equations - Solution of N.S. equations for standard cases of Plane two Dimensional and Axi-symmetric Flows.
(2) Plane Two-dimensional Flows.	Steady Flow between Parallel Plates- Couette and Poiseuille Flows- Unsteady laminar Flow Past a Flat Plate,
(3) Axi- symmetric Flows.	Flow through a Circular Annulus- Flow without and with Pressure Gradient- Hagen-Poiseullie Equation, Relationship between Friction factor and Reynolds Number for Laminar Flow through Pipes.
(4) Special Cases of Viscous Flow	a) Laminar Flow between Co-axial Cylinders, b) Hydrodynamic Lubrication and c) Low Reynolds Number Flow Around a Sphere.
(5) Turbulent Flow & its Characteristics	Transition from Laminar to Turbulent Flow- Critical Reynolds Number-Stability Parameter- Characteristics of Turbulent Flow –Mean and Fluctuating Components of Velocity – Quantitative Description of Turbulence - Statistical Nature of Turbulent Flow- Isotropic and Homogeneous Turbulence.
(6) Analysis of Turbulent Flows.	Turbulence Modelling – Semi-empirical Theories –Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept, Karman Similarity Hypothesis - Basic Concepts related to the following Governing Equations of Turbulent motion - (i) Continuity Equation, (ii) Reynolds Equations – Reynolds Stress Tensor.

Unit II Boundary Layer Theory	
(7) Boundary Layer Analysis.	Theory of Boundary Layer – Characteristics of Laminar Boundary Layer - Boundary Layer Growth over a Flat Plate (without pressure gradient) - Laminar and Turbulent Boundary Layers, Boundary Layer Thickness and its Characteristics- Displacement, Momentum and Energy Thickness.

(8) Hydrodynamically Smooth & Rough Boundaries.	Velocity Distributions for Turbulent Flow in Pipes- Hydrodynamically Smooth and Rough Flows-Velocity Defect Law- Von Karmans' Universal Law for Mean Velocity near Smooth and Rough Boundaries- Relationship between Mean Velocity and Maximim Velocity.
(9) Resistance of Commercial Pipes.	Friction Factor for Pipe Flows- Dependence on Reynolds Number and Relative Roughness- Resistance of Commercial Pipes- Moody's Diagram- Simple Pipeline Design Problems.
(10) Viscous Drag and Boundary Layer Separation.	Karman Momentum Integral Equation- Viscous drag, Boundary, Layer Separation- Mechanism of Separation -Control of B.L. Separation.

Unit III Drag, Lift & Propulsion.	
(11) Concepts of Drag and Pressure Distribution over Immersed Bodies.	Drag and Lift- Deformation Drag, Friction Drag, Form Drag- Drag coefficient. Distribution of Fluid Pressure on immersed bodies – Pressure Distribution for flow past a circular disk, sphere- Effects of eddy pattern in two dimensional flow – Distribution of pressure for two dimensional flow past a cylinder - Von Karman vortex trail- Eddy shedding; Drag of immersed bodies - Variation of Drag Coefficient with Reynolds Number; Drag on Cylinder –Resistance diagram for bodies of revolution- Drag Coefficient of Practical Bodies.
(12) Lift & Propulsion	Effect of Circulation in Irrotational Flow- Generation of Lift around a Cylinder- Magnus Effect- Computation of Lift Force- Lift on Airfoil- Lift Coefficient and its Variation with Angle of Attack- Jukowsky Profile- Polar Diagram- Stall - Induced Drag

Unit IV Open Channel Flows – I.	
(13) Basic Concepts.	Introduction, Classification of Open Channels- Classification of Flow. Channel Geometry – Geometric Elements of a Channel Section. Velocity Distribution in a Channel Section – Wide Open Channel – Measurement of Velocity – Velocity Distribution Coefficients – Pressure Distribution in a Channel Section – Effect of Slope on Pressure Distribution. Basic Equations – Chezy's Equation – Manning's Equation.
(14) Uniform Flow in Rigid & Mobile Boundary Channels	Uniform Flow Computation- Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow. Determination of Normal Depth and Velocity. Design of Channels for Uniform Flow – Design of Nonerodible Channels –Best Hydraulic Section – Determination of Section Dimensions for Uniform Flow for Uniform Flow - Most Economical Channel Sections- Rectangular, Trapezoidal, Circular and Triangular Channel Sections - Critical Flow –Computation of Critical Flow – Section Factor for Critical Flow.
(15) Design of Channels for Uniform Flow	Design of Channel Sections for Non-erodible channels –Design of Erodible Channels- Critical Velocity and Critical Tractive Force Concepts.
(16) Application of Energy Principle in Open channels.	Definition of Specific Energy, Conjugate or Alternate Depths- Sub-critical, Critical and Super-critical Flows- Froude Number- Specific Energy Diagram, Critical depth, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections.
(18) Application of Momentum Principle in Open channels.	Specific Force- Sequent Depths- Hydraulic Jump in Rectangular Horizontal Channels- Loss of Energy due to Hydraulic Jump- Types of Jumps and their features.
(19) Canal Transitions & Control Sections.	Canal Transitions- Change of Depth in Channels with (a) Change in Cross-section and (b) Hump in the Bed- Control Sections- Venturi Flume and Parshall Flume.

Unit V Varied Flow in Open Channels.	
(20) Analysis & computation of G.V.F.	Definition of G.V.F. and Derivation of Governing Equation- Mild, Steep, Critical, Horizontal and Adverse Slopes- Classification of G.V.F. Profiles- Backwater and Drawdown Curves- G.V.F. Profiles for Channels with Changing Slopes.

	Computation of G.V.F. Profiles- Graphical Integration Method and method of Direct Integration (Procedures Only), Direct Step and Standard Step Methods – Computation of G.V.F. Profiles in rectangular channels using Direct and Single Step methods (Simple Slope cases only).
(21)Practical Problems in G.V.F. and Rapidly Varied Flow.	Two Lake (Reservoir) Problems – Delivery of a canal for sub-critical flow – Delivery of a canal for supercritical flow. Rapidly Varied Flow – Hydraulic jump – Types of jump – Hydraulic jump in horizontal rectangular Channels – Hydraulic jump in sloping rectangular channels.
(22) Spatially Varied Flow	Basic principles and assumptions – Dynamic equation for spatially Varied Flow for Flows with increasing and decreasing discharges-Analysis of Flow Profile for i) Rectangular lateral-spillway channel with free- overfall without losses and ii) Rectangular channel of small sloe with a bottom rack.

Text Books

(1) Engineering Fluid Mechanics by K.L. Kumar S. Chand & Co.
(2) Fluid Mechanics by A.K. Jain Khanna Publishers.
(3) Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth Standard Book House
(4) Flow through Open Channels by K. Subramanya
(5) Flow through Open Channels by K.G. Ranga Raju

CE314 GEOTECHNICAL ENGINEERING – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

UNIT – I : A) Introduction: Historical development – Physical properties of Soil – Void ratio – Porosity, Degree of Saturation, Water content, Unit Weights, Specific Gravity – their relationships, Relative density. Consistency limits – determination and various indices – plasticity index Liquidity index – Significance and Importance, Activity.

Classifications : Mechanical analysis – Sieve analysis, stoke's law, hydrometer and Pipette Analysis Textural Classification, Structural Classification based on size – unified soil classification and modification by Bureau of Indian Standard.

B). Soil Hydraulics – Types of soil water capillary rise and surface tension, Darcy's law and its limitations constant head and variable head permeameters pumping tests, Factors effecting coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, No flow downward flow and upward flow conditions, quick sand conditions, critical hydraulics gradient.

UNIT – II : Stress distribution : Bousinesq's theory for determination of vertical stress, assumptions and validity, extension to rectangular and circular loaded areas, 2 : 1 approximate method, westergard's theory Newmarks influence chart. Construction and use, contact pressure distribution beneath footings.

Consolidation : Oedometer Test, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi's one dimensional consolidation theory assumption, derivation and application, coefficient of consolidation time curve fitting methods, initial compression, primary compression and secondary compression determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

UNIT – III : Compaction : Mechanism of compaction Factors effecting compaction – water content, compactive effort, Nature of soil. B.S., Modified AASHO and IS compaction tests. Effect of compaction on physical and engineering properties of soils, Field compaction – Equipment and Quality Control proctors penetrometer.

Subsoil Exploration : Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.

UNIT – IV : Shear Strength of Soils : Stress at a point, Mohr circle of stress, Mohr coulomb failure theory shear tests – shear box, unconfined compression, and triaxial compression tests, fieldvane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio and dilatancy, shear strength of clays, total stress analysis and effective stress analysis, skemptons pore pressure coefficients, stress paths.

TEXT BOOKS :

1. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao.
2. Soil Mechanics, Foundation Engineering by V.N.S. Murthy.
3. Soil Mechanics and Foundation Engineering by K.R. Arora.

CE315 ENVIRONMENTAL ENGINEERING – I

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 0 T Sessional Marks: 30

UNIT – I

Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

Water Demand and Quantity studies : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

UNIT - II

Hydrological Concepts: Hydrological Cycle, Types of Precipitation, Measurement of Rainfall. Surface sources of water: Lakes, Rivers, Impounding Reservoirs, Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, Springs, Wells and Infiltration galleries, Yields from wells and infiltration galleries.

Collection of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water : Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Laying of pipe lines.

UNIT - III

Quality and Analysis of Water : Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

UNIT –IV

Treatment of Water : Flowchart of water treatment plant, Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, Defluoridation, Removal of Odours.

UNIT – V

Distribution of Water : Methods of Distribution system, Components of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks, Water connection to the houses.

References :

1. Environmental Engineering – Peavy, Rowe, Tchenobolus
2. Elements of Environmental Engineering – K.N. Duggal
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S.Birdie
4. Water Supply Engineering – Dr. P.N.Modi
5. Water Supply and Wastewater Engineering – Dr. B.S.N.Raju
6. Water Supply Engineering – B.C. Punmia
7. Water Supply Engineering – Hussain
8. Water Supply Engineering – Chatterjee

ELECTIVE-I

CE316 A ESTIMATING AND QUANTITY SURVEYING

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction : Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

UNIT – II : Specialisations : Meaning, purpose, types of specialisations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Race analysis – Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

UNIT – III : Detailed estimate of buildings. Different items of work in building; Principles of taking out quantities, detailed measurement form; long walls and shortwalls method of building estimate, Centre line method of building estimate. Estimate of RCC building, slope roof buildings; G.I. and A.C. Sheet, Detailed estimate of different types of doors and windows, electricity and water supply. Sanitation works etc.

UNIT – IV : Estimate of earth work; different formulae for calculations, estimate of metalled road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc. Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning.

REFERENCE BOOKS :

1. Estimation, Costing, Specifications and Valuation in civil Engineering by M.Chakraborti.
2. Estimating and Costing in Civil Engineering by B.N. dutta.
3. Textbook of estimating and costing by G.S. Birdie.
4. Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli.
5.

3 /4 BE (Civil) First Semester

CE 316B REPAIR AND REHABILITATION OF STRUCTURES (Elective)

University Examination: Duration 3hrs Marks 70

Sessional Marks: 30

No. of Periods per week: 4L+2T

UNIT-I: Materials: Construction chemicals, Mineral admixtures, Composites, Fibre reinforced concrete, High performance concrete, polymer-impregnated concrete.

UNIT-II: Techniques to test the existing strengths: Destructive and non destructive tests on concrete.

UNIT-III: Repairs of Multistory structures: Cracks in concrete, possible damages to the structural element-beams, slab, Column, Footings, etc., Repairing techniques like Jacketing, Grouting, External prestressing, Use of chemical admixtures, Repairs to the fire damaged structures.

UNIT-IV: Foundation problems: Settlement of shallow foundations – repairs, sinking of piles, wells – repairs.

UNIT-V: Corrosion of Reinforcement: Preventive measures – coatings –use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, flowing concrete.

Reference:

1. "Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.
2. "Concrete Structures: Repairs, water proofing and protection" by Philip H. perkins, Applied sciences publications Ltd., London, pp.302.
3. "Durability of concrete structure: Investigation, Repair, Protection" Edited by Geoffmang., E. & FN SPON, An imprint of Chapman & Hall, pp.270.
4. "Deterioration, maintenance and Repair of structures" by Johnson, McGraw Hill, pp.375.

3/4BE (Civil) First Semester

CE 316C DISASTER MANAGEMENT (Elective)

University Examination: Duration 3hrs Marks 70
Sessional Marks: 30
No. of Periods per week: 4L+2T

UNIT-I: Concept of disaster management. Types of disasters. Disaster mitigating agencies and their organization structure at different levels. Overview of Disaster situations in India: Vulnerability profile of India and vulnerability mapping including disaster prone areas, communities and places.
UNIT-II: Disaster preparedness-ways and means; skills and strategies; rescue, relief, reconstruction and rehabilitation.
UNIT-III: Seismic vulnerability of urban areas. Seismic response of R.C frames buildings with soft first storey. Preparedness for natural disasters in urban in urban areas. Preparedness and planning for an urban earthquake disaster. Urban serrlements and natural hazards. Tsunami and its impact.
UNIT-IV: Landslide hazards zonation mapping and geo-environmental problems associates with the occurrence of landslides. A statistical approach to study landslides. Land causal factors in urban areas organization of mockdrills.
UNIT-V: Role of remote sensing, science & technology, Rehabilitation programmes, Management of Relief Camp, information systems & decision making tools, voluntary Agencies & community participation at various stages of disaster Management, School Awareness & Safety programme

Book:

1. "Natural Hazards in the Urban habitat" by lyengar, CBRI, Tata McGraw Hill
2. "Natural Disaster management", Jon Ingleton (Ed), Tulor Rose, 1999
3. "Disaster Management", RB Singh (Ed), Rawat Publications, 2000.
4. Anthropology of Disaster management", Sachindra Narayan, Gyan Publishing house, 2000.

CE317 ENVIRONMENTAL ENGINEERING LABORATORY-1

University Examination: Duration 3 hrs. Marks:50
No of Periods per Week : 0 L+ 3P Sessional Marks: 50
Experiments on :

1. (a) p^H.
   (b) Conductivity.
2. (a) Turbidity.
   (b) Jar Test .
3. Hardness.
4. Acidity estimation.
5. Alkalinity estimation.
6. Available Chlorine & Residual Chlorine.
7. Fluorides.
8. Iron Estimation.
9. Estimation of Total Solids : Settleable Solids : Suspended solids, dissolved solids.
10. D.O.
11. B. O. D.
12. C. O. D.
13. Chlorides.

CE318 GEOTECHNICAL ENGINEERING LABORATORY – I

University Examination: Duration 3 hrs. Marks :50
No of Periods per Week : 0 L+ 3P Sessional Marks: 50

1. Atterberg limits
2. Field density by Core Cutter and Sand replacement method.
3. Grain size analysis
4. Hydrometer/pipette analysis.
5. Specific gravity by pycnometer/density bottle method.
6. Permeability of soil – Constant and variable head tests.
7. IS light compaction.

DEMONSTRATION EXPERIMENTS :

1. Consolidation test.
2. Quick sand model and others if any.

CE319 SOFT SKILLS

(COMMON WITH OTHER BRANCHES)

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, Analysing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

CE321 STRUCTURAL ANALYSIS – III

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii)Castigliano's theorm – II.

UNIT – II : Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (I)slope-deflection method (ii)moment distribution method (iii)Kani's method, (iv) Column Analogy.

UNIT – III : Arches : Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

UNIT – IV : Suspension bridges : Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

UNIT – V : Introduction to matrix methods of structural analysis (Very elementary treatment only) Static indeterminacy, Kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only. – Truss with 3 supports and 7 members.

TEXT BOOKS :

1. Statically indeterminate structures – C.K. Wang
2. Structural analysis – A matrix approach – G.S. Pandit and S.P. Gupta.
3. Indeterminate Structures by R.l. Jindal
4. Indeterminate Structural Analysis by J.S. Kinney.

CE322 REINFORCED CONCRETE STRUCTURES – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Retaining Walls : Types of retaining walls, forces on retaining walls, Rankine and Coloumb earth pressure theories (c and ϕ soils). Passive earth pressure, Drainage of retaining walls. Stability requirements. Preliminary proportioning of cantilever retaining walls. Design of cantilever and counterfort retaining walls.

UNIT – II : Water Tanks : Stress in concrete and steel in water tanks, Modular ratio, Impermeability requirements, Under ground rectangular tanks, Elevated rectangular and circular tanks, Design of these tanks for strength and cracking, Design of staging of rectangular tanks.

UNIT – III : Bridges : Components of a bridge in sub structure and super structure. Classification of bridges. Highway loading standards, kerbs, footpaths, railings, parapet loadings, Impact, wind, longitudinal forces.
Design of solid slabs (casual reference to MOST drawings)
Design of T-beam bridge deck slab, Longitudinal and Cross beams (casual reference to MOST drawings)
Courbon's theory.

UNIT – IV : Piles and Pile caps : Design of bored cast in situ piles (bearing and friction types), under reamed piles. Pile Caps design; bending and truss methods.

UNIT – V: Prestresed Concrete – Reinforced Concrete Versus Prestressed Concrete. – Prestressing Systems (Fressinet, Gifford Udal, Magnel Blatten) – Prestressing Losses – Steel and Concrete for Prestressing – Homogeneous Beam Concept, limiting eccentricities, Pressure line, Elastic Stress distribution across the depth due to D.L. eccentric prestress and L.L.

TEXT BOOKS :

1. Limit State of Design of Reinforced Concrete – P.C. Vergheese
2. Reinforced Concrete Limit State Design – A.K. Jain.
3. Design of reinforced Concrete Structures – P. Dayaratnam.

CE323 STEEL STRUCTURES – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

Note: All the designs should be taught in the limit state design method as per IS 800-2007".

UNIT – I :Plate Girders: Components of a plate girder, Economical depth, Design of flanges (flange area and moment of inertia methods), curtailment of flange plates, connection of flange angles to web and flange angles to flange plates.

UNIT – II :Web stiffeners : Vertical stiffener, horizontal stiffener, Bearing stiffener.
Web splices : Rational, Shear and Moment splices, Splices of flange angles and flange plates.

UNIT – III : Bridges : Loadings, Deck type and through type bridges, Plate girder bridges, design of stringers, cross girders, wind bracings. Design of cross girder bridges, tension and compression members, joints, wind bracings.
Bearings : Types of bearings, plate bearing, Rocker bearing, Roller bearing, Knuckle pin bearing.

UNIT – IV :Water tanks, Introduction, Design of elevated circular and rectangular water tanks, Design of pressed steel tanks.

UNIT – V : Plastic analysis : Introduction, Upper and Lower bound theorems, Uniqueness theorem, Shape factor, Load factor
Beams : Collapse load for fixed and continuous beams, Design of beams
Frames : Collapse load for a frame of single bay single storey frame.

REFERENCES :

Design of Steel structures – N. Subramanian, Oxford University Press.
Design of steel structures – Ramchandra (Vol. I & II)
Limit State Design of steel structures IS: 800-2007-V.L. Shah and Veena Gore, Structures Publications, Jai – Tarang, 36 Parvati, Pune.
Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti IK Internatinoal Publishing House, Bangalore – 560 001..

CE324 GEOTECHNICAL ENGINEERING – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 1 T Sessional Marks: 30

UNIT – I : Bearing Capacity : Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, General and local shear failure conditions. Factors affecting bearing capacity of Soil. Allowable bearing pressure based on N-values. Bearing capacity from plate load tests. Shallow Foundations : Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations. Foundations on expansive soils.
Settlement analysis : causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

UNIT – II : Pile Foundations : Types, Construction, load carryig capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

UNIT-III: Caissons : Types of caissons, pneumatic caissons, Different shapes of well foundations. Relative advantages and disadvantages. Different Components of well and their function. Grip length, problems in well sinking and remedial measures.
Stability Analysis of Slopes : Finite Slopes Fellinius slip circle method, Friction Slip circle method and Taylor's stability numbers, types of failure of finite slopes – Toe slope and Base failure. Infinite slope, factors of safety.

UNIT – IV : Earth Pressure : Types of Earth pressure. Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure. Bulkheads – Classifications, Cantilever sheet Piles in Sandy soils and clay soils. Analysis of Anchored bulkheads – free earth support and fixed earth support methods.

NOTE : This course does not cover structural design of foundations.

TEXT BOOKS :

1. Analysis, Design of foundations and Earth retaining structures by Shamsher Prakash, Gopal Ranjan and Swami Saran.
2. Foundation Analysis and Design – J. E. Bowles.
3. Soil Mechanics and Foundation Engineering – By K.R. Arora.

CE325 - FLUID MECHANICS - III

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT I: Dimensional Analysis and Similitude.	
(1) Fundamental Concepts of Dimensional Analysis	Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities- Dimensional Homogeneity.
(2) Methods of Arriving at Dimensionless Groups.	Non-dimensional Parameters- Raleigh's Method- Buckingham's π method- Buckingham's modified method- Omitted and Superfluous variables.
(3) Examples in Dimensional Analysis	Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,
(4) Similarity and Similarity Laws.	Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities- Modeling Criteria- Similarity Laws- Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.
(5) Application of Similarity Laws to Practical Problems	Bodies Completely submerged in Fluids, Bodies subjected to Gravity and Viscous Forces, River Models- Manning's Law- Distorted Models -Depth distortion and slope distortion. Problems related to Modeling of Tides, Harbours, and Pumps & Turbines.

Unit II Hydraulic Machinery – I Turbines.	
(6) Introduction and Classification of Turbines.	Function of Prime movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action- Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbines, choice of Type of Turbine-Specific Speed.
(7) Working of Impulse Turbines.	Component Parts & Working Principles of a Pelton Turbine- Recapitulation of Work Done by series of vanes mounted on Wheel- Velocity triangles, Simplified Form of Velocity Triangles for a Pelton Turbine Bucket; Hydraulic and Overall Efficiencies.
(8) Design Principles of Impulse Turbines.	Design Principles of Pelton Turbine- Fixing Various Dimensions of Bucket of a Pelton Turbine- Governing Mechanism for a Pelton Turbine.
(9) Working of Reaction Turbines & Design Principles.	Component Parts & Working Principles of a Francis Turbine- Design Principles of Francis Turbine- Arriving at vane Angles- Governing Mechanism for a Francis Turbine. Draft Tube Theory-Functions and Types of Draft Tubes in Reaction Turbines- Efficiency of Draft Tube.

(10) Performance characteristics of Turbines	Unit Quantities – Specific Speed and its importance – Model Relationships. Performance Characteristics of Turbines - Operating Characteristics- Iso-efficiency Curves.

Unit III Hydraulic Machinery – II Centrifugal Pumps.	
(11) Centrifugal Pumps	Functions of a Pump- Types of Pumps- Selection Criterion - Rotodynamic and Positive displacement Pumps- Comparison between Centrifugal & Reciprocating Pumps.
(12) Component parts & Working principles of centrifugal pumps	Centrifugal Pumps- Component Parts, Classification of Centrifugal Pumps / Impellers based on Shape and Type of Casing- Pump with Volute Casing, Pump with Vortex Chamber& Pump with Guide vanes, Closed, Semi-closed & Open Impellers, Axial, Radial & Mixed Flow Impellers; Shape and Number of Vanes; Working Principles of Centrifugal Pumps- Working Head and Number of Stages, Single & Double Suction.
(13) Work done by centrifugal pumps	Pressure Change in a Pump, Manometric and Static Head- Velocity Vector Diagrams– Effect of Vane Shape. Work Done -Pump Losses and Efficiency- Pressure Rise in the Impeller- Minimum Starting Speed of pump- Multi Stage Pumps; Pumps in Parallel and Series
(14) Cavitation & NPSH	Cavitation- maximum Suction Lift- NPSH and its Importance in Selection of Pumps,

Unit IV Hydraulic Machinery – III Reciprocating Pumps & Pump Performance.	
(15) Reciprocating Pumps.-Fundamental concepts	Reciprocating Pumps- Component Parts- Operation of Single Acting and Double Acting Reciprocating Pumps- Discharge Co-efficient, Volumetric Efficiency and Slip.
(16) Work done by Reciprocating pumps	Work Done and Power Input- Indicator Diagram, Effect of Acceleration and Friction on Indicator Diagram, Maximum Speed of Rotation of Crank.
(17) Air Vessels and their principles	Air Vessels and their Effect, Modified Indicator Diagram in the presence of Air Vessels, Work Saved due to Presence of Air Vessel- Flow into and from Air Vessel.
(18)Performance characteristics of Pumps	Similarity Relations and Specific speed of Pumps- Performance Characteristics of Centrifugal Pump- Dimensionless characteristics -Constant efficiency curves of Centrifugal Pumps.

UNIT V: Unsteady flows in Pipes & Open channels	
(19) Water hammer & Governing equations	Definition – General discussion, classification of conduits- general equation for water hammer- Allevie's water hammer charts- Arithmetic integration method. Water hammer for the case of pump fitted in a pipe line.
(20) Control of water hammer	Pressure conditions along the penstock – Mechanically operated relief valves, Surge tanks types, Design principles of Surge Tanks (Simple Surge Tanks only)
(21)Unsteady Flows in Open Channels.	Gradually Varied Unsteady Flow –Dynamic Equation for Unsteady Flow – Monoclinical Rising Wave –Dynamic Equation for Uniformly Progressive Flow. Flood Routing concepts – Channel & Reservoir routing – Hydraulic & Hydrological methods. Wave Profile of Uniformly Progressive Flow- Dam Break Problem - Wave Propagation.(Solution of Unsteady-flow equations and Spatially varied Unsteady Flow are excluded)
(22) Rapidly Varied Unsteady Flow	Rapidly Varied Unsteady Flow - Uniformly Progressive Flow – Moving Hydraulic jump – Positive and Negative Surges – Surges in Power canals, Canal Transitions and Channel Junctions –Pulsating Flow.

Text Books

(1) Engineering Fluid Mechanics by K.L. Kumar S. Chand & Co.
(2) Fluid Mechanics by A.K. Jain Khanna Publishers.
(3) Fluid Mechanics by D.S. Kumar.
(4) Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth -Standard Book House
(5) Hydraulic Transients by Richie
(6) Hydraulic Transients by Streeter

CE326 ELECTIVE – II

CE326 A ENVIRONMENTAL IMPACT ANALYSIS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to EIA. Definition of E IA and EIS.C.E. guidelines in USA, preparation of EIS, Elements of EIA (1 question either/or).

UNIT – II : Agency Activities, Environmental setting. Environmental attributes, air, water, soil, ecology, noise Socio-Economic aspects, Culture and human aspects (Human settlements – rehabilitations) (1 question either/or).

UNIT – III : Environmental impacts, Identification measurement, Aggregation, Secondary and Cumulative Impacts (1 question either/or).

UNIT – IV : Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement (1 question either/or).

UNIT – V : Case studies, Economic impact analysis energy production impact analysis, cost benefit analysis, Environmental impact mitigation and control measures. (1 question either/or).

REFERENCE BOOKS :

1) Environmental Impact Analysis – Urban & Jain.
2) Environmental Impact Analysis – Canter, Mc. Graw Hill Publishers.

CE326 B STRUCTURAL DYNAMICS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to Structural Dynamics – Types of prescribed Loads – Analysis of Dynamical behaviour of Structures – Mathematical and Analytical Models – Degrees of Freedom. Single degree freedom – Un-damped and Damped Systems - Free body diagram – Solution of Differential equation of Motion – Frequency, Period and Amplitude – Logarithmic decrement – Simple Problems.

UNIT – II : Free Vibration of SDOF Systems – Response of SDOF System to Harmonic Excitation, Dynamic Excitation – Rayleigh's method- Vibration measuring instruments, Types of Damping Systems – Response Spectra.---------

UNIT – III : Mathematical model of MDOF Systems – Vibration of Un-damped two Degrees of Freedom system – Simple Problems – Free Vibration of MDOF System – Natural Frequencies & Mode shapes – Mode Superposition method as per IS 1893 Code of Provisions.

UNIT – IV : Shear Building – Free Vibration of Shear Building – Dynamic Analysis of Simple Beam, Plane Frame and Plane Truss – Equation of Motion – Formulation of Element Stiffness Matrix only.

UNIT – V : Introduction to Earth Quake Response of Structures – Response of SDOF and MDOF systems to earth quake excitation – Simple problems on SDOF System - Concept on Seismic Design – IS 1893 (1984) – Provisions for Seismic Design of Buildings.

Text Book :

1) Structural Dynamics by Mario Paz

References :

1) Dynamics of Structures by R.W. Clough & J. Penzien
2) Dynamics of Structures by Anil . K. Chopra
3) Earth quake Engineering by A.R. Chandrasekharn & Jaikrishna.

CE326 C RIVER ENGINEERING

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Incipient Motion of Sediment Particles. Critical tractive force.
Regimes of Flow : Ripple and dune regime, antidune regime, importance of regimes of flow.
Bed Load Transport : Bed load equations.
Suspended Load Transport : General equation of diffusion, integration of sediment distribution equation, method of integrating curves of concentration X velocity, simple relations for suspended load.

UNIT – II : Bed Level Variation in Alluvial Streams : Continuity equation for sediment, equilibrium depth of scour in long channel contractions, general mathematical models, silting of reservoirs, local scour.
Variation in Plan form of Streams : Secondary currents, flow in rigid boundary open channel bends, scour and deposition at Alluvial Bends, sediment distribution at channel bifurcations, meandering, lateral migration of Alluvial Streams cutoffs, delta formation.
UNIT – III : Sediment control in Canals : Methods of sediment control.
River Training : Objective of river training, river training for flood control, navigation, guiding the flow, sediment control, stabilization of rivers.
Alluvial River Models, Debris Flows, Density Currents.

UNIT – IV : Unsteady Flow : Governing Equations for one – dimensional flow, channel routing, kinematic routing, diffusion routing, Muskingum – Cunge routing.

REFERENCES:

1) R.J. Garde and K.G. Ranga Raju, Mechanics of sediment transportation and Alluvial stream problems, Wiley Eastern limited, 1977.
2) M.Hanif Chaudhry, open channel flow, Prentice hall of india private limited, 1994.

CE326 D REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to remote sensing : Introduction, A brief history of RS, Energy sources and radiation principles, sensor systems used in RS, RS satellites, land sat, spot, IRS etc., RS data products, RS analysis examples – measurement analysis – classification.
RS in civil engineering projects : Topographic mapping : Geometric characteristics, digital elementary model, Cartographic requirements of satellite data, Mapping using SLAR.
Resource Mapping : Geometric and hydrographic features. Soil mapping and characteristics.
Application in water resource engineering. Environmental pollution monitoring.
Regional and urban mapping, planning systems and waste disposal sites.

UNIT – II : INTRODUCTION TO GIS :
Introduction, GIS overview, Engineering of GIS applications, GIS components.
Data Structures in Thematic maps :
Data structures for GIS, Data base structures, Data models, H,N,R query languages for data models. The nature of geographic data, spatial data models, Raster data models, Vector data models, Data base management for GIS, Data structures for Thematic maps. The choice between Raster and vector.

UNIT – III : DIGITAL ELEVATION MODELS :
Importance of DEM, Methods of DEM, Image methods, Data sources and sampling methods for DEM.
DATA INPUT, VERIFICATION, STORAGE AND OUTPUT :
Data input, Data verification, Classification, and storage data output.
DATA QUALITY, ERRORS AND NATURAL VARIATION :
Components of data quality, sources of errors, nature of boundaries, statical nature of boundaries, combining attributes from overland maps.

UNIT – IV : GIS ANALYSIS FUNCTIONS :

Introduction, Organization of data analysis, Classification of functions, maintenance and analysis of spatial data, Maintenance & analysis of nonspatial attribute data, integrated analysis of spatial & nonspatial data, output formatting, cartographic modeling.

UNIT - V: CHOOSING AND IMPLEMENTING A GIS

Awareness, need for GIS, Developing system requirements, evaluation of alternative systems, system justification and development of an implementation plan, operational system.

REFERENCE BOOKS :

Principles of Geographical information systems for land resource assessment – P. A. Burrough (Clarendon Press, Oxford).
Geographic Information systems a management perspective Stan Aronoff (WDL Publications, Ottawa, Canada).
Remote sensing in civil engineering – Kennie, J.J.M., Matthews, M.C.
Remote sensing principles and interpretation – Floyd F. Sabims, Jr. W.H. Freeman & Co.

CE326 E ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT OF WATER RESOURCES PROJECTS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : ECOLOGICAL CONCEPTS : Overview : Environment, Ecology, Ecosystems Human Interaction – linkages consequences and management. Concept of sustainability .

Ecosphere : Atmosphere, Hydrosphere, pedasphere, biosphere and interactions. Residence time of elements.

Energy flow in ecosystems : Solar energy, trophic structure.

Biological building blocks : Nutrients - Macro and Micro, carbon, nitrogen, and phosphorus cycles.

Ecosystems of the world : Terrestrial systems, Estuary; Marine and Wetland Systems; relationships within the ecosystems.

Biotic and abiotic interactions, Nature's resilience.

Biogeographic regions : Forests, grasslands, deserts, Biomass productivity, agroclimatic zones.

Global ecoconcerns Climatic changes, greenhouse effect, ozone layer depletion.

UNIT – II : IMPACT ASSESSMENT : Introduction : Scope, Dams and Reservoirs, Channelisation, dredging, irrigation, hydro-power, flood & drought control projects.

Illustrative Examples. Nature of Impact, Adverse and beneficial, reversible and irreversible, short term and long term impacts.

Identification : Environmental reconnaissance, Environmental examination, and Environmental studies during planning, design and operation of projects.

Attributes (Parameters) : Air; microclimate, Water; surface water and ground water, Land; erosion, salinization, waterlogging, subsidence. Ecology; Terrestrial and aquatic flora and fauna; Human Aspects; Displacement, rehabilitation; noise pollution, project related hazards; Base line data collection.

Prediction : Qualitative methods based on past experience, quantitative methods based on mass balance and mathematical models.

Assessment : Scoping, adhoc methods, checklists, matrix methods, index method, networks, simulation and modelling, environmental evaluation system, cost benefit analysis.

UNIT – III : MANAGEMENT AND ENHANCEMENT MEASURES : Monitoring and Evaluation : Water quality standards, monitoring network and frequency of data collection, database management, Geographical Information Systems, role of Environmental management models.

Rehabilitation and Resettlement : Provision for equivalent or better standard of living, cultural, social, educational and medical facilities; live stock management; forest preservation and enhancement. Contingent plans for unforeseen dislocation.

Preventive and Remedial Measures : Saline, alkaline and waterlogged soils; extent, distribution and mode of formation; reclamation procedures, use of chemical amendments in alkali soils, surface and subsurface and vertical drainage system for saline soils; disposal of saline drainage effluent into water bodies, evaporative ponds and deep injection wells, desalinization by physical, chemical and biological treatment; reuse of saline drainage effluent, salt tolerant crops, agroforestry, aquaculture.

Lining of water distribution networks, land levelling, On Farm Water management, sprinkler and drip irrigation methods, scheduling of irrigation based on crop water requirements, crop management, biodrainage, water pricing, reallocation of water to other sectors.

UNIT – IV : Conjunctive use of groundwater and surface water : Transportation of ground water to water scarce areas, cycling and blending approaches.
Soil and Water Conservation : Erosion control, contour bunding and terracing, pasture development, afforestation, checkdams, strip cropping, agronomic practices, recycling and reuse of water, water harvesting.
Maintenance of Minimum Flow : Quality and quantity for downstream use, development of fisheries and recreational facilities.
Health hazard Mitigation : Measures against water related diseases, vector control, risk analysis.
Waste Land Development : Types of wastelands and their distribution, utilisation of wasteland for forestry, pasture.
Major Legislation in Direct and Related Areas : Awareness of legislation in respect to water quality, waste disposal, air pollution, groundwater exploitation, forestry, wild life and other environmental impact parameters.
Public Participation : Possible roles for individuals, communities and institutions; appropriate areas; public relations, aspects; role of local and outside leadership; nongovernmental organisations.

TEXT BOOKS & REFERENCES :

Ecological Concepts :

1) Dasman, R.F. Environmental Conservation, John Wiley and Sons, 1984.
2) Ehrlich, P.R. et al., Ecoscience-Population, Resources, Environment, Freeman Publication, 1977.
3) E.J., Kormondy, 'Concepts of Ecology', Prentice Hall, 1989.
4) Odum, E.P. ' Oxford and IBH Publishing Co. 1975.
5) Ramade, F. 'Ecology of a Natural Resources', John Wiley & Sons, 1982.
6) Revelle, P. and C. Revelle, 'The Environment. Issues and Choices for Society', Jones and Bartlett, 1988.

Impact Assessment :

1) Canter, L. 'Environmental Impact Assessment of Water Resources Projects'. Lewis Publishers, 1986.
2) Dee, N.; J.K. Baker; N.L. Dronby, 'Environmental evaluation System for Water Resources Planning, 1972.
3) Guidelines for Environmental Impact Assessment for River Valley Projects: Ministry of Environment and Forests, Govt. of India, 1985.
4) Jain, R.K. et al., 'Environmental Impact Assessment'. Von Nostrand, 1977.
5) Environmental Impact Guidelines for Water Resources development, U.N. Economic and Social Commission for Asia and Pacific, Bangkok, 1990.
6) Lohani, B. and North, 'Environmental Quality Management'. South Asian Publishers, 1984.

Management and Enhancement Measures :

1) Draggan, S., J.j. Cohrssen and R.E. Morrison, 'The Agenda for Long-Term Research and Development'. Praeger Publishers.
2) Goodman, 'Water Resources Systems Analysis and Management, McGraw-Hill.
3) Holdgate, M.W. and G.F. White, 'Environmental Issues (Scope Report 10)', John Wiley & Sons, 1976.
4) Ram Prasad, 'Wasteland Development', Associated Publishing Company, 1991.
5) Tanji, K.K., 'Agricultural Salinity Assessment and Management', American Society of Civil Engineers, 1990.

GENERAL REFERENCE :

Silenced Rivers – Patrick Mc Cully; Orient Longman Publications.

CE326 F OPTIMIZATION TECHNIQUES.

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

1. Introduction: Need and scope of optimization. Historical Development. Statement of optimization problems. Objective function and its surface, design variables, constraints and constraint surface. Classification of optimization problems (Various "functions) continuous, discontinuous and discrete) and function behaviour (Monotonic, Non-monotonic and unimodal).

2. Classical optimization techniques : Differential calculus method, multivariable optimization by method of constrained variation and Lagrangean multipliers (generalised problem). Kuhn-Tucker conditions for optimality,

3. 'Non-linear programming : Unconstrained minimization-Fibonacci, golden section. Quadratic and cubic interpolation methods for a one-dimensional minimization and Univariate method, Powel's method, Newton's method and Davidon Fletchar powell's method for multivariable optimization. Constrained minimization - Cutting plane method, Zoutendjik's method and penalty function methods.

4. Linear programming - Definitions and theorems - Simplex method - Duality in Linear programming. Plastic analysis and minimum weight design and rigid frame.

Reference :

1. Rao,S.S.:"Optimization theory and applications," Wiley eastern Ltd., New Delhi, 1978.
2. Robert M. Stark and Robert L. Nicholls, H, "Mathematical Foundations for Design ; Civil Engineering Systems." McGraw Hill Book Company, New York, 1972.
3. "Optimum structural Design, theory and applications" Edited by R.H. Gallegher and O.C. Zienkiewiez. John Wiley and Sons, New York, 1973.
4. Majid, K.I.: "Optimum Design of Structures" Newness-Butter-Worths. London. 1974

CE327 GEOTECHNICAL ENGINEERING LAB. – I I

University Examination: Duration 3 hrs. Marks :50

No of Periods per Week : 0 L+ 3P Sessional Marks: 50

(1) Field identification & classification of soils
(2) Unconfined compression test
(3) CBR test/plate bearing test
(4) Triaxial compression test
(5) Direct sheartest
(6) Vane sheartest
(7) Relative density
(8) Triaxial test
(9) Differential freeswell and swell pressure test.
(10) Consolidated drained
(11) Demonstration experiments (subject to availability)
(12) S.P.T.
(13) Consolidated undrained Foundation models
(14) Plate load test
(15) Pressuremeter test
(16) Field vane shear.

CE328 CONCRETE LABORATORY

University Examination: Duration 3 hrs. Marks :50

No of Periods per Week : 0 L+ 3P Sessional Marks: 50

1) Specific gravity and unit weight of cement
2) Specific gravity and unit weight of coarse and fine aggregates.
3) Determination of normal consistency of cement
4) Determination of initial and final setting time
5) Fineness of cement.
6) Determination of compressive strength of cement (for different grades of cement).
7) Bulking characteristics of sand.
8) Sieve analysis of coarse and fine aggregates and classification as per IS 383.
9) Workability tests on green concrete by using : Slump cone,Compaction factor apparatus,Flow table,Vee-Bee consistometer.
10) Tests on Hardened concrete.
11) Compressive Strength
12) Split tensile strength
13) Modulus of rupture
14) Design of concrete mix by using IS code method (for class work only)
15) Case studies on a) framed structures and b) plate girder bridges.

INDUSTRIAL TRAINING

To be held during summer vacation at the end of second semester of III year and evaluated in the 1st Semester of IV year

B. E. IV / IV (CIVIL ENGINEERING) 1 st SEMESTER

CE411 WATER RESOURCES ENGINEERING – I

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 2 T Sessional Marks: 30

UNIT – I INTRODUCTION AND HYDROLOGICAL ASPECTS:

Water Resources in India, Hydrology in water Resources Planning – Hydrologic Planning – Precipitation – Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data- Consistency of rainfall record – Double mass curve, Depth –Intensity, Depthh area duration curves.

Infiltration – Factors affecting and its determination, Infiltrometers

Evaporation and Evapo – Transpiration. Pan evaporation, Consumptive use, determination of evapotranspiration – Blenney & Creeddle, Penmann and Hargreeaves methods.

Runoff – Factors affecting runoff, methods of determination of runoff, stream gauging, hydrograph analysis, base flow separation, unit hydrographs – Hydrograph of different durations, applications of unit hydrograph, S-hydrograph.

UNIT II – GROUND WATER FLOW:

Mechanics of interstitial flow, definitions, sub surface distribution of water, ground water movement, Darcy's law – permeability, intrinsic permeability well hydraulics – Steady flow into different types of aquifers and wells – Determination of hydraulic properties of aquifer, Well losses, specific capacity of well, and well efficiency, pumping tests- Recuperation test method for determination of well yield.

Methods of construction of open well-yield of an open well – methods of construction of tube wells, well shrouding and well development, spacing of tube wells, design of tube well – pumping requirements, centrifugal and bore hole type pumps – collector wells.

UNIT III – RESERVOIR PLANNING:

Types of reservoir- Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir, Purpose of reservoir, Design studies, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, yield from a reservoir of given capacity, operating schedules, Rule Curve for reservoir operation, Economics of Waterresources Projects, Apportionment of total cost of a Multi Purpose project, Benefit - Cost Ratio.

Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, control of reservoir sedimentation.

UNIT IV - IRRIGATION:

Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Depth of water held by soil in different zones, Water extraction - Quality of irrigation water.

Water requirements of crops, Duty, Delta and Base period - Their relationship, Crops – Seasons, Factors affecting duty and methods of improving duty, consumptive use of water – Determination of canal capacities for cropping patterns, Size of reservoir, Assessment of irrigation water charges.

UNIT V – CANAL SYSTEMS:

Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy's and Lacey's theories, Critical Tractive force method, Design problems – Balancing depth – L.S. of a channel-Dsign according to I.S : 7112, 1975. Schedule of area statistics, Cross section of an irrigation channel, -Maintenance of irrigation channel.

Regulation of channel system – Canal outlets, Requirements of a good outlet – Types of outlets, Water logging-Causes and control – land drainage, canal lining – methods, design of lined canals, canal navigation – requirements, methods to make navigability feasible.

REFERENCE BOOKS :

1) Water resources engineering – B.C. Punmia.
2) Water resources engineering – S.K. Garg.
3) Water power engineering – H.K. Barrows.
4) Hand book of applied hydrology – Ven te Chow.

CE 412 TRANSPORTATION ENGINEERING – I

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 1 T Sessional Marks: 30

UNIT I : Highway Engineering – I : Highway development and planning, Classification of roads, Highway alignment, Highway Geometrics – Design of Cross sectional elements, Sight distance, horizontal and vertical alignment.

UNIT II : Highway Engineering – 2 : Traffic Engineering – Traffic Characteristics, Traffic studies (Surveys), Traffic Control devices – Design of intersections. Design of pavements – Design factors, design of flexible pavements – Group Index method, CBR Methods, Design of Rigid pavements – Wester guard equations, I.R.C. recommendations for design of concrete roads.

UNIT III : Highway Engineering – 3 : Construction of roads – Earthen roads – W.B.M. roads – Bitumens roads – Cement concrete roads – Highway materials and their properties and tests. Maintenance of all types of roads – Highway drainage – Arborical culture – Street lighting.

UNIT IV : Airport Engineering : Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

REFERENCE BOOKS :

1) Highway Engineering by Khanna & Justo.
2) Highway Engineering by Sharma & Sharma.
3) Airport planning and Design by Khanna & Arora.

CE413 PROJECT PLANNING AND MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT I : PERT and CPM : Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Barcharts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.

UNIT II : Cost analysis / updating / resource scheduling : Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimising project cost, crash limit, Free float limit, Optimisation. Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource levelling, circle notation and arrow notation.

UNIT III : Contracts : Contracts – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Master Roll Form 21. Piece work Agreement form, work order; Contract system with tenders – Definitions – Contract ,Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lumpsum contract; Lumpsum and schedule contract, Item rate contract, sub-contracts, joint ventures, Areitration Disputes and claim settlement.

UNIT IV : Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personnel Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

REFERENCE BOOKS :

1) PERT and CPM – L. S. Srinath.
2) PERT and CPM – Punmia.
3) Estimating and Costing – B.N. Dutta.
4) Construction Management and Planning – Guna and Sen Gupta, B.

CE414 ENVIRONMENTAL ENGINEERING – II

University Examination: Duration 3 hrs. Marks :70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction to sanitation – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers—safety of sewer workers .

UNIT – II: Storm sewers- design: Pumping of wastewater – Pumping stations – location – components parts– types of pumps and their suitability with regard to wastewaters. House Plumbing: plumbing systems of drainage-sanitary fittings and other accessories– single stack system- one pipe and two pipe systems – Design of building drainage.

UNIT – III: Bacteriology of sewage: Sewage characteristics – Physical, Chemical and Biological Examination– decomposition- cycles of decomposition-– Sampling and analysis of wastewater – BOD-COD-Treatment of sewage - Primary treatment: Screens-grit chambers – grease traps – floatation – sedimentation – design of primary and pretreatment units..

UNIT – IV: Secondary treatment: Aerobic and anaerobic treatment process-comparison.
Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes,miscellaneous methods, Oxidation ponds, Oxidation ditches,Aerated Lagoons.
Attached Growth Process: Trickling Filters – mechanism of impurities removal- classification– filter problems – design and operation-recirculation. RBCs, Fluidized bed reactors, sewage disposal methods.

UNIT – V: Anaerobic Processes: Septic Tanks and Imhoff tanks-Principles and Design-sludge treatment and disposal-Fundamentals of UASB. Biosolids (Sludge): Characteristics- thickening – digestion,drying and sludge disposal,.

TEXT BOOKS:

1.Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Environmental Engineering by Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. McGraw-Hill international edition
3. Environmental Engineering –II : Sewage disposal and Air Pollution Engineering, by Garg, S.K. Khanna Publishers
4. Sewage treatment and disposal by Dr. P.N. Modi.
5. Water supply and Waste Water Engineering by Dr. B.S.N. Raju

CE415 COMPUTER APPLICATIONS IN CIVIL ENGINEERING (C A C E)

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 3 L+ 3P Sessional Marks: 50

GENERAL : Data Base management in Civil Engineering Applications. Creation of Data Tables and Retrieval of Data using Structured Query Language.

UNIT I: Determination of Bending Moment Diagram, Deflections for different loading conditions for a Simply Supported Beam and Cantiliver Beam. Determination of fixed end moments for different loading conditions of a fixed beam. Calculation of Influence line diagrams at any section of a Simply Supported Beam.

UNIT II : Estimation of Run off for a Catchment. Estimation of Friction factor for Laminar and Turbulent flows, Minor losses in pipe flow. Conversion of Angles from WCB to RB. Classification of Soils. Determination of coefficient of permeability, Degree of Consolidation and Shear Strength.

UNIT III : Application of problems in Hydraulics such as Hardy cross method in the Analysis of pipe network, Computation of water surface profiles in open channel flows. Estimation of Settlement of foundations in Cohesive Soil, Stability Analysis of Slopes. Estimation Earth Pressures in Cohesive and Cohesionless soils. Application of problems in Environmental engg., Transportation Engg. Design of Slabs using I.S. Code method. Analysis and Design of Beams by using Limit state method. Design of columns subjected to axial load and Uni-axial Moment. Design of Isolated Footing. Design of rolled steel columns, built up columns, Beams and built up Beams.

UNIT IV : Basic AUTO CAD Commands, Introduction to AUTO LISP Programming. Analysis and Design of R.C. Building Frames by using Staad - III, Analysis and Design of Grid Floors by using Staad – III. Preparation of Contour Maps and Alignment fixing of Roads by using AUTO CIVIL. Quantity estimation of Civil Engineering Structures and Construction Management.

TEXT BOOKS :

1) Computer aided design, software and analytical tools by C.S. Krishnamoorthy & S. Rajesh.
2) Computer applications in Civil Engineering by S.K. Parikh.
3) Computer aided design in Reinforced concrete by V.L. Shah.

CE416 ELECTIVE – III

CE416A INDUSTRIAL STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Connectios : Design of Frame, seated moment resisting connections(both welded and riveted).

UNIT – II : Analysis of Pitched (Gable) Portal frames, Assumptions, Bending Moment and Shear Force diagrams. Design of portal frame (dead, live and wind loads).

UNIT – III : Analysis and design of gantry ginders, Steel Bracket design.

UNIT – IV : Towers, Principles of Analysis and Design of Latice towers, Transmission towers. Design of lathic towers and transmission towers(only sessional work).

UNIT – V: Analysis of Mill Bends

TEXT BOOKS :

1. Design of Steel Structures by M.Raghupati.
2. Design of Steel Structures by Arya and Azmani.
3. Design of Steel Structures by P. Dayaratnam.
4. Design of Steel Structures by Kazmi and Zindal.

CE416 B MULTISTOREYED STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Analysis of Portal Frames by Moment Distribution Methods with and without sway Analysis of continuous beams and one bay one storey Frames by Kani’s method with and without sway.

UNIT – II : Introduction to Matrix methods : Analysis of continuous beams and one bay one storey portal frames by stiffness method.

UNIT – III : Analysis of one bay one storey portal frames and continuous beams by Flexibility matrix methods.

UNIT – IV : Analysis of Multistoreyed frames by substitute frame method.

UNIT – V : Analysis of Multistoreyed frames for wind loads by portal, cantilever and Girder Factor methods.

(For Saessional Work only)
Introduction to shear walls, Different types – Behaviour of cantilever walls with rectangular cross section – Flanged shear walls.

1. Analysis of Inderminate structures – C.K Wang 2. Matrix Analysis of framed Structures-W Weaver& Gere.

CE416 C ELEMENTS OF SOLID WASTE MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT 1 : INTRODUCTION: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes : Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

UNIT 2 : SOLID WASTE MANAGEMENT: Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of Solid Waste management- Waste generation and handling at source-Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

UNIT 3 : TRANSFER AND TRANSPORT OF WASTES: Transfer station-Processing and segregation of the soilid waste- various methods of material segregation.

UNIT 4 : PROCESSING AND TRANSFORMATION OF SOLID WASTES: Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration-advantages and disadvantages of incineration.

UNIT 5 : DISPOSAL OF SOLID WASTE: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

Reference Books : Integrated Solid Waste Management by Tchobanognous
Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

CE416 D SOIL DYNAMICS AND MACHINE FOUNDATIONS

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Types of machine foundations – General requirements, Design criteria for machine foundations, Permissible amplitudes and bearing pressures.
Resonance and its effect – free and forced Vibrations with and without damping – Constant force and rotating mass type excitation – Magnification factor – Phase difference between forces and displacement for steady state vibrations – Logarithmic decrement.

UNIT – II : Natural frequency of foundation – soil system – Barkan's and I.S. methods of determining natural frequency. Tachehotarioff's reduced natural frequency.
Elastic properties of soil for dynamical purpose and their experimental determination of shear modulus from wave theory.

UNIT – III : Apparent soil mass – bulb of pressure concept – Pauw's analogy of foundation – soil system (charts to be supplied for solving problems).
Theory of elastic half – space lamb and the dynamic Boussinesq problem – Reisner's solution and its limitations – Quinlan and Sung's modifications Hsiegh's equations for vertical vibration.

UNIT – IV : Principles of design of foundations for reciprocating and impact type of machine – as per I.S. codes.- Vibration isolation – types and methods of isolation – isolating materials and their properties.

REFERENCES :

1) Hand-book of machine foundations by Srinivasulu and Vaidyanathan – M/s. Tata McGraw Hill Publications.
2) I.S. Codes.
3) Soil Mechanics and Foundation Engineering by B.C. Punmia – M/s. Lakshmi publishing co.
4) Analysis and design of Foundations and Retaining Structure by Shamsher prakash, Gopal Ranjan and Swamisaran – M/s Saritha Prakashan, Meerut.
5) Vibrations of soils and Foundation by Richart Hall and Woods Prentice Hall Inc., New Jersey.

CE416 E PRINCIPLES OF WATER QUALITY MANAGEMENT

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT 1 : Introduction- importance of water quality management-Pollution of surface water bodies – Rivers, Reservoirs and Lakes –The impacts on the natural water bodies -Sampling procedures for the estimation of characteristics.

UNIT 2 : Modeling the fate of pollutant in natural water: Fundamentals of process and mechanisms- Conventional Streeter-Phelps BOD-DO models, Critical deficit and time required to reach the critical deficit.

UNIT 3 : Fundamentals of ground water flow – variations of ground water levels, fluctuations due to Evapotranspiration, Meteorological phenomena

UNIT 4 : Groundwater pollution and management – Sources of ground water pollution and their effects – municipal, industrial, agricultural and miscellaneous, ground water basin investigations. Groundwater modeling techniques.

UNIT 5 : Introduction to Urban storm water quality management - Groundwater remediation – Groundwater recharging- recharging methods.

Reference Books:

1. Ground Water Technology by B. K. Todd.
2. An introduction to Water quality modelling. James,A.
3. Surface water quality modeling by Chopra, S.C

CE416 F PORT AND HARBOUR ENGINEERING

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

Unit – I

Description and formulation of waves and tides in the ocean, Linear wave theory, wave generation, wave transformation; Shoaling, refraction, diffraction and reflection, wave prediction techniques, Long waves in irregular shaped basins or bays, harbor oscillations.

Unit – II

Growth and regulation of ports. Various components of maritime systems, including shorefront and inlan infrastructure, Docks and Repair facilities, Concepts of port and marine terminal design, cargo handling equipment and intermidal transportation networks.

Unit – III

Port and harbor layout for safe and efficient vessels navigation and cargo loading and unloading. Port buildings. Port and marine terminal layout, navigation channels and dredging, shore infrastructure and utilities, land reclamation , and environmental and economic considerations. Dredging; dredging equipment. Dredging for navigation improvement, pipelines and cables, soil replacement. Potential effects of dredging on environment, environmental factors.

Unit – III

Foundamentals of port structures design, design codes, guidelines and functional requirements. Structural, geotechnical, and materials considerations, for a variety of environmental conditions, including extreme wave and current environments, ice, and seismic loading.

Unit – IV

Functional desing of the various components of ports and marine terminals, including steel, concrete, timber, and stone structures. Design procedures for breakwaters, bulkheads, wharves, dolphins, piers, fender and mooring systems and revetments.

Unit – V

Marine and offshore construction equipment: Basic motions of swaway Barges, crane barges, Offshore derrick barges, semisubmersible barges, Jack-up construction barges, launch barges, pipe laying barges, floating concrete plant. Pile driving equipment.

Reference Books / Text Books

1. Port Engineering, by Per Bruun
2.Design and construction of Ports and Marine Structures, by A.D. Qinn, Mc Graw-Hill
3. PHRI (Port and Harbour Research Institute) Japan manual.
4. Handbook of Port Harbour Engineering: Geotechnical and structural aspects, by Gregory Tsinker
5. Construction of marine and offshore structures, by Ben C. Gerwick, CRC Press Tayler and Francis group.
6. Dredging: A Handbook for Engineers by R.N. Bray, A.D. Bates and J.M. Land: John Wiley & Sons, Inc.
7. Planning and Design of Ports and Maritime Terminals: 2ed, edited by Hans Agershou: Thomas Telford

CE417 TRANSPORTATION ENGINEERING LABORATORY

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 0L+ 3P Sessional Marks: 50

1) Testing of Aggregates : Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & Soundness.
2) Testing of bitumenous material : Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.
3) Testing on Soils : C.B.R. test (IS 2720 – Part-XVI) – N.D.C. Penetration test (IS 2720 Part-XXXII) – Group Index.

REFERENCE BOOKS :

1) Highway material testing by Khanna & Justo.

CE418 FLUID MECHANICS LABORATORY– II

University Examination: Duration 3 hrs. Marks 50

No of Periods per Week : 0 L+ 3P Sessional Marks: 50

1) Characteristics of a hydraulic jump. - To measure and draw Y_2/Y_1, $(E_1 – E_2)/E_1$, $Lj/(Y_2-Y_1)$ as a function of F_r, and compare with theoretical results wherever possible.

2) Canal transitions– To measure the depth of water in canal transitions (a) with a reduction of bed width and (b) With a rise in bed level.
3) Pipe friction. (a) To measure the piezometric head variation along the length of a pipe and compute Darcy- Weisbach f. (b)To plot H.G.L and T.E.L.
4) Drag characteristics of a circular cylinder with its axis normal to the direction of flow.
(a) To measure the pressure distribution on the surface of a cylinder and plot the dimensionless pressure variation around the cylinder and compute the pressure drag.

(b)To measure the velocity variation in the wake of the cylinder, velocity of approach, and compute the total drag by momentum principle.

5) Performance characteristics of a centrifugal pump. - To measure the discharge, head developed, and power input at various discharges for centrifugal pump and draw the performance characteristics.
6) Performance characteristics of a reciprocating pump.
7) Performance characteristics of a Pelton / Francis / Kaplan turbine. - To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.
8) Impact of a jet on bodies.

CE419 INDUSTRIAL TRAINING

The students are supposed to submit a detailed report covering the following aspects related to civil engineering projects that are relavant to the industry in which they received training:

- Project Planning,
- Design,
- Scheduling,
- Specifications,
- Tender Document Preparation,
- Calling of Tenders,
- Material Procurement Methods / Pracices,
- Inventory, Stores Maintenance and Material Issue Norms,
- PERT / CPM Details,
- Project Execution,
- Check Measurement,
- Project Management,
- Quality Control,
- Safety and Risk Analysis and
- Maintenance, Repairs and Operation.

The report will be evaluated for 100 marks by a viva-voce committee comprising of the following members:

- Head of the Department
- Two internal Examiners
- One external examiner and
- Chairman Board of studies.

B. E. IV / IV (CIVIL ENGINEERING) 2 nd SEMESTER

CE421 TRANSPORTATION ENGINEERING– II

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 1 T Sessional Marks: 30

UNIT – I : RAILWAY ENGINEERING – 1 : Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings.

UNIT – II : RAILWAY ENGINEERING – 2 : Track Geometric design – Points & Crossings – Track drainage – Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

UNIT – III : DOCK & HARBOUR ENGINEERING : Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

UNIT – IV : TUNNEL ENGINEERING : Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

REFERENCE BOOKS :

1) Railway Engineering by S.C. Saxena & S. Arora.
2) Railway Engineering by Rangwala.
3) Dock & Harbour by Birdie.
4) Tunnelling by Rangwala.

CE422 WATER RESOURCES ENGINEERING – II

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 3 L+ 2 T Sessional Marks: 30

UNIT – I Storage Works : Classification of dams, factors governing selection of types of dam, selection of site, preliminary investigation.
Gravity Dams : Forces acting on a gravity dam, stability criteria, modes of failure – elementary and practical profiles, stability analysis, principal and shear stress – construction joints, openings in dams – galleries, foundation treatment of gravity dam.

UNIT – II Earth Dams : Types, foundation for earth dams, design of earth dams, causes for failure of earth dams, criteria for safe design, phreatic line, seepage analysis – seepage control through body and foundation.
Spillways : Essential requirements, spillway capacity, components, types of spillways and their working, design of ogee spillway, energy dissipation below spill way, scour protection, use of hydraulic jump as energy dissipater – design of stilling basins – USBR and IS standard basins - spillway crest gates, different types.

UNIT – III Diversion Head Works : Types, location and components, effects of construction of weirs on permeable foundation, Bligh's, Lanes and Khosla's theories, Method of independent variables, design principles of weirs and barrages, design of weirs on permeable foundations, design of vertical drop weir, canal head regulator, silt control devices.
Regulation Works : Canal falls, definition necessity and location, classification of falls, design principles of syphon well drop, notch fall, sarada fall, straight glacis fall, offtake alignment, cross regulator and distributary head regulator.
Cross Drainage Works : Types, factors affecting the suitability of each types, classification of aqueducts, design principles of different types of aqueducts.

UNIT – IV River Training Works : River Training and its objectives, classification of river training works, marginal embankment, guide banks, groynes, cutoffs, bank pitching, launching aprons, miscellaneous types of river training works.
Water Power engineering : Development of hydro power in India, assessment of available power, utilisation factor, load factor, diversity factor, storage and pondage, types of hydro power schemes, components of hydel schemes –

fore bay, intake structure, trash racks, surge tanks, water hammer pressure, sub structure and super structure of power house.

REFERENCE BOOKS :

1) Water resources engineering– B.C. Punmia.
2) Water resources engineering– S.K. Garg.
3) Water power engineering – H. K. Barrows.

CE423 ELECTIVE – IV

CE423 A ADVANCED CONCRETE STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Yield Line Analysis : Analysis and Design of Slabs using yield line theory. Slabs supported on four edges, three edges and two opposite edges subjected to uniformly distributed load.

UNIT – II : Grid Floor : Analysis and Design of Grid Floors as per IS Code and more rigorous method.

UNIT – III : Design of Bunkers and Silos.

UNIT – IV : I.S. Code provisions for ductility of concrete structures, Serviceability requirements with regard to deflection and crack width.

UNIT – V : Flat Slabs – Different Components of a Flat Slab, Direct Design Method, Bending Moments in the interior and end Spans.

TEXT BOOKS :

1) Advanced Reinforced Concrete designed by N. Krishnam Raju.
2) Design of Reinforced Concrete Structures by P. Dayaratnam.
3) Reinforced Concrete Structures by Paurk and Pauly.

CE423 B PRESTRESSED CONCRETE

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Introduction, Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete.
Materials for prestressed concrete, high strength concrete and high strength steel.
Prestressing systems (1) Fressinet System (2) Gifford Udall (3) Magnel Blatan System, Tensioning devices, anchoring devices. (d) Pretensioning and Post tensioning.

UNIT – II : Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to curvature etc. I.S. code provisions.

UNIT – III : Analysis of prestress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

UNIT – IV : Limit state design of flexural members, stress, I.S. code provisions, design of symmetrical beams, design of prestressed concrete poles, design for shear, I.S. code provisions.

UNIT – V : (a) Transfer of prestress (Pretensioned members), Transmission length, bond stress, Transverse tensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.
(b) Anchorage zone in post tensioned members, stress distribution in end block, Guyon's method of approach of analysis of end block (Not more than 2 cables).

TEXT BOOKS :

1) Prestressed Concrete by P. Dayaratnam.
2) Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns.

CE423 C AIR POLLUTION CONTROL

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.

UNIT – II : Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behaviour accumulation, estimation of pollutants – Effective stack height.

UNIT – III : Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

UNIT – IV : Ambient air quality monitoring and stack monitoring.

UNIT – V : Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

REFERENCES :

1) Air Pollution Control Technology by T. Painter.
2) Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3) Air Pollution Control by K.V.S.G. Murali Krishna.
4) Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.

CE423 D GROUND IMPROVEMENT TECHNIQUES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : In-situ densification Methods in granular soils – Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth.
In-situ Densification methods in cohesive soils, introduction, preloading or dewatering, drainwalls, sand drains, sand wicks, geodrains/banddrains, stone and lime columns, forced vaccum preconsolidation, thermal methods.

UNIT – II : Grout injections, suspension and solution grouts, grouting equipment and methods, Applications.
Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls.

UNIT – III : Geotextiles : Introduction, types of geotextiles; Functions and their application, tests for geotextile materials, geogrids, functions.
Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

UNIT – IV : Lime and Bituminous Stabilization : Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.
Stone columns, introduction, construction practice, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc.

REFERENCE BOOKS:

1) Robert M. Koerner : Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill.
2) E. J. Yoder : Principles of pavement design, John Wiley and sons.
3) Leonards, G.A. Foundation Engineering.
4) Khanna S.K. and Justo C.E.G: Highway Engineering Nemchand Publications.
5) Sowers G.F. : Introductory Soil Mechanics and Foundations.

CE423 E COASTAL ENGINEERING

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Mechanics of Wave Motion : Wave fundamentals and classification of waves, small amplitude wave theory, wave celerity, length, and period, orbital motions, pressure distribution, wave trains and wave energy, transformation of waves, higher order wave theories, stokes higher order wave theories, cnoidal wave theory, wave refraction, wave diffraction, wave reflection, wave breaking.

UNIT – II : Tides, Storm surges, Tsunamis - Wave Prediction : Wave height variability, energy spectra of waves, directional spectra of waves, wind information needed for wave prediction, estimating the wind characteristics, delineating a fetch, forecasts for lakes, bays, and estuaries, significant wave method, wave spectrum method, forecasting wind waves in shallow water, deep water relation for wave decay, hurricane waves.

UNIT – III : Littoral Processes : Ocean currents, long shore currents and setup due to ocean waves, sediment transport in the offshore zone, surf zone, bar-berm prediction and budget of the littoral zone.

UNIT – IV : Wave runup, over topping and transmission - Wave Forces : Wave forces on cylinders and walls.

REFERENCES :

1) Ippen, A.T., Estuary and coastline hydrodynamics, Mc Graw – Hill book company Inc., 1966.
2) Sorensen, R.M., Basic coastal engineering, John Wiley & Sons, 1978.
3) U.S. Army Coastal Engineering Research Center, Shore protection manual, Vols. I, II and III, 1977.

CE423 F HYDRAULIC STRUCTURES

University Examination: Duration 3 hrs. Marks 70

No of Periods per Week : 4 L+ 2 T Sessional Marks: 30

UNIT – I : Straight Gravity concrete Dams : Single-step design, multiple-step design, Internal stresses in gravity dams, stress distribution around openings, stress distribution around a circular hole in an infinite plate due to a normal stress on the plate, stress distribution around a horse shoe shaped gallery using phillips and zanger's tables, design of reinforcement around galleries in dams.
Arch Dams : Economic central angle of an arch dam, constant radius method, constant angle method, and variable radius and variable angle design of arch dams, trial load method of analysis of arch dams.

UNIT – II : Earth Dams : Seepage analysis, stability analysis of infinite slopes with and without seepage, stability analysis of finite slopes – friction circle method, method of slices, ordinary method of slices, simplified Bishop method of slices, spencer's method.
Spillways : Hydraulic design of ogee spillways, comprehensive discharge characteristics of ogee spillways, design of reinforcement in the crest region of an ogee spillway, hydraulic design of chute spillways, morning glory spillways, side channel spillways.
Stilling basins and energy dissipaters: Intake Structure:

UNIT – III : Water Conductor System : Selection of type of water conductors, economic analysis for determination of sizes of water conductors, analysis and design of lined pressure tunnels, water hammer analysis, analysis and design of surge tanks of various types, design of anchor blocks for penstocks, design of penstock junctions, design of scroll cases and draft tubes.

UNIT – IV : Gates and Valves : Vertical lift gates, tainter gates, cylindrical gates, butterfly valves, Howell – Bunger valves, needle valves, flow induced forces on vertical lift gates, flow induced vibration of vertical lift gates. Layout of Power Houses.

REFERENCES :

1) Creager, W.P. Justin, J.D., and Hinds J., Engineering for dams, Vol.II, Wiley Eastern Private Limited, 1945.
2) Creager W.p. and Justin J.D. Hydro electric hand book, John Wiley & Sons Inc., Newyork, 1949.
3) U.S.B.R. Design of small Dams, 1960.

4) Davis and sorensen, Handbook of applied hydraulics.
5) Lambe and Whitman, Soil Mechanics.
6) Streeter, V.L. and Wylie, G.B. Hydraulic Transients, Mc Graw Hill Book Company, 1967.
7) Hanif Chaudhry, M. Applied Hydraulic Transients, Van Nostrand Reinhold Company, 1979.

CE424 IRRIGATION STRUCTURES0 – DESIGN AND DRAWING (SESSIONAL WORK ONLY)

University Examination: Duration 0 hrs. Marks 0

No of Periods per Week : 0 L+ 4 D Sessional Marks: 50

(a) Tank surplus weir ; (b) Barrage : (c) Glacis type of canal drop : (d) Notch Fall : (e) Syphon Aqueduct (type III) (f) Cross regulator and head regulator

TEXT BOOKS :

1) Water resources Engineering – C. Satyanarayana Murthy.
2) Water resources Engineering – S.K. Garg.
3) Type Designs of Irrigation Structures _ R.S.N. Murthy.

CE425 PROJECT WORK

University Examination VIVA VOCE Marks: 50

No of Periods per Week : 0 L+ 6T Sessional Marks: 50