B. E. CIVIL - Course Structure

Yr	Sub Code	ODD SEMESTER Sub. Name	L	T	P	C	Sub. Code	EVEN SEMESTER Sub. Name	L	T	P	C
2	MAT-201	ENGG.MATHEMATICS-III	4	0	0	4	MAT-202	ENGG. MATHEMATICS -IV	4	0	0	4
	CIE-201	FLUID MECHANICS - I	3	1	0	4	CIE-202	FLUID MECHANICS – II	3	1	0	4
	CIE-203	STRUCTURAL ANALYSIS - I	3	1	0	4	CIE-204	STRUCTURAL ANALYSIS - II	3	1	0	4
	CIE-205	BUILDING SCIENCE AND TECH	4	0	0	4	CIE-206	STRUCTURAL DESIGN - I	3	1	0	4
	CIE-207	SURVEYING - I	3	1	0	4	CIE-208	SURVEYING - II	4	0	0	4
	CIE-209	ENGINEERING GEOLOGY	4	0	0	4	*** - ***	OPEN ELECTIVE –I	3	0	0	3
	CIE-211	SURVEYING PRACTICE – I	0	0	6	2	CIE-210	BUILDING DESIGN & DRAWING	0	0	3	1
	CIE-213	MATERIAL TESTING LAB - I	0	0	3	1	CIE-212	FLUID MECHANICS LAB	0	0	3	1
							CIE-214	MATERIAL TESTING LAB– II	0	0	3	1
							CIE-216	GEOLOGY LAB	0	0	3	1
		TOTAL	21	3	9	27		TOTAL	20	3	12	27
3	CIE-301	GEOTECHNICAL ENGG. - I	3	1	0	4	HSS-302	ESSENTIALS OF MANAGEMENT & ENGINEERING ECONOMICS	4	0	0	4
	CIE-303	STRUCTURAL DESIGN - II	3	1	0	4						
	CIE-305	WATER RESOURCES ENGG	4	0	0	4	CIE-302	GEOTECHNICAL ENGG. - II	3	1	0	4
	CIE-307	ENVIRONMENTAL ENGG.-I	4	0	0	4	CIE-304	STRUCTURAL DESIGN III	4	0	0	4
	CIE-309	TRANSPORTATION ENGG. - I	4	0	0	4	CIE-306	TRANSPORTATION ENGG.II	4	0	0	4
	CIE-***	PROGRAM ELECTIVE – I	3	0	0	3	CIE- ***	PROGRAM ELECTIVE –II	3	0	0	3
	CIE-311	SOIL MECHANICS LAB	0	0	3	1	***-***	OPEN ELECTIVE – II	3	0	0	3
	CIE-313	SURVEYING PRACTICE-II	0	0	3	1	CIE-308	STRUCTURAL DRAWING	0	0	3	1
							CIE-310	COMPUTER LAB - I	0	0	3	1
							CIE-312	PROJECT SURVEY & SEMINAR	0	0	3	1
		TOTAL	21	2	6	25		TOTAL	21	1	9	25
4	CIE-401	ESTIMATING, COSTING AND VALUATION	3	1	0	4	CIE – 402	INDUSTRIAL TRAINING/TOUR	0	0	0	1
	CIE-403	CONSTRUCTION PLANNING, ORGANISATION AND EQUIPMENTS	4	0	0	4	CIE-499	PROJECT WORK	0	0	0	20
	CIE-405	ELEMENTS OF EARTHQUAKE DESIGN OF STRUCTURES	4	0	0	4						
	CIE-407	ENVIRONMENTAL ENGG. - II	4	0	0	4						
	CIE-409	STRUCTURAL DESIGN - IV	4	0	0	4						
	CIE-***	PROGRAM ELECTIVE-III	3	0	0	3						
	CIE-411	COMPUTER LAB - II	0	0	3	1						
	CI E-413	ENVIRONMENTAL ENGG. LAB	0	0	3	1						
		TOTAL	22	1	6	25		TOTAL	0	0	0	21

NOTE : Proposed Course Structures for 2010 admission and later

LIST OF ELECTIVES

PROGRAM ELECTIVE – I

CIE-321 ADVANCED STRUCTURAL ANALYSIS
CIE-323 OPEN CHANNEL FLOW AND SEDIMENT TRANSPORT
CIE- 325 AIR POLLUTION AND CONTROL
CIE-327 BUILDING CODE AND REQUIREMENTS

PROGRAM ELECTIVE – II

CIE-318   HYDROLOGICAL ANALYSIS
CIE-320   URBAN TRANSORTATION SYSTEMS
CIE-322   SOLID WASTE MANAGEMENT
CIE-324   GROUND IMPROVEMENT TECHNIQUES
CIE-326   COASTAL ENGINEERING
CIE -328 FINITE ELEMENT METHOD OF ANALYSIS

PROGRAM ELECTIVE – III

CIE- 421   DESIGN OF FOUNDATION AND EARTH RETAINING STRUCTURES
CIE-423   GROUND WATER ENGINEERING
CIE-425   DESIGN OF HYDRAULIC STRUCTURES
CIE-427   ADVANCED REINFORCED CONCRETE DESIGN
CIE-429   BRIDGE ENGINEERING
CIE-431   ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING

MAT CIE 201 ENINEERING MATHEMATICS – III [4 0 0 4]

Total number of lectures - 50

Vector Calculus: Gradient, divergence and curl, and their physical meaning and identities. Line, surface and volume integrals. Simple problems. Green's theorem, statement of divergence and Stokes' theorems. Simple applications.　　(12)

Fourier Series: Periodic functions, Euler's formulae. Fourier series of odd and even functions and of functions with arbitrary period. Half range expansions. Fourier sine and cosine transforms. Fourier integrals. Application of Fourier series to forced vibration problems.　　(12)

Partial differential equations: Basic concepts and solutions of equations involving derivatives with respects to one variable only. Solutions by indicated transformations and separation of variables. Derivation of one dimensional wave equation (vibrating string) and its solution by using the method of separation of variables, Simple problems D'Alembert's solution of wave equation. Derivation of one dimensional heat flow equation using Gauss divergence theorem and its solution by separation of variables. Solutions of 2-D Laplace equations.　　(10)

Introduction to probability : Finite sample space, conditional probability and independence. Bayes' theorem, one dimensional random variables. Two and higher dimensional random variables, mean, variance, correlation coefficient and regression. Chebyshev inequality.　　(10)

Distributions: Binomial, Poisson, uniform, normal, gamma, chi-square and exponential, simple problems.　　(06)

REFERENCE BOOKS

1. Murray R. Spiegel, (1981), "Vector Analysis" Schaum Publishing Co.

2. Grewal B.S. (2006) "Higher Engg. Mathematics", Khanna Publishers, 39th Edition.

3. Erwin Kreyszig (2006) "Advanced Engg. Mathematics", Wiley Eastern Ltd. 8th Edition

4. Meyer Paul L., (1980), "Introductory Probability and Statistical applications", Addison - Wesley Publishing Company.

CIE-201 FLUID MECHANICS – I [3 1 0 4]

Total number of lectures – 50

Introduction: Scope and importance of the subject. Definition of fluid - Distinction between a solid and a fluid - Distinction between a liquid and a gas - fluid continuum (02)

Fluid Properties and Classification of Fluids : Specific weight, mass density, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity and their units, dimensions and significance. Classification of fluids - Ideal and real fluids, Newtonian and Non - Newtonian fluids, compressible and incompressible fluids (06)

Fluid Pressure and its Measurement: Pressure at a point in a static fluid - Pascal law - Atmospheric, absolute, gauge and vacuum pressures. Pressure measurement - simple manometers and differential manometer Mechanical pressure gauges (Bourdon Pressure gauge only) (04)

Hydrostatics: Forces on plane surfaces - Horizontal, vertical and inclined surfaces, Forces on curved surfaces, centre of pressure on plane and curved surfaces, Drawing pressure diagrams. (04)

Kinematics of Fluid Motion: Introduction, methods of describing fluid motion - Lagrangian and Eulerian approach - classification of flow - steady flow and unsteady flow, uniform flow and Non - uniform flow, laminar and turbulent flow, compressible and incompressible flow, three, two and one dimensional flow, Rotational flow and irrotational flow - stream line, pathline, streak line and stream tube, Acceleration in one dimensional flow - continuity equation in differential form in Cartesian co-ordinates - continuity Equation for one dimensional flow. (04)

Dynamics of Fluid Motion: Euler's Equation of motion in one dimension - Bernoulli's Equation, limitation and modification of Bernoulli's Equation. Application of Bernoulli's equation - Venturimeter, orificemeter and pitot tube. (06)

Ideal Fluid Flow: Requirements for ideal fluid flow, Rotational and irrotational flows – velocity potential functions, Stream Function, Flow nets. (04)

Laminar Flow Through Pipes: Reynold's Experiment, steady laminar flow through a circular pipe - Relation between pipe friction factor and Reynold's Number. (04)

Turbulent Flow Through Pipes: Head loss due to friction-Darcy weisbach Equation- Minor losses in pipe lines- Expression for loss of energy due to sudden expansion, pipes in series and pipes in parallel. Concept of equivalent pipe and equivalent length - pipe siphons - Hydraulic and Energy gradients. Water hammer in pipes- pressure rise in a pipe due to gradual and sudden closure of valves.

(08)

Flow Measurement: Flow under constant head - orifices and mouth pieces. Classification of orifice and mouth pieces, Hydraulic coefficients and their determination - Flow through notches and weirs - Rectangular, triangular, trapezoidal and cippoletti notches - Broad crested weir - open spillway and siphon spillway; Flow under variable head – Time of emptying and filling of tanks through orifices. (08)

REFERENCE BOOKS

1. Bansal R. K. (2010), "Fluid Mechanics and Hydraulic Machines", Laxmi Publishers, New Delhi.
2. Raghunath H.M, (1987), "Fluid Mechanics and Machinery", CBS Publishers and Distributors, New Delhi.
3. Jain A.K., (2002), "Fluid Mechanics", Khanna Publishers, New Delhi.
4. Kumar D. S.(2000), "Fluid Mechanics and Fluid Power Engineering", Katson Publishing House, New Delhi.
5. Streeter V.L. and Wiley E.B., (1998), "Fluid Mechanics", McGraw Hill book Co., New York.
6. Modi P.N. and Seth S.M. (2005), "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
7. Garde R.J., (2003), "Fluid Mechanics through problems", New age international Pvt. Ltd., Publishing, New Delhi.

CIE 203   STRUCTURAL ANALYSIS – I [3 1 0 4]

Total number of lectures - 48

Introduction: Overview and Scope of the subject   (01)

Analysis of Determinate Trusses: Plane trusses- method of joints and method of sections

(04)

Shear force and bending moment diagrams: Relationship between bending moment, shear force and load intensity. SFD and BMD for statically determinate beams   (8)

Bending and shear stresses: Determination of bending and shear stresses in statically determinate beams of various cross sections   (7)

Deflections: Determination of deflection in statically determinate beams using Mecaulay's method, Moment -area method and Conjugate beam method.

(10)

Stability of columns: Slenderness ratio, failure by buckling, Euler's formula, concept of equivalent length for different support conditions, limitation of Euler's formula, Rankine-Girdon Formula   (04)

Torsion of circular shaft : Simple torsion theory, solid and hollow circular shafts, power transmitted by shafts   (06)

Analysis of Arches and suspension bridge: Analysis of three hinged   parabolic and segmental arches. Determination of horizontal reaction, normal thrust, radial shear and bending moment. Analysis of suspension bridge with three hinged stiffening girder.   (08)

REFERENCE BOOKS

1. Basavarajaiah & Mahadevappa, (2001), Strength of Materials, CBS Publishers.
2. Rajput R.K., (2004), Strength of Materials, S Chand & Co.
3. Reddy C.S., (2004), "Basic structural analysis", Tata McGraw Hill, New Delhi.
4. Bhavikatti S.S., (2005), Strength of Materials, Vikas Publishers.
5. Ramamrutham & Narayanan, (1989), Strength of Materials, Dhanpat Rai
6. E. J. Hearn, (1991), Mechanics of Materials, Vol. I, Pergamon Press.

CIE 205 BUILDING SCIENCE & CONCRETE TECHNOLOGY [4 0 0 4]

Total number of lectures - 48

Design and Construction of Masonry (as per SP20):
Masonry elements, Mortar, Lime mortar, Cement mortar, bonds in brickwork, Reinforced brickwork, Stone masonry - coursed, rubble and ashlar stone masonry, Joints in masonry, Hollow block construction. Rat trap masonry, Load bearing and partition walls. Damp proof construction for walls and floors. Masonry arches. Lateral supports and stability, effective Height, Effective Length, Effective Thickness, Slenderness Ratio, Eccentricity, Load Dispersion, Design Examples.
(14)

Plastering, Painting and Flooring:

Wall plastering: types, properties. White washing, Colour washing and Distempering of walls. Plastic emulsion, enamel and powder coat painting of walls. Painting of wood and metal works. Granolithic, Concrete, Mosaic, Ceramic, Marble, Terrazzo and Synthetic material flooring: Definitions   (03)

Roofs:
Sloped roofs - Lean-to, Coupled and Collared roofs. Timber trusses - King post and Queen post trusses.
Shoring, Underpinning, and Scaffolding.   (03)

Bricks, Tiles, Lime: Types, refractive and modular bricks and their application Testing as per IS 3495(Part I toIV). Flooring, roofing and decorative Tiles – Mechanical Properties and uses of Tiles . Properties and uses of Lime   (04)

Timber: properties, defects, seasoning and preservation, plywood-Types and uses.
Tar, Bitumen and Asphalt: Properties and uses.
Modern Building Materials: Plastic, FRP, rubber, glass, ferro-cement, glass, ceramics, paints, distemper, varnishes-Definitions and applications.   (04)

Corrosion: Dry corrosion, Galvanic corrosion, rusting, Aqueous corrosion. Corrosion prevention – different methods.   (02)

Cement: Types, composition, properties and uses, physical tests on cement as Per I.S.   (04)
Concrete Technology:
Concrete: Definition, ingredients: coarse aggregate, fine aggregate, water, properties, tests as per IS, Water-cement ratio. Fresh Concrete: Mix design proportion-batching-workability mixing, placing, compacting, various methods of curing, Test on Fresh concrete as per IS. Hardened Concrete: Destructive and non destructive tests.   (14)

REFERENCE BOOKS:

1. SP 20-1991 Handbook on Masonry design and construction
2. SP10-1975 Nomograms for thickness of masonry walls (First reprint September 1991)
3. SP:62 (S&T) :1997 Handbook on Building Construction Practices.
4. ''National Building Code'', (1988), BIS, New Delhi
5. Punmia B.C, (2003), "Building Construction", Lakshmi Publications, New Delhi.
6. Sushil Kumar, (1976) "Building Construction", Standard Publication
7. Mohan Rai and Jai Singh M.P, (1986) "Advances in Building Material and Construction" CBRI Publications, Roorkee.
8. Neville A. M, (1989), "Properties of Concrete", McGraw Hill- Singapore.
9. Shetty M.S., (2006), "Concrete Technology", S. Chand and Co., New Delhi.
10. ITTI, (2003), ''Engineering Materials'', Tata McGraw – Hill Publishing Co., Ltd., New Delhi.

CIE 207 SURVEYING – I (3 1 0 4)

Total number of lectures – 48

Introduction : Principles of Surveying – methods – Plane and geodetic – Principles of chain surveying offsets – Cross staff and principles of optical square – Error in offset – obstacles in chaining. (08)

Compass Survey : Principles, use and Adjustment of prismatic compass, surveyors compass, Bearings and Included angles – Declination – Local attraction – Graphical adjustment of compass traverse – latitudes and Departures in a traverse. (07)

Plane Table survey : Methods – Orientation – Solving two and three point problem with bessels method – Plane table traversing. (03)

Computation of Areas and Volumes : Areas calculation using Mid ordinate rule,Averageordinate,Trapezoidal and Simpsons, Volume calculation using prismoidal and Trapezoidal rule. (04)

Levelling : Introduction – Simple levelling – Differential levelling – Errors in Levelling – Curvature and Refraction- Sensitiveness of bubble tube – Cross sectioning and Profile levelling – Reciprocal Levelling (10)

Contours :Introduction - Application and uses – Methods in Contouring – Characteristics of contours Use of planimeter in contours. (04)

Theodolite Survey : Introduction and description of Theodolite – Repetition and Reiteration methods Temporary adjustments of theodolite – Trignometric levelling using height and distance formulae. (10)

Study of Minor Instruments : Hand level, Abney level, Electronic theodolite, Ceylon ghat tracer, Indian pattern clinometer, Box sextant. (02)

REFERENCE BOOKS:

1. PunmiaB.C ,(2005), " Surveying and levelling" , Vol.I and II , Lakshmi Publishers , New Delhi.
2. AroraK.R , (1993), " Surveying", Vol.I, Standard Book house, New Delhi.
3. Kanetkar T.P and Kulkarni S.V,(1996), " Surveying and levelling " parts I and 2, Pune VidyarthiGrihaPrakashan.
4. ThomasNorman , " Surveying" , Edward Arnold Publishers (ELBS),Budapest.
5. Duggal S.K, (1996), " Surveying", Vol. I, Tata Mcgraw Hill – Publishing Co.Ltd,New Delhi.
6. Venkatramaiah C, (1996) "Surveying" Universities Press, India

CIE 209   ENGINEERING GEOLOGY [4 0 0 4]

Total number of lectures – 50

Introduction: Earth as a planet, Interior of the Earth, its structure and composition. Geological time scale.   Geology and Civil Engineering   (04)

Seismology: Earthquakes and tsunamis in the world. Plate tectonics and other causes of earthquake. Earthquake mechanism, seismic zoning map of India and its use. Seismic terminology- focus, epicenter, seismic waves, magnitude, intensity, intensity scale and its correlation with ground acceleration. Characteristics of strong ground motions and attenuation. Earthquake recording instruments.   Case studies- Bhuj earth quake, Sumatra and Japanese tsunamis   (10 hrs)

Physical Geology: - Origin and development of river systems, erosion, transportation and deposition by rivers.

Weathering (deterioration) of rocks. Kinds of weathering. Agencies, causes and products of weathering. Soil formation, soil profile, classification of soils, erosion and conservation. An introduction to groundwater, mode of occurrence and prospecting   (06 hrs)

Structural Geology: Outcrop, dip & strike, clinometer, Compass. Definition, different parts of folds, faults, joints and unconformity and their recognition in the field and their importance in Civil engineering projects.   (09 hrs)

Petrology: Introduction to crystallography. Minerals - definition, physical proportion of important rock forming and ore minerals.   Mineral deposits of India   (06 hrs)

Rock as building material - Rock cycle. Classification of rocks in to igneous, sedimentary and metamorphic. Texture and Structure in rocks. Rock deposits in India   (08 hrs)

Engineering Geology: An introduction to Remote sensing and GIS, Geological considerations in selection of sites for dams & reservoirs, tunnels, bridges & highways. Landslides, their causes and prevention.   (07 hrs)

REFERENCE BOOKS :

1. Parbin Singh, (2002), "Engineering Geology", S.K. Kataria and Sons, New Delhi.
2. Mukherjee P.K., (2003), "A text book of Geology", World Press, Kolkata.
3. Venkata Reddy D., (1995), "Engineering Geology for Civil Engineering", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

CIE 211 SURVEYING PRACTICE – I [0 0 6 2]

Total number of lectures – 23

Chain survey
To conduct direct and indirect ranging.   (01)

Construction of Geometric figures using chain and tape - triangle, pentagon, trapezium, hexagon   (01)

To erect perpendicular from a given point to a given line and from a given line to any given point using (i) Chain tape only (ii) Cross staff   (01)

Compass Survey
Study of compass and construction of regular pentagon and hexagon   (01)

Construction of a quadrilateral   (01)

Distance b/w two inaccessible points   (01)

Plane table surveying

Radiation and intersection methods.   (01)

Solving three point problem by Bessel's solution   (01)

Plane table traversing   (01)

Levelling

 study of instrument   (01)

Simple levelling - To find out elevation of different points shown on the ground w.r.t. given arbitrary B.M.   (01)

To find difference in level b/w two points by height of instrument method.
                                                                                (01)
To find difference in level b/w two points by Rise and fall method including inverted staff reading.   (01)

To find difference in level b/w two points by reciprocal leveling.   (01)

Theodolite - Study of the instrument.   (01)

Measurement of Horizontal angle by method of repetition.   (01)

Measurement of Horizontal angle by method of reiteration.   (01)

Measurement of vertical angles   (01)

To find RL when base of object is inaccessible.   (01)

Single plane method   (01)

Double plane method   (01)

Distance b/w inaccessible points   (01)

Theodolite Traversing.   (01)

REFERENCE BOOKS

1. Kanetkar T.P. and Kulkarni S.V., (1996), " Surveying and levelling", Part I and II, Pune Vidyarthi Griha Prakashana - Pune.

2. Punmia B.C., (2005), "Surveying", Vol. I, Lakshmi Publications, New Delhi.

CIE 213 MATERIAL TESTING LAB - I [0 0 3 1]

Total number of lectures - 13

Tension test on mild steel	(01)
Compression test on cast iron	(01)
Compression test on timber	
Shear test on mild steel specimen	(01)
Torsion test on mild steel specimen	(01)
Rockwell hardness test	
Brinell's Hardness test	(01)
Impact tests : a) Izod b) Charpy	(01)
Bending test on wood	
Fatigue test (Demonstration)	(01)

Test on Bricks – Compressive Strength
                Absorption
                Efflorescence   (01)

Tests on Flooring and Roofing Tiles: Wear resistance (Dorry's abrasion Test)
                                Knife Edge Load
                                Absorption   (02)

Tests on Bitumen: Specific Gravity
                    Viscosity
                    Softening Point
                    Flash and Fire Point
                    Ductility
                    Penetration Value.

Compressive strength of Laterite Stone.   (03)

REFERENCE BOOKS:

1. Suryanarayana A.V.K., (1990), "Testing of Metallic Materials", Prentice Hall of India, New Delhi.
2. Khanna & Justo , (1989), "Highway Materials Testing", Nemchand, New Chand.
3. Technical Teachers' (1983), "Training Institute, Laboratory Manual of Strength of Materials", Oxford University Press.
4. Relevant I S Codes.

MAT CIE 202 ENGG. MATHEMATICS – IV

CIE- 202   FLUID MECHANICS – II [3 1 0 4]

Total number of lectures – 50

Flow in open Channels: Introduction to free surface flows - Geometric elements - Types of open channel flows. Chezy's and Manning's formulas, hydraulically efficient channel cross section – Rectangular and trapezoidal channels. Specific energy, specific energy curve, critical depth, alternate depth, critical flow in a rectangular channel, Froude's Number and its significance.   (10)

Gradually varied flow: Basic assumptions, Dynamic equation of GVF, characteristics and classification of flow profiles. (M,S and C type profiles), Step method of computation of back water curve (M1)type only.   (06)

Rapidly varied flow: Hydraulic jump in a rectangular channel, loss of energy in a hydraulic jump- Venturi, standing wave and Parshall flumes.   (04)

Dimensional Analysis And Model   Similitude: Introduction, Fundamental dimensions – Similitudes - Dimensional homogeneity - Dimensional analysis by Buckhingham - π theorem and its applications - Model studies : Model numbers, Model laws- Froude's law and Reynold's law. Undistorted and distorted models - scale effect.   (06)

Impulse Momentum Principle And Its Applications: Momentum Equation, Impact of free jets - Forces exerted by a jet on stationery, moving and series of flat plates - Forces exerted by a jet on stationary, moving and series of curved vanes. Work done and efficiencies,   (06)

Hydraulic turbines: General layout of hydro power plants - classification of turbines - Impulse turbine and reaction turbines, description, typical dimensions and general Principles of working of Pelton, Francis and Kaplan turbines. Work done and efficiencies of impulse and reaction turbines. (Inlet and outlet velocity diagrams and solution to simple problems only) Governing of turbines, specific speed and unit quantities of different types of turbines, selection of turbines and functions of a draft tube.   (12)

Centrifugal Pump: Classification, description and general principle of operation of centrifugal pumps – work done and efficiencies, multistage pumps - pumps in series and pumps in parallel, specific speed of a pump.   (06)

REFERENCE BOOKS

1. Chow Vente, (1985), "Open channel Hydraulics", Tata McGraw - Hill Publishing Co., Ltd., New Delhi.
2. Modi P.N. and Seth S.M, (2005), "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
3. Streeter V.L and Wiley E.B., (1998), "Fluid Mechanics", Mc Graw Hill Co. New York.
4. Garde R.J., (2003), "Fluid Mechanics through problems", New age international Pvt. Ltd., publishing, New Delhi.
5. Bansal R. K. (2010), "Fluid Mechanics and Hydraulic Machines", Laxmi Publishers, New Delhi.
6. Jagadish Lal, (2005), "Hydraulic Machines", Metropolition Book Co. Pvt Ltd., New Delhi.
7. Raghunath H.M., (1987) "Fluid Mechanics and Machinery", CBS Publishers and Distributors, New Delhi.
8. Jain A.K., (2002), "Fluid Mechanics", Khanna Publishers, New Delhi.
9. Kumar D. S.(2000), "Fluid Mechanics and Fluid Power Engineering", Katson Publishing House, New Delhi.

CIE 204 STRUCTURAL ANALYSIS – II [3 1 0 4]

Total number of lectures - 48

Strain Energy: Strain energy due to axial force, shearing force, bending moment and twisting moment. Law of conservation of energy, virtual work on rigid and elastic bodies, Betti's theorem, Maxwell's law of reciprocal deflections, Castigliano's theorems. (03)

Deflection: Determination of deflection in beams, simple frames and trusses by strain energy methods-Unit load method and Castigliano's method. (12)

Analysis of two hinged parabolic arches. Determination of horizontal reaction, normal thrust, radial shear and bending moment. Lateral yielding, rib shortening, and effect of temperature change. (04)

Rolling Loads and Influence Lines: Determination of maximum S.F. and B.M. at a section in the beam due to concentrated loads and udl, equivalent udl, Influence lines for S.F. and B.M. in beams. Use of influence lines to determine max. S.F. and max. B.M. at a section and absolute max. B.M. and S.F. in the beam. Influence lines for beams with hinges. (07)

Analysis of Simple Statically Indeterminate Beams: Analysis of propped cantilever, fixed and continuous beams by strain energy and consistent deformation methods. Analysis of continuous beams by three-moment theorem. (10)
Analysis of statically indeterminate beams, bents and frames : using slope deflection, and moment distribution methods. (12)

REFERENCE BOOKS

1. Reddy C.S., (2004), "Basic structural Analysis", Tata McGraw Hill, New Delhi
2. Ramamrutham, Theory of Structures,
3. Rao Prakash D.S., (1996), "Structural Analysis", Universities Press, India.
4. Gupta S.P., Pandit G.S. and Gupta R, (2003), "Theory of Structures", Volume 2, McGraw Hill, New Delhi.
5. Vaidyanathan R., and Perumal R., (2004), "Comprehensive Structural Analysis" Vol. I & II, Laxmi Publications, New Delhi.
6. Kinney J S., "Indeterminate Structural Analysis", (1957), Addison-Wesley Publishing Company, Massachusetts, USA

CIE 206 STRUCTURAL DESIGN-I [3 1 0 4]

Total number of lectures – 48

Concrete Mix Design as per IS code procedure   (04)

Role of reinforcement, behaviour of RCC section. Straight line Theory - Assumptions, determination of Neutral axis, determination of stress and strain due to bending moment - Singly reinforced and doubly reinforced sections.   (10)

Cracked Section, determination of short term and long term deflections of R.C. beams, determination of Crack width.   (06)

Limit state method, principle of limit state method of design, characteristic loads, characteristic strength, partial safety factors. Stress strain characteristics for concrete and steel.   (03)

 Introduction to stress block parameters for collapse, limit state of serviceability.   (02)

Limit state method of design of beams - Design of rectangular beams (singly and doubly reinforced), flanged beams, Design for Shear and Torsion.   (10)

 Limit State Design of one way and two way slabs for various boundary conditions   (07)
 Limit state of collapse in compression, Design of axially loaded short R.C. columns, uniaxial bending - using SP16 hand book.   (06)

REFERENCE BOOKS

1. Karve S.R, and Shah V.L., (1996), "Limit state Theory and design of reinforced concrete ", Structures Publishers, Pune.
2. Verghese P.C., (1999), "Limit State Design of Reinforced Concrete", Prentice Hall of India, New Delhi.
3. Shah H.J., (2005), "Reinforced concrete", Vol. I, Charotar Publishing house, Anand.
4. Sinha N.C., and Roy S.K., "Fundamental of Reinforced Concrete", Year,
5. S. Chand and company. Place of Publication
6. Shah V.L., and Karve S.R., (1997), "Illustrated Reinforced Concrete
7. Design", Structures Publishers, Pune.

CODE BOOKS
1. IS:456 – 2000, "Code of practice for plain and Reinforced concrete", Bureau of Indian Standards, New Delhi
2. SP-16 - 1980 Design Aids for Reinforced concrete IS 456 - 1978. Bureau of Indian Standards, New Delhi

CIE 208 SURVEYING – II [3 1 0 4]

Total number of lectures - 48

Tacheometry: Principles, methods - analytic tacheometer - distance and elevation formulae for horizontal and inclined site with staff vertical and normal - Beaman's stadia arc - range finder. (10)

Curves: Introduction - simple curve - Basic definition - compound curve - reverse curve - transition curve - lemniscate curve - vertical curve - design of vertical curve. (14)

Construction Surveying: Introduction - equipments for setting out - pipe line - building and structures - staking out a highway. (03)

Photogrammetric Surveying: Terrestial - principles - photo theodolite, horizontal and vertical distances of points from photographic measurement.

Aerial Photogrammetry - aerial camera - scale of vertical photograph, drag and lift - computation of flight plane. (09)

Under Ground Surveys: Introduction - application of under-ground surveys - auxilliary theodolite - aligning the theodolite -problems in tunnel survey. (04)

Hydrographic Survey: Shore line survey - methods of sounding -locating - reduction of soundings and plotting. Three point problem, nautical sextant and station pointer. (05)

Electronic Distance Measurement: Introduction - Basic - concepts - Basic principles of EDM - Total station Instruments - computing distance from the phase differences - brief description of EDM Instruments. (03)

REFERENCE BOOKS

1. Kanetkar T.P. and Kulkarni S.V., (1989), "Surveying and levelling", Part I and II, Pune Vidyarthi Griha Prakashana – Pune.
2. Arora K.R., (1993), "Surveying", Vol. I and II, Standard Book House, New Delhi.
3. Punmia B.C, (2005), "Surveying", Vol. I and II, Lakshmi Publications, New Delhi,
4. David Clark, (1983), "Plane and Geodetic Surveying for Engineers", Vol I and II, - CBS Publication and Distributors, New Delhi.
5. Norman Thomas, (1963), "Surveying", Edward Arnold Publishers (ELBS) London.

XXX – XXX – ELECTIVE – I (OE)

CIE 210 BUILDING DESIGN AND DRAWING. [0 0 3 1]

Total number of classes - 14

Foundations:

Plan, elevation and sectional views giving all details for different types of foundations – Masonry foundations, RCC Footings – Isolated, combined and raft footings. (1 Sheet)

Doors and Windows:

Plan, elevation and sectional views giving all details for

    a) Wooden and Aluminium doors, with

        i)   Fully panelled

        ii)   Fully glazed,

    b) PVC doors and Steel doors

    c) Collapsible Door, (2 Sheet)

    d) Wooden windows with

    i) Partially glazed

    ii) Fully panelled.

    e) Aluminium windows with

    i) Fully glazed Fixed and open able shutters

    ii) Fully glazed Sliding (2 leaves and 3 leaves) (2 Sheets)

Designing and Drawing of Residential Buildings:

Plan, Elevation and Sectional views of Single bedroom house with Mangalore tiled roof, Double bedroom house with RCC roof. (2 Sheets)

Designing and Drawing of Public Buildings:

Plan, Elevation and Sectional views of School Building, Bank, and Health Centre for the given Line Diagram. (3 Sheets)

Introduction to Auto cad:

Introduction to Auto CAD for drafting plan and elevation of single bed room RCC building with flat roof. (4 Classes).

REFERENCE BOOKS

1. Balagopal Pabhu T.S., Vincent Paul K. and Vijayan C., (1999) "Building Design of Civil Engg. Drawing", Spades Publishers, Calicut.
2. Shah and Kale, (1985), "Principle of Building Drawing", Tata McGraw Hill Publishing Co., New Delhi.
3. Sharma and Kaul, (1976), "Text book of Building Construction", S. Chand, New Delhi.
4. Rangawala S.C., "Elementary and advanced building Construction".
5. IS National Building Code – 1970.

CIE 212 FLUID MECHANICS LAB [0 0 3 1]

Total number of classes - 12

Calibration of V – Notch	(01)
Calibration of Rectangular notch	
Calibration of Cippoletti Notch	(01)
Calibration of orifices	
Calibration of mouth pieces	(01)
Calibration of Venturimeter	
Calibration of orifice meter	(01)
Determination of Friction factor of pipes	(01)
Experiment on venturi flume	
Experiment on standing wave flume	(01)
Calibration of Broad crested weir	
Calibration of curved weir	(01)
Test on Impact of jet on Vanes	(01)
Test on centrifugal pump	(01)
Test on pelton turbine	(01)
Test on Francis turbine	(01)
Demonstration of Kaplan Turbine	(01)

REFERENCE BOOKS

1. Modi P.N. and Seth S.M., (2005)., "Hydraulics and Fluid Mechanics" Standard Book House, New Delhi.
2. Jain A.K., (2002), "Fluid Mechanics", Khanna Publishers, New Delhi.
3. Streeter V.L and Wiley E.B., (1998) "Fluid Mechanics", McGraw Hill Co. New York.
4. Modi.P.N(1988), " Irrigation, water resource and water power", Standard book house publications, Delhi.
5. Klimentor(1983), " General hydrology", MIR publications,Moscow.
6. H.M.Raghunath(1985),"Hydrology", Wiley Eastern pulications, Delhi.
7. Wilson. E.M(1990),"Engineering hydrology", Macmillon education limited, London.
8. W.Viessman & J.Knapp(1989),"Introduction to hydrology", Harper & Row publishers.

CIE 214 MATERIAL TESTING LAB - II [0 0 3 1]

Total number of lectures - 13

Determination of specific gravity of cement
Determination of Fineness of cement   (01)
Determination of standard consistency of cement
Determination of setting times of cement   (01)
Determination of soundness of cement
Determination of strength of cement   (01)
Determination of specific gravity of fine aggregate
Determination of specific gravity of coarse aggregate   (01)
Determination of fineness modulus of fine aggregate
Determination of fineness modulus of coarse aggregate   (01)
Determination of bulking of sand
Determination of clay (or silt) content in sand   (01)
Determination of workability of concrete by slump test
Determination of workability of concrete by compaction factor test(01)
Determination of workability of concrete by
      Vee – Bee consistometer Test
Determination of compressive strength of concrete   (01)
Determination of tensile strength of concrete
Determination of flexural strength of concrete   (01)
Determination of permeability of concrete
Determination of modulus of elasticity of concrete   (01)
Determination of aggregate impact value
Determination of aggregate abrasion value (Los Angeles Test)   (01)
Alkali – Aggregate reaction – Demonstration
Flakiness and Elongation Indices of Aggregates - Demonstration
Rebound Hammer, Profometer, Corrosion analyser, Ultrasonic tester –
Demonstration   (02)

REFERENCE BOOKS

1. Shetty M.S., (2006), "Concrete Technology", S. Chand and Co.
2. Neville and Brooks, (2003), "Concrete Technology", Pearson Education.
3. Singh Gurucharan, (1988), "Materials of Construction", Std. Publishers.
4. Relevant IS Codes.

CIE 216 GEOLOGY LAB   [0 0 3 1]

Total number of Classes – 12

Identification and description of the following minerals with uses and distribution in India.   (02)

Rock forming Minerals: Quartz group - rock crystal, Amethyst, Rose crystal, agate, flint, Jasper. Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Koaline, Calcite, Magnesite, Dolomite, Hornblende, gypsum, Olivine, Corundum, Garnet, Talc, asbestose, Chlorite. Ore minerals: hematite, Magnetite, Limonite, Chromite, Chalcopyrite, Pyrite, Galena, Azurite, Malacite.   (02)

Megascopic study of the following rocks with their composition, texture, structure, and engineering importance- Granite, gabro, dunite, pegmatite, dolomite, basalt, obsidian, pumice, conglomerate, breccia, sandstone, limestone, shale, laterite, gneiss, slate, quartzite and marble.   (02)

Interpretation of geologic maps with horizontal inclined, folded, faulted and unconformity.   (04)

Determination of thickness of strata on horizontal ground   (02)

Dip and strike problems   (01)

Borehole problems and their uses in dams, tunnels and reservoir site.   (01)

REFERENCE BOOKS

1. Muruthesha Reddy M.T., (2002), "Engineering Geology Practicals", New age International Publishers, New Delhi
2. Gurappa K.M., (1975), "Structural geology maps and problems".
3. Gokhale W., (1987), "Manual of geological maps", CBS publications, New Delhi.

CIE 301 GEOTECHNICAL ENGINEERING – I [3 1 0 4]

Total number of lectures - 50

Introduction: Introduction to Geotechnical Engineering, Soil structure-Single grained, Flocculated and Dispersed structure, Clay minerals.   (03)

Index properties of soil : Soil as a three phase system, Physical properties of Soil - Specific gravity, Void ratio, Porosity, Degree of saturation, Bulk density, Dry density, Saturated density, Relative density, Moisture content, Inter - relationships between them, Atterberg's limits, Sieve Analysis, Hydrometer analysis, IS Classification of soils   (12)

Total, effective and neutral stresses: Principles of Effective, Neutral and Total Stresses   (02)

Flow Through Soil: Concept of permeability. Darcy's law, Factors affecting permeability, Laboratory determination of permeability of soils, Permeability of stratified deposits.   (05)

Seepage Through Soils: Quick sand condition, Laplace equation (No Derivation) , Flow nets- properties and applications, Graphical method of construction of flow nets for sheet pile and cut off walls.   (05)

Compaction of Soil: Optimum moisture content, Maximum dry density and Zero air voids line, Factors affecting compaction, IS light and heavy compaction tests, Equipments for compaction control in the field.   (03)

Stress Distribution in Soil: Boussinesq's theory for stresses in soils. Use of Boussinesq's equations for determination of stress distribution (No derivation) - for point load, Uniformly loaded circular and rectangular areas, Construction and use of New Mark's chart.   (04)

Consolidation of Soil: Concept, Spring analogy, Definition of - Compression Index, Coefficient of Compressibility, Coefficient of Volume Compressibility. Normally Consolidated, Pre- consolidated, Over and Under consolidated soils. Casagrande's method for determination of Pre-Consolidation pressure, Its significance, Terzaghi's one dimensional consolidation theory (No derivation). Consolidation tests, Use of laboratory curve fitting methods.   (08)

Shear Strength of Soil: Concept of shear strength of soils, Mohr-Coulomb theory and failure criteria, Laboratory determination of shear strength parameters - Direct shear, Triaxial, Unconfined compression and Vane shear tests, Drained, Undrained and consolidated undrained tests and their applications.

                    (08)

REFERENCE BOOKS

1. Terzaghi K., and Peck R.B., (1967), "Soil Mechanics in Engineering Practice", A Wiley International Edition, 2nd Edition, New York.
2. Taylor D.W., (1960), "Fundamentals of Soil mechanics", Asia Publishing house Bombay, 3rd Edition.
3. Ramiah B.K. and Chickanagappa L.S., (1990), "Hand Book of Soil Mechanics and Foundation Engg.", Oxford and IBH, 2nd Edition.
4. Lambe T.W. and Whitman R.V., (1987), "Soil Mechanics", SI Version, John Wiley and Sons.
5. Alam Singh and Chowdhury G., (1994), "Soil Engineering in theory and practice", CBS publishers

6. Punmia B.C,.(2005), "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., 16th edition.
7. Arora K.R, (2008), "Soil Mechanics and Foundation Engineering", Standard, Publishers and Distributors, 7th Edition.
8. Murthy V.N.S., (1995), "A Text Book of Soil Mechanics and Foundation
9. Engineering", Sai Kripa, Technical Consultant, Bangalore, 3rd Edition.
10. Gopal Ranjan and. Rao A.S.R, (2000), "Basic and Applied Soil Mechanics", New Age International Pvt. Limited, Publishers, 2nd Edition.

CIE 303 STRUCTURAL DESIGN - II [3 1 0 4]
(Syllabus as per requirement of IS 800-2007)

Total number of lectures - 48

Introduction: scope and use of structural steel, Importance of steel construction. Corrosion, Fire protection and fatigue consideration in steel structures.   (02)

Limit state method of design: Allowable stress design, Limit state method of design, partial safety factors, and load combinations.   (02)

Structural fasteners: Bolted connections-type of bolts and bolted joints, specifications for bolts, strength of a joint, efficiency of joints, design of lap joints, butt joints and bracket connections. Welded connections – type of welds and welded joints, standard notations for fillet and Butt welds, strength of welds, design of lap joints, butt joints and bracket connections.   (11)

Design of Tension members: Types of sections used for tension members, effective length of compression members, classification of cross section, buckling class of cross sections, local and overall buckling, design of axially loaded tension member - plate, single angles, double angles and other sections with welded and bolted connections.   (06)

Compression member: Types of sections used for compression members, design of axially loaded compression member –standard sections, built up sections, laced and battened columns. Design of column splices, column bases – simple slab base and gusseted base for axially loaded column.

(10)

Design of flexural members: standard and built up sections. Design of beams – laterally supported and laterally unsupported compression flange. Web crippling, web buckling and deflection.   (06)

Welded Plate Girders : Elements of plate girder, proportioning of web, proportioning of flanges, self weight of plate girders, stiffeners - Detailed Design.
(06)

Roof Trusses: Loads on roofs, unsymmetrical bending, design of purlins, Design of truss members and joints, connection between column and trusses.   (05)

REFERENCE BOOKS

1. Subramanian N., "Design of Steel Structures", (2008), Oxford University press, New Delhi.
2. Duggal S.K., "Limit State method of design of steel structures", (2010), Tata McGraw-Hill, New Delhi
3. Martin L.H and Purkiss J.A., " Structural Design of Steelworks to BS 5950", (1992), Edward Arnold, London.
4. Arya A.S and Ajmani J.L, "Design of Steel Structures", (1996), Nemchand Bros., Roorkee.
5. Kazim S.M.A. and Jindal R.S, "Design of Steel Structures", (1990), Prentice Hall of India, New Delhi.
6. Dayarathnam P., (1996), "Design of Steel structures", S. Chand and Company Ltd., Ram Nagar, New Delhi.

CODE BOOKS:

1. IS 800-2007: General construction in steel-Code of practice (third revision), Bureau of Indian Standards, New Delhi.
2. IS 875-1987 (Part III): Code of practice for design loads (other than earthquake) for building structures, Bureau of Indian Standards, New Delhi.
3. BS 5950 (part I) - 1985: Structural us of steelwork in buildings, British Standards Institution, London.
4. SP: (6)-1964: Hand book for Structural Engineers, Bureau of Indian Standards, New Delhi

Note: Students taking this course, have to procure the codes : IS 800-2007 and SP (6)-1964 and it is mandatory.

CIE 305 WATER RESOURCES ENGINEERING   (4-0-0- 4)

Total number of lectures – 50

Introduction: Scope of the subject, World water resources, Need for planned utilization of water resources, hydrologic cycle, hydrological data and hydrological equation. (02)

Hydrology: Types of precipitation. Rainfall intensity, duration and measurement, Mean rainfall on the basin. Water losses- Infiltration, evaporation, transpiration. Estimation of water losses, infiltration indices. Run-off- Process, estimation, stream gauging, flow-duration curves, flow-mass curves. Hydrographs-types and uses. (12)

Irrigation engineering: Necessity, benefits and ill-effects of irrigation. Types of irrigation systems. Water requirement of crops. Irrigation efficiencies. Duty, Delta, Base period. Depth and frequency of irrigation. Canal irrigation- Types, alignment, canal sections, canal lining. (09)

Reservoir planning: Purposes and types, investigations, reservoir capacity. Reservoir sedimentation. Water losses from reservoir and control. (04)

Hydraulic structures: Dams- Introduction. Types- Gravity dams, arch dams, buttress dams, earth dams. Spillways and energy dissipaters
Gravity dams- forces acting, design requirements, single step method for low gravity dams.
Diversion head works-components
Canal masonry works- Falls, regulators, cross drainage works. (15)

Flood studies: Importance, estimation of flood magnitude, flood routing, flood control measures. River training works. (08)

REFERENCE BOOKS

1. Viessman and Knapp, (1989), "Introduction to Hydrology", Harper and Row Publishers, Singapore.
2. Linsley, Pauler and Kohlas, (1975), "Hydrology for Engineers", MGHK Publishers, Tokyo.
3. V.T. Chow, D.R. Maidment, L.W. Mays(1998), "Applied Hydrology", McGraw Hill.
4. Modi.P.N(1988), " Irrigation, water resource and water power", Standard book house publications, Delhi.
5. Klimentor(1983), " General hydrology", MIR publications,Moscow.
6. H.M.Raghunath(1985),"Hydrology", Wiley Eastern pulications, Delhi.
7. Wilson. E.M(1990),"Engineering hydrology", Macmillon education limited, London.
8. W.Viessman & J.Knapp(1989),"Introduction to hydrology", Harper & Row publishers.

CIE 307 ENVIRONMENTAL ENGINEERING – I [4 0 0 4]

Total number of lectures - 48

Introduction: Need for protected water supply, essentials of water supply, project documents preparation. (02)

Quantity of water - Population forecasting - different methods, rate of demand - factors affecting and its variation. (05)

Sources of water: different sources of water, intakes/ water borne diseases and their control, conveyance of water (Pump capacity, Economical diameter). (04)

Quality of water - Physical, chemical and biological characteristics, analysis of water, drinking water standards. (05)

Treatment of water - Aeration of water - types of aerators, theory of sedimentation, sedimentation with coagulation, coagulants, feeding devices, mixing devices, flocculation - design considerations. (08)

Filtration - types of filters - design considerations.
Disinfection – theory, methods of disinfections, chlorination.
Other treatment methods - softening of water, Removal of iron and manganese, defluoridation, desalination. (10)

Distribution of water - distribution methods, systems of supply, service reservoirs and their capacity, layouts of distribution. (05)

Pipe appurtenances: service connection, location of water supply pipes in buildings. wastage of water - Leakage detection & prevention, corrosion and its prevention. (05)

Air Pollution: Definition, important air pollutants and their sources, effects of air pollution on human health and on materials, control measures – air cleaning devices such as electrostatic precipitators, wet scrubbers, gravity settling basins. (04)

REFERENCE BOOKS

1. Manual on water supply and treatment CPHEEO, (1991), Ministry of Urban development, New Delhi.
2. Garg S.K., (1999), "Environmental Engg.-I", Khanna Publishers, New Delhi.
3. Birdie G.S., (1987), "Water Supply and Sanitary Engg.", Dhanpath Rai and Sons, New Delhi.
4. B.C. Punmia, ""Water Supply and Sanitary Engg.", Dhanpath Rai and Sons, New Delhi.
5. Modi and Sethi, ""Water Supply and Sanitary Engg.", Dhanpath Rai and Sons, New Delhi.
6. Fair and Gayer, ""Water Supply and Sanitary Engg.", Dhanpath Rai and Sons, New Delhi.

CIE 309 TRANSPORTATION ENGINEERING-I (4-0-0-4)
Total number of lectures: 50

HIGHWAY ENGINEERING: -

Introduction: - Highway engineering, scope of highway engineering, highway classification, factors controlling highway alignment, engineering survey for highway location. (05)

Highway Economics and Finance: -Methods of Economic Analysis- Motor vehicle operation cost, Highway finance. (06)

Geometric Design:- Elements of highway, factor and effecting friction, Camber, types of camber, width of formation, Sight distance-stopping and Overtaking, Horizontal curve, Extra widening, Super elevation, Transition curve, Vertical curves-Summit and Valley Curves. (10)

Pavements Design: - Types of pavements, Factors which influences design and selection of different types of pavements, Brief study on pavement materials, Design of Flexible pavements-C.B.R, Group Index and IRC method, Design of Rigid pavements- IRC method.

Types of failure in pavements, Types of joint in Rigid pavements. (12)

Highway Drainage System:-Types of drainage and design. (02)

TRAFFIC AND TRANSPORT ENGINEERING: -

Traffic Engineering:- Traffic engineering, vehicular and road user characteristics, traffic studies, Variation in speeds, speed and delay studies and problems, Origin and destination studies, traffic density, Traffic volume study and traffic volume, Relation between speed, travel time and traffic volume, Traffic density and passenger car units, Traffic signs and traffic signals, design problems. (09)

Transportation Planning: - Transportation planning and stages in transport planning, Trip generation, Trip distribution models, Trip assignment, and modal split. (06)

REFERENCE BOOKS:

1. Khanna S.K and Justo C.E.G., (2001), "Highway Engineering", 8th Edition, Nemchand and Bros., Roorkee.
2. Kadiyali L.R., (2000), "Traffic Engineering and Transportation Planning", 6th Edition, Khanna Publisher, New Delhi.
3. E.J. Yoder, Principles of Pavement Design, 2nd Edition, John Wiley & Sons, Inc. New York, 1975.
4. Yang H. Huang, Pavement Analysis and Design, Prentice Hall, 2003.
5. Hutchinson, B.G., Principles of Urban Transportation System Planning, McGraw-Hill, 1974
6. McShane W R & Roess R P, Traffic Engineering, Prentice-Hall, NJ, 2010.
7. Vukan R. Vuchic, Urban Transit: Operations, Planning and Economics, Wiley, 2005.
8. Ceder A, Public Transit Planning and Operation, Elsevier, 2007.

CIE 311 SOIL MECHANICS LABORATORY [0 0 3 1]

Total number of Classes - 14

1. Determination of moisture content by oven drying method, pycnometer and torsion moisture meter. (01)
2. Determination of specific gravity by density bottle and pycnometer. (01)
3. Determination of Atterberg's limits-Liquid limit, plastic limit and shrinkage limit. (01)
4. Determination of in-situ unit weight by core cutter method and sand replacement method (01)
5. Sieve analysis and hydrometer analysis (01)
6. Determination of coefficient of permeability by constant head and variable head permeameter (01)
7. Standard Compaction test, use of proctor needle (01)
8. Modified compaction test (01)
9. Triaxial shear test (01)
10. Unconfined compression test (01)
11. Direct shear test, Vane shear test (01)
12. Demonstration of- (02)
    (a) Triaxial compression strength test with pore pressure and volume change measurements
    (b) Cone penetration test
    (c) CBR test (01)

REFERENCE BOOKS

1. Relevant IS codes
2. Bowles J.E., (1986), Engineering properties of soil and their measurement McGraw – Hill Book Company, New York, 2nd edition.
3. Lambe T.W, Soil testing for Engineers, John Wiley and Sons, INC.
4. Cheng Liu and Jack B. Evett, (1987), Soil properties, Testing, Measurement and Evaluation, Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

CIE 313 SURVEYING PRACTICE – II(0 0 3 1)

Total no. of classes - 13

Tacheometric surveying :

1. Determination of Tacheometric constants.   (01)
2. To find the gradient of a line joining two points at different elevations. (01)
3. Location of offsets along a road alignment Tacheometric traverse.   (01)

Curve Surveying: (Using Chain and Tape)
4. Setting out simple curve by offset from long – chord.   (01)
5. Successive bisection of arcs.   (01)
6. Setting simple curves by offset from chord produced.   (01)

Curve Surveying: (Using theodolite)
7. Setting out a compound curve.   (01)
8. Setting out a reverse curve.   (01)
9. Setting out a transition curve(BernoullisLeminscate).   (01)
10. Setting out a combined curve.   (01)

Total Station Method
11. Generating general plan.   (01)
12. Generating contour plan.   (01)

Study of Instruments : Hand level, Clinometers, Abney level,Use of Planimeter,Box sextants, Nautical sextants, Ceylonghat tracer.   (01)

REFERENCE BOOKS

1. PunmiaB.C ,(2005), " Surveying and levelling" , Vol.I and II , Lakshmi Publishers , New Delhi.
2. AroraK.R , (1993), " Surveying", Vol.I, Standard Book house, New Delhi.
3. Kanetkar T.P and Kulkarni S.V,(1996), " Surveying and levelling " parts I and 2, Pune VidyarthiGrihaPrakashan.
4. ThomasNorman , " Surveying" , Edward Arnold Publishers (ELBS),Budapest.
5. David Clark,(1983), " Plane and Geodetic Surveying for Engineers " , Vol I and II – CBS publication and Distributors, New Delhi.

PROGRAM ELECTIVE – I

CIE 321 ADVANCED STRUCTURAL ANALYSIS [3 0 0 3]

38 hours

Influence Lines for Bridge Trusses and Statically Indeterminate Beams: Influence line for axial force in members of simple bridge trusses. Muller-Breslau principle. Influence lines for reactions, B.M. and S.F. in statically indeterminate beams (with single degree of redundancy)   (06)

Kani's method of Analysis: Analysis for continuous beams with and without support sinking. Analysis of symmetrical and nonsymmetrical frames with hinged and fixed boundary conditions   (06)

Matrix Methods : Stiffness and flexibility coefficients, stiffness and flexibility matrices along specified co-ordinates, Analysis of continuous beams by stiffness and flexibility matrix methods, local and global co-ordinate systems, transformation matrix, Analysis of trusses and simple frames by stiffness and flexibility matrix methods.   (20)

Plastic Analysis : Ductility, Behaviour in the plastic range, concept of plastic hinge, plastic moments, shape factor for different shapes of cross - section, redistribution of moment, collapse mechanism. Upper and lower bound theorems. Determination of collapse loads using statical and kinematic methods for simple structures.   (06)

REFERENCE BOOKS

1. Reddy C.S., (2004), "Basic structural Analysis", Tata McGraw Hill, New Delhi
2. Ramamrutham, Theory of Structures,
3. Rao Prakash D.S., (1996), "Structural Analysis", Universities Press, India.
4. Gupta S.P., Pandit G.S. and Gupta R, (2003), "Theory of Structures", Volume 2, McGraw Hill, New Delhi.
5. Vaidyanathan R., and Perumal R., (2004), "Comprehensive Structural Analysis" Vol. I & II, Laxmi Publications, New Delhi.
6. Kinney J S., "Indeterminate Structural Analysis", (1957), Addison-Wesley Publishing Company, Massachusetts, USA

CIE 323 OPEN CHANNEL FLOW AND SEDIMENT TRANSPORT   [3 0 0 3]

Pre-requisite: CIE-201 & CIE 202   FLUID MECHANICS – I & II

Total number of lectures - 38

Review of Fundamentals of Open Channel Flow: Classification of open channel flow, Properties of open channels, velocity and Pressure distribution, Energy and Momentum principles; uniform flow and critical flow - concepts, Formulae and computations. (08)

Gradually Varied Flow: Basic Assumptions, Dynamic equation of GVF, characteristics and classification of flow profiles, Integration and step methods. Introduction to spatially varied flows – with increasing and decreasing discharge. (08)

Rapidly Varied flow: Characteristics of flow, Flow over spillways, Hydraulic Jump, types – basic characteristics of the jump. Surface profiles, Location of jump, use of Hydraulic Jump as Energy Dissipater. (08)

Sediment Transport: Introduction, bulk properties of sediments and modes of sediment motion. Theories such as competent velocity concept, lift concept, critical tractive force concept and Shields analysis. Bed form, effect on channel roughness, Regimes of flow, DuBuoy's and Einsteins equations, bed and suspended load transport and sediment samplers. (08)

Design of Stable Channels: Introduction, variables and conditions for design, empirical approach and tractive force method. (06)

REFERENCE BOOKS

1. Ven Te Chow., (1985), "Open Channel Flow", Mc Graw Hill Company Ltd., New York.
2. Graf. W.H., (1971), "Hydraulics of Sediment Transport", Mc Graw Hill   Publishing Company, New York.
3. Garde R.J. and Rangaraju, (2000), "Mechanics of sediment transportation and Alluvial Stream Problems", Wiley eastern ltd., New Delhi.
4. French R.H., (1987), "Open Channel Hydraulics", Mc Graw Hill Company, New
5. Subramanya K., (2005), "Flow in Open Channels", Tata Mc Graw Hill Publishing Company, New-Delhi.
6. Shen H.B., (1969), "River Mechanics", Shen H.B. P.O. Box 606, Fort Collins, Colorado.
7. Henderson F.N., (1978), "Open Channel Flow", McMillan, New York.

CIE 325 AIR POLLUTION AND CONTROL [3 0 0 3]

Total number of lectures - 36

Definition, classification and properties of air pollutants, Behaviour of air pollutants, chemical reactions in atmosphere- smog. (05)

Meteorology variables, primary and secondary lapse rate, Inversions, stability conditions, general characteristics of stack plumes, Design Problems, stack height estimation. (06)

Effects of air pollution – human health, animals, plants and materials. Global effects of air pollution - acid rain, Green house effect, ozone layer depletion. Air quality and Emission standards, Air pollution index. (11)

Industrial plant location and planning. (02)

Sampling, analysis and control - Measurement of gaseous and particulate pollutants, stack sampling, smoke and smoke measurement, control methods - different types. (09)

Air-pollution due to gasoline driven and diesel driven engines, effects and control. Air pollution Act (03)

REFERENCE BOOKS

1. Rao H.V.N. and Rao M.N, (1989), "Air pollution", Tata Mc Graw Hill, New Delhi.
2. Air Pollution - Sampling and Analysis - APHA.
3. Rao C.S., (1995), "Environmental Pollution control", Wiley Eastern Ltd. Delhi.

CIE 327 BUILDING CODE AND REQUIREMENTS [3 0 0 3]

Total number of lectures - 38

Development control rules and General building requirements: low income housing in urban areas, rural areas, cluster planning for houses (06)

Fire and Safety: fire prevention, life safety, fire protection (03)

Loads, Forces and Effects on buildings: Dead load, imposed load, wind load, seismic load, snow load, special loads, load combinations. (06)

Soil and foundations: Types of foundations, settlement, footing on clay soil, pad foundation, strip foundation – depth and thickness of foundation, flexible foundations, determination of modulus of elasticity of soil (06)

Earth quake resistant of masonry wall: design of masonry wall –special considerations in earthquake zone, guide lines for improving earth quake resistance (05)

Lighting and ventilation: determination of luminous flux, efficiency, CRI, CCT, lighting design of building, Ventilation- design consideration, methods, air requirements, air conditioning (06)

Water supply, drainage and sanitation: definitions of terminologies used, pipe system- single stake, one pipe, two-pipe system, Plumbing system- definitions of terminologies, water, drainage and sanitation requirements (06)

REFERENCE:

National Building Code of India 2005

HSS 302 ESSENTIALS OF MANAGEMENT & ENGINEERING ECONIMICS [4 0 0 4]

CIE 302 GEOTECHNICAL ENGINEERING - II [3 1 0 4]

Total number of lectures - 50

Soil Exploration: Objectives, Methods of boring, Types of samples and samplers, Requirements of good sampler, Sampler tubes, Significant depth, Depth and spacing of bore holes, Penetration tests, Ground water investigations, Exploration log, Planning of exploration programme. (06)

Earth pressure : Earth pressure at rest, Active and passive conditions, Rankine's theory for active and passive condition, Bell's equation for C-Φ Soil, Coulomb's theory for active and passive conditions. (09)

Stability of slopes - Finite and infinite slopes, Types of failure of Finite slopes. Factor of safety, Stability of finite slopes by Swedish circle method and friction circle method - Effect of sudden draw down and submergence, Factor of safety using Taylor's stability chart. (09)

Bearing capacity of shallow footings – Classification of footings, Types of shallow footings, Definitions, modes of shear failure, Terzaghi's theory (No derivation), factors affecting bearing capacity, allowable bearing pressure, IS recommendations, Permissible, total and differential settlement , Estimation of bearing capacity from plate load and penetration tests. (09)

Pile foundations: Uses and types of piles, Pile driving, Load carrying capacity of a single pile by dynamic formulae-Engineering News and Hiley's formulae, Load carrying capacity of a single pile by static formula, Group action and Negative skin friction, IS pile load test, use of under-reamed piles and Bored compaction piles. (09)

Well foundations - Components of well foundation, Depth of well as per IRC and IS , Forces acting on the well foundation , Sinking of wells, Tilts and shifts, remedial measures. (03)

Machine foundations – Types of Vibrating machines, Types of machine foundations, General criteria, Basic definitions, Force transmitted to the foundation, Transmissibility factor. Block foundation subjected to vertical vibration, Determination of mass, Spring constant and damping factor. (05)

REFERENCE BOOKS

1. Bowels J.E. (1998), "Foundation Analysis and Design", McGraw-Hills Book Company 4th Edition.

2. Srinivaslu and Vaidyanathan (2003), "Hand book of Machine   Foundations", Tata McGraw Hill Book Company.
3. Shashi K Gulati and Manoj Datta, (2005), "Geotechnical Engineering", Tata Mc Graw-Hill Publishing company limited, New Delhi.
4. Hsai – Yang Fang, (2001), "Foundation Engg.", Hand Book, CBS
5. Publishers and Distributors, 2nd Edition, New Delhi.
6. Bhattarchaya, (2007), "Design of foundations in seismic areas-principles and applications", Foundation Publications, IIT Kanpur
7. Arora K.R., (2008), "Soil Mechanics and Foundation Engineering", Standard, Publishers and Distributors, 7th Edition.
8. Gopal Ranjan and Rao A.S.R., (2000), "Basic and Applied Soil Mechanics", New Age International (P) Limited, Publishers, 2nd Edition.
9. Punmia B.C., (2005), "Soil Mechanics and Foundations", Laxmi Publications Pvt., Ltd., 16th Edition.
10. Venkataramaiah C (2006), "Geotechnical Engineering", New age International Limited, Publishers, New Delhi.

CIE 304 STRUCTURAL DESIGN –III (RCC AND STEEL)

Total number of lectures = 48

Flat Slab: Interior panels – direct design method   (06)

Stair case: Types of stairs, live load on stairs, IS code provisions, General notes on design of stairs, design of dog legged and open newel types.   (08)

Design of short and slender Columns subjected to axial load and biaxial bending moments**.**
                                                                                                                      (05)

 Column footing: Isolated footings, Rectangular, combined – type of footing, pressure distribution under footing, detailed design.
(10)

Retaining walls: Types of retaining walls, General design requirement, design of cantilever and counter-fort type retaining wall

                                                                                                                      (05)

Water tanks: Introduction, requirement of materials, Design of water tank as per IS code 3370, Rectangular and circular tanks resting on ground.   (08)

Beam – Beam and Beam-column connections   (06)

REFERENCE BOOKS

1. Verghese P.P., "Limit State Design of Reinforced Concrete", (2005), Prentice Hall of India, New Delhi.
2. Punmia B.C., "Limit state design of reinforced concrete", (2007), Laxmi Publications(P) limited, New Delhi.
3. Shah M.G. and Kale C.M., (1991), "RCC Theory and Design", Mecmillan India Ltd.
4. S.Unnikrishna Pillai and Devdas Menon, "Reinforced concrete design", (1998), Tata Mcgraw-Hill Publishing company Limited, New Delhi.
5. Ramchandra and Virendra Gehlot ,(2004)"Elements of limit state design of concrete structures" , Scientific Publishers (India), Jodhpur.
6. Punmia B.C, Ashok kumar Jain and Arun Kumar Jain, "Reinforced concrete structures", (1998),   Laxmi Publications(P) limited, New Delhi.

CODE BOOKS

1. IS:456 – 2000, "Plain and reinforced concrete code of practice", Bureau of Indian Standards, New Delhi.
2. IS:3370 – Part II & IV, Code of Practice for Concrete Structures for the Storage of Liquids, Bureau of Indian Standards, New Delhi.
3. IS:800 – 2007, "General construction in Steel-code of Practice", Bureau of Indian Standards, New Delhi.
4. SP:16-1984, "Design Aids for Reinforced Concrete to IS :456-1978", Bureau of Indian Standards, New Delhi.

CIE 306 TRANSPORTATION ENGINEERING-II   (3-1-0-4)
Total no. of classes : 50

RAILWAY ENGINEERING: -

Introduction: - Scope of railway engineering, Railway terminology, Railway Survey.   (04)

Tractive resistance: - Resistant due to friction, wave action, curves, gradients, speed of the train; Hauling capacity and Tractive efforts.   (04)

Permanent way: - Components parts rail and rail fastenings, ballast, sleepers, Railway creep, Anti-creep devices, coining of wheel, wear of rail.   (04)

Alignment Details: - Grades and curves, effect of normal and ruling gradients, pusher and balance grades, super elevation, equilibrium cant, cant deficiency and grade compensation.   (03)

Points and crossing: -Necessity of turnouts, Switches and track junction, Design of turnouts.   (04)

Railway Station and Yards: **-** Types of railway stations, classification of yards.
(01)

Equipments in Station Yards: - Triangle, Turn Table, Scotch Block, Fouling marks, Buffer Stops.   (01)

Signals: - Classification, function, Control on movement of train by different methods.   (03)

Interlocking: - Types and function.   (02)

AIRPORT ENGINEERING: -

Introduction: - History and development of aviation, Aviation organizations and their functions, Aircraft characteristics and its influence on airport planning, Factors to be considered in Airport Planning, Site selection survey, Obstructions, Airport configuration**.**   (04)

Geometric Design: - Runway orientation, Basic runway lengths, Geometric design of Runway and Exit taxiways.   (05)

Airport Capacity: - Runway and Terminal capacity and its improvement, Delay related capacity, Gate position and gate capacity, Terminal area, Aircraft parking system.   (04)

Visual aids and Air traffic control system: - Flight rules, Navigational and landing aids, VASI, PAPI enroute air traffic control, ILS, MLS.   (03)

Pavement Design: - ESWL concepts, FAA method and LCN-PCN method of pavement design   (06)

Airport Drainage System:-Design runoff, Surface and subsurface drainage. (02)

REFERENCE BOOKS

1. Saxena S C and Arora S P "A Text Book Of Railway Engineering".
2. Srinavasan R and Rangawala "Harbour, Dock and Tunneling Engineering".
3. Khanna S K., Arora M G and Jain S S "Airport Planning and Design".
4. Horenjeff, R. and McKelvey, F. "Planning and Design of Airports", Fourth edition, Mc Graw Hill Company, New York, 1994.
5. Ashford, N. and Wright, P.H., "Airport Engineering", Third edition, John Wiley and Sons, New York, 1992.

XXX – XXX ELECTIVE – III (OE)

CIE 308   STRUCTURAL DRAWING [0 0 3 1]

Total number of classes – 13

Stair case: Dog legged and open newel types.   (02)

Column footing: Rectangular combined footing   (01)

Water tanks: Rectangular and circular tanks – on the ground   (03)

Design of Steel Columns and Beams – Built up column – column splices – column bases subjected to axial loads, Lacings, Battening   (03)

Roof trusses – Design of roof truss purlin and bearing plate.   (01)

Welded Plate girder   (01)

Beam-beam and Beam-column connections   (02)

REFERENCE BOOKS

1. Krishnamoorthy, (2008), "Structural Design and Drawing", (Concrete Structures) CBS Publications, New Delhi.
2. Duggal S.K., (2008), "Limit State Design of Steel Structures", Tata McGraw Hill education private Limited – New Delhi.
3. Krishna Raju N., (2009), "Structural Design and Drawing " Universities Press, India
4. Shah M.G. and Kale C.M., "RCC Theory and Design", (1991), Mcmillan India Ltd.
5. Verghese P.P., "Limit State Design of Reinforced Concrete", (2005), Prentice Hall of India, New Delhi.
6. Punmia B. C., "Limit State Design of reinforced concrete" , (2007). Laxmi Publications, Limited.
7. Subramanian N., "Design of Steel Structures", (2008), Oxford University Press, New Delhi.

CODE BOOKS

1. IS 456 – 2000, "Plain and reinforced concrete code of practice", Bureau of Indian Standards, New Delhi.
2. IS 800 – 2007, "General construction in Steel-code of Practice", Bureau of Indian Standards, New Delhi.
3. SP-16--1984,"Design Aids for Reinforced Concrete to IS:456-1978, Bureau of Indian Standards ,New Delhi.
4. IS 3370 – Part II & IV, "Code of Practice for Concrete Structures for the Storage of Liquids". Bureau of Indian Standards, New Delhi

CIE 310 COMPUTER LAB – I [0 0 3 1]

Total number of lectures - 12

Writing and Executing computer programmes in C language for the following.

(01)

Solution of system of simultaneous equations by

    a) Gauss Elimination method
    b) Gauss Jordan elimination method
    c) Choloskey Decomposition method.
    d) Gauss Siedal and Jacobi iterative methods.   (03)

Matrix inversion by

    a) Gauss Elimination method.
    b) Gauss Jordan Elimination method.   (02)

Determination of Eigen value and Eigen vector by

    a) Iteration methods
    b) Jacobi method
    (02)

Determination of Integral of the given equation by

    a) Trepezoidal rule
    b) Simpsons rule
    c) Gaussian Quadrature.   (02)

Finding the deflection of beams by Finite difference method   (01)

Determination of critical loads of columns.   (01)

REFERENCE BOOKS

1. Salvadori M.G. and Baran S., (1963), "Numerical methods in Engineering", Practice Hall of India, New Delhi.
2. Krishnaraju N and Muthu K.U., (2001), "Numerical methods for Engineering problems", Macmillan India Ltd., New Delhi.
3. Rajasekaran S., (1992), "Numerical Methods for Science and Engineering", Wheeler and Co. Pvt. Ltd., New Delhi.
4. Rajaraman V, (1980), "Computer Oriented Numerical Methods", Prentice Hill of India New Delhi.
5. Balaguruswamy E, (1999), "Numerical Methods", Tata McGraw Hill, New Delhi.
6. Steven Chopra L. and Raymond P. Canale, (1988), "Numerical Methods for Engineers", McGraw Hill International Edition.

PROGRAM ELECTIVE – II
CIE 318 HYDROLOGICAL ANALYSIS   (3-0-0-3)
Pre-requisite: CIE-   WATER RESOURCES ENGINEERING

Total number of lectures - 38

Introduction: Hydrological cycle, Scope and application of hydrology, Hydrological failures, Hydrological budget, Geomorphology of drainage basins. (02)

Analysis of precipitation data: Rain gauge network, Testing consistency of data, Estimation of missing precipitation data, Mean areal precipitation, Intensity-duration-frequency analysis, Depth-area-duration analysis, Design storms and probable-maximum precipitation. (08)

Abstractions: Infiltration process, Infiltration capacity curves, Infiltration indices, Estimation of evaporation and transpiration-empirical methods, Energy balance, Water balance method. (06)

Runoff: Rainfall-runoff correlations- linear, non-linear, simple, multiple, coaxial correlation diagrams, Rational method, S-C-S method. (04)

Hydrographs: Definition and types, Storm hydrograph, Baseflow separation, Unit hydrograph- theory and applications, S-curve, Synthetic unit hydrograph- Synder's method, Introduction to Instantaneous unit hydrograph. (10)

Floods: Definition, Emperical methods, rational method, Envelope curves, Flood frequency methods, Flood routing. (08)

REFERENCE BOOKS

1. Linsley, Pauler and Kohlas, (1975), "Hydrology for Engineers", MGH Publishers, Tokyo.
2. Linsley,Kohler &Paulhus((1949),"Applied hydrology", MGH Publications, Newyork.
3. V.T. Chow, D.R. Maidment, L.W. Mays(1998), "Applied Hydrology", McGraw Hill.
4. Modi.P.N(1988), " Irrigation, water resource and water power", Standard book house publications, Delhi.
5. Klimentor(1983), " General hydrology", MIR publications,Moscow.
6. H.M.Raghunath(1985),"Hydrology", Wiley Eastern pulications, Delhi.
7. Wilson. E.M(1990),"Engineering hydrology", Macmillon education limited, London.
8. W.Viessman & J.Knapp(1989),"Introduction to hydrology", Harper & Row publishers.

CIE 320 URBAN TRANSPORTATION SYSTEMS   (3-0-0-3)

Pre Requisite CIE 311 Transportation Engg. – I

Introduction:- Role of Transportation: History of transit, Recent Trends in transit, Mass transportation characteristics, Demand Characteristics: Spatial, temporal and behavioral characteristics.   (06)
Public Transport: Definitions, modes of public transport and comparison, public transport travel characteristics, trip chaining, technology of bus, rail, rapid transit systems, basic operating elements.   (08)
Transit Network Planning: Planning Objectives, principles, considerations, transit lines types, geometry and characteristics, transit routes and their characteristics, timed transfer networks, prediction of transit usage, evaluation of network, accessibility considerations.   (10)
Transit Scheduling: Components of scheduling process, determination of service requirements, scheduling procedure, marginal ridership, crew scheduling. (08)
Terminals and Depot: Design of bus stops, design of terminals – principles of good layout, types of layout, truck terminal, depot location, twin depot concept, crew facilities and amenities.   (06)

REFERENCE BOOKS

1. Kristhi, Lal, Transporation Engineering, PHI, Delhi, 2008 Hay, W.W., An Introduction to Transportation Engineering, 2nd Ed., John Wiley & Sons, 2001
2. Kadiyali, L. R, "Traffic Engineering and Transport Planning", Khanna Publishers New Delhi – 110006, 2006
3. Hutchinson, Urban Transport Planning, John Wiley, 2006
4. Dickey, J.W., et. al., Metropolitan Transportation Planning, TMH edition, 2002.
5. Paguette, R.J., et.al, Transportation Engineering - Planning and design, 2nd edn., John Wiley & Sons, 2002.
6. Railis, V.R, Inter city Transport, Engineering and Planning, The Macmillan Press, 2003.
7. Vuchic V.R., "Urban Public Transportation System and Technology", Prentice Hall,
8. Inc. Englewood Cliffs, New Jersey, 1981.
9. Agarwal M.K., "Urban Transportation in India", INAE, Allied Publishers Ltd., 1996.
10. Grey G.E. & Hoel, LA, "Public Transportation" Prentice Hall, Englewood Cliffs, N.J.

CIE 322 SOLID WASTE MANAGEMENT
Total number of lectures – 38

Solid waste - definition, sources, classification and characteristics.   (04)

Transport, collection equipment, systems of collection, garbage chutes, transfer stations, route optimisation   (05)

Disposal methods - open dumping, selection of site, ocean disposal and other methods of disposal.   (05)

Composting - Aerobic and Anaerobic composting, factors affecting, Microbiology, Indore and Bangalore method, Mechanical process.   (06)

Incineration - Process 3T's to control high temp., design approach, prevention of air pollution, Pyrolysis.   (05)

Sanitary land filling - definition, methodology, trench area, ramp and pit method, site selection, prevention of site pollution, Lechate treatment, gas collection and recirculation.   (08)

Recycle and Reuse - Material and energy, recovery operations, reuse in other industries, plastic wastes, Environmental significance.   (05)

REFERENCE BOOKS

1. Tchbanogious G. Theisen and Lilsaissen R,(1993), "Solid Waste Engineering Principles and Management Issues", Mc Graw Hill, New York
2. Bhide and Sundreshan, "Solid Waste Management in Dry Countries".
3. Joseph D. Hagerty, Joseph Pavoni L and John E Heer Jr. , (1975), "Solid Waste Management", Van Nostrand Reinhold Co.

CIE 324 GROUND IMPROVEMENT TECHNIQUES [3 0 0 3]

Total number of lectures - 38

Introduction: Introduction to ground improvement, Necessity of ground improvement, Classification of ground modification techniques.   (02)

Mechanical modification: Methods of compaction-shallow and deep compaction, Properties of compacted soil, Compaction control tests, Vibro compaction and vibro replacement-stone columns.   (07)

Hydraulic modification: Objectives and techniques, Traditional dewatering methods, well points, Preloading- Methods, Vertical drains-Sand drains and prefabricated drains.   (04)

Physical and chemical modification: Modification by admixtures- granular admixtures, cement, lime, flyash, industrial wastes etc., Modification at depth by grouting-techniques, grouting plant, applications of grouting, Stabilization of soil with lime columns and cement columns.   (10)

Modification by inclusions: Evolution of soil reinforcement, principles and advantages of reinforced earth, behavior of reinforced earth, design methods, material specifications. Rock bolting and Soil nailing – Applications, construction procedure, design and specification. Geosynthetics - Types, Civil Engineering applications of geo-synthetics.   (15)

REFERENCE BOOKS

1. Fang H.Y., (1997), "Foundation Engineering Hand book", 2nd edition, CBS publishers and Distributors, New Delhi.
2. Alam Singh and Chowdhary G.R., (1990), "Soil Engineering in Theory and Practice" Part-3, CBS Publishers and Distributors, New Delhi.
3. Alam Singh, (1988), "International Overviews Current Practices in Geotechnical Engineering", IBT Publishers and Distributors, New Delhi.
4. Kuberan R., Nakul Dev and Govindan K.K., "Geotechnical Engineering", Indian Experiences, A Compilation of IGS Annual Lectures, 1978 - 1992, Edition Indian Geotechnical Society.
5. M.R. Hausmann (1990), "Engineering Principles of Ground Modifications", McGraw Hill Publishing Co.
6. Purushotham Raj, "Ground Improvement Techniques", Laxmi Publications, New Delhi.

CIE 326 COASTAL ENGINEERING [3 0 0 3]

Total number of lectures – 38

Origin of coasts, wind, waves, ocean currents, tides, wave theories (basics), wave forces   (07)
Coastal process: wave shoaling, wave refraction, wave diffraction, wave reflection, wave breaking, types of breakers, Wave run-up, beach profile, beach process (03)
Coastal erosion: erosion process, causes for erosion, littoral drift   (02)
Coastal protection work: Seawalls and bulkheads, Design of seawall, Groins, Jetties, off-shore breakwaters, artificial beach nourishment, new technologies of shore protection;   (07)
Environmental impact assessment: concept of coastal zone management, coastal eco-systems, coastal pollution and its implications.   (02)
Port Planning: Classification of Harbours, General planning, requirements, navigation channel, berth occupancy, Graving and floating dry docks, slipways
                                                                                          (06)
Berthing structures, types, loads on berthing structures, preliminary analysis
                                                                                          (05)
Breakwaters: types, rubble mound breakwaters preliminary analysis and design.
                                                                                          (06)

REFERENCE BOOKS

1. Harbour and coastal Engineering, Volume I & II, 2002, Editors S. Narasimhan, S. Kathiroli, Nagendra Kumar B., National Institute of Ocean Technology, NIOT, Chennai, Ocean and Coastal Engineering Publications.
2. Coastal Structures, 2002, Proceedings of short term course by the Department of Ocean Engineering, I.I.T. Madras, Chennai, India
3. Coastal Erosion Areas–Protection and Management", 2003, Proceedings of short term course by the Dept. of Applied Mechanics and Hydraulics, N.I.T.K. Surathkal, India
4. Hand Book of Coastal and Ocean Engineering, 1990, by Herbich, Gulf publishing Co.
5. Coastal Engineering Manual,(CEM),2006,U.S.Army Corps of Engineer,Vicksburg, Miss.
6. Port Engineering, 1981, Brunn P., Gulf publishing Company.

CIE 328 FINITE ELEMENT METHOD OF ANALYSIS [3 0 0 3]

Total number of lectures - 36

Introduction - Brief general description of the method, theory of elasticity - constitutive relationships - plane stress and plane strain.   (03)

Concept of an element, types of elements, displacement models - displacement models by generalised coordinates, shape functions for different types of elements.
                                                                                          (04)

Variational method of formulation - Minimization of potential energy approach, formulation of element stiffness and consistent load vector.   (02)

Application of Finite element method to pin jointed and rigid jointed structures.
                                                                                          (18)

Application to plane stress and plane strain problems.   (09)

REFERENCE BOOKS

1. Cook R.D., Malkas D.S. and Plesha, M.E., (1989), "Concepts and Applications of Finite Element Analysis", 3rd Edition, John Wiley and Sons, New York.
2. Zinkiewiez O.C., (1979), "The Finite Element Method", 3rd edition, Tata McGraw Hill Book Co, New Delhi.
3. Desai C.S. and Abel J.E., (1987), "Introduction to the Finite Element Method", Ist Indian Edition, CBS publications, New Delhi.
4. Krishnamoorthy C.S., (1987), "Finite Element Analysis", 2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Bathe K.J., (1997), "Finite Element Procedures in Engineering Analysis", 2nd Edition, Prentice Hall Engle Wood, Cliffs, New Jersey.

CIE 401 ESTIMATING, COSTING AND VALUATION [3 1 0 4]

Total number of lectures - 48

Estimation: Introduction, Definition, types of estimate, approximate estimate, units of measurement: IS 1200, work charged establishment, plinth area, carpet area.   (05)

Estimate of building, doors and windows, RCC work   (10)

Roads, different types of roof   (05)

Measurement of earth-work by cross-sections, spot levels, contours, mass diagram and its characteristics   (05)

Specification: Definition, types, principles, detailed specification for different components of the buildings   (04)

Rate Analysis: Purpose, factors effecting, overhead charges, turn out of work, rate analysis for different items of building.   (07)

Contract : Functioning and organization of PWD. Tender and its notification, EMD and Security deposit. Contract: Types of contract, termination of contract, work slip qualification of contractor, responsibilities of engineer, owner, and contractor. Different methods of execution of work, measurement book, nominal muster roll, running bill, agreement, and schedule rate. Arbitration.   (05)

Valuation: Purpose of valuation, scrap value, salvage value, market value, factors which affect the value, sinking fund, year's purchase, depreciation, determination of depreciation, different methods of valuation, land and building method of valuation, calculation of standard rent, rental method of valuation.   (07)

REFERENCE BOOKS

1. M. Chakraborti., "Estimating, Costing, Specification & Valuation in Civil Engineering", Published by the Author, Sixteenth edition, 2003.
2. B.N.Dutta., "Estimating and Costing in Civil Engineering", UBS Publishers' Distributors Ltd. Sixteenth reprint, 2000.
3. CPWD., "Manual for Standard Specification and Rate Analysis".
4. Namavathi Roshan H., "Professional Practice", Lakhani Book Depot, 2001.
5. NABHI's "Compilation of Analysis of Rates- Civil Works", NABHI publications, P.O.Box No. 37, New Delhi – 110 001
6. IS 1200: Part 1 to 16: Method of measurement of building and civil engineering work

CIE 403 CONSTRUCTION PLANNING, ORGANISATION AND EQUIPMENTS [4 0 0 4]
Total number of lectures - 48

Introduction to Construction Management - Classification of construction works, various stages in the Construction of a Project, construction team, Work Breakdown Structure   (02)

Planning for Construction Projects: Steps involved in planning, Objectives of planning, Stages of planning, Stages of planning by different agencies.   (03)

Scheduling – Definition, Preparation of construction schedules, Advantages, Bar charts and Milestone charts – Preparation, Merits and Demerits.   (02)

Network Analysis : -Introduction, Terms and definition, Network representation, Rules for drawing a network diagram, Fulkerson's rule for numbering the events.
(03)

Pert Analysis – Time estimates, Calculation of slack, critical path, probability of completion time of project.   (04)

CPM analysis - Differences between CPM and PERT, Calculation of float, critical path.   (04)

Cost Analysis - Direct cost, indirect cost, Total project cost, Cost slope, steps involved in optimisation of cost.   (04)

Project updating - Data required for updating, updating flow chart.   (02)

Construction organising - Principles of organisation, type of organisation for construction team.   (04)

Management of Construction equipments - Classification of construction equipment, factor affecting selection of construction equipments, Planning of construction equipments, Economic life of equipment, preventive maintenance and repairs, time and motion studies, cost of owning and operation and related problems on construction equipment, drilling, blasting, tunnelling, and paving equipment.   (20)

REFERENCE BOOKS

1. Dr. Seetharaman. S., 1997, Construction Engg. and Management, Umesh Publication.
2. Sengupta B., Guha M, 1998, Construction Management and Planning McGraw Hill Companies.
3. Dr. Punmia B.C. and Khandelwal K.K.,2002 Project Planning and Control with PERT and CPM Laxmi Publication
4. Varma Mahesh, 1987, Construction equipment and its planning and application, Metropolitan Publication.

CIE 405 ELEMENTS OF EARTHQUAKE RESISTANT DESIGN OF STRUCTURES [4 0 0 4]

Total Number of lectures - 48

Introduction: Plate tectonics, elastic rebound theory of earthquake, seismic zoning map of India, seismic waves, seismograms, earthquake magnitude and intensity.

(03)

Introduction to theory of vibrations: Types of dynamic loadings, importance of vibration analysis, types of vibration, degrees of freedom, Free vibration of single degree undamped and damped systems, Forced vibration (Harmonic Loading) of single degree undamped and damped systems, Resonance. Introduction to MDOF system.   (18)

Primary and secondary effects of earthquake.   (02)

Lesson learnt from the past earthquakes: Case studies of important Indian earthquakes, major world earthquakes.   (04)

Effect of structural irregularities on the performance of RC buildings during Earthquakes: Vertical irregularities, Plan configuration problems   (04)

Equivalent static method (IS 1893): seismic coefficients- evaluation, estimation of fundamental time period, base shear and its distribution.

(07)

Ductile detailing of RC frames as per IS 13920 (1993): Ductile detailing of Beams, ductile detailing of columns and frame members with axial load and moment   (07)

Restoration and retrofitting of exciting structures.   (03)

REFERENCE BOOKS

1. Pankaj Agarwal and Manish Shrikhande " Earthquake Resistant Design of Structures", 2006, Prentice-Hall of India Private Limited, New Delhi.
2. C.V.R. Murty " Earthquake Tips- Learning Earthquake Design and Construction", 2005, National Information Centre of Earthquake Engineering, IIT Kanpur.
3. Jai Krishna, A.R. Chandrasekaran and Brijesh Chandra "Elements of Earthquake Engineering", 1994, Second Edition, South Asian Publishers PVT. LTD, New Delhi.
4. P.C. Varghese," Advanced reinforced concrete desigh", 2005, Second Edition, Prentice-Hall of India Private Limited, New Delhi.
5. Clough and Penzin, " Dynamics of Structures", 1993, McGraw Hill, New York
6. Chopra A.K., "Dynamics of Structures", Theory and Application to Earthquake Engg., 1996, Prentice Hall of India Pvt. Ltd. New Delhi.

CODE BOOKS

1. IS:1893 (part 1)- 2002, "Criteria for earthquake resistant design of structures", Bureau of Indian Standards, New Delhi
2. IS: 13920 – 1993, Ductile detailing of reinforced concrete structures subjected to seismic forces- code of practice, Bureau of Indian Standards, New Delhi

CIE 407 ENVIRONMENTAL ENGINEERING – II [4 0 0 4]

Total number of lectures – 50

Introduction: Aim and object of sewage disposal, systems of sanitation, systems of sewage disposal, investigation of sanitary projects. (04)

Quantity of sanitary sewage and storm sewage: Design of sewers, flow variations, partial flow diagrams. (05)

Construction of sewer: laying of sewers, jointing and testing of sewers, sewer appurtenances, Pumping of sewage, house drainage systems, systems of plumbing, typical layout plan showing house drainage. (06)

Characteristics of sewage: Physical, Chemical and biological testing of sewage, Aerobic and anaerobic process, cycles of decomposition. (05)

Treatment and Disposal of sewage - flow diagrams, screens, grit chamber, skimming tank, primary sedimentation, secondary clarifiers. (06)

Secondary treatment - trickling filters - theory, parts, operation and design. RBCs. Activated sludge process,- meaning, flow diagram, modifications, bulking of sludge, sludge volume index.
Sludge disposal, digestion of sludge, sludge digesters. (06)

Disposal of sewage - dilution - self purification of streams, oxygen sag curve. Land disposal – suitability, sewage farming and sewage sickness. Septic tanks, oxidation ponds, oxidation ditch. (07)

Tertiary treatment: Chlorination of sewage, co-agulation of sewage etc. (02)

Solid waste disposal: Quality and quantity of refuse, Collection and conveyance of solid wastes. Disposal of solid waste by composting, and other methods, Salvaging, grinding and discharging into sewers. Hazardous waste and its disposal, Biomedical waste Management and E – waste management (05)

Industrial Effluent Treatment: Introduction**,** General characteristics of industrial wastes from dairy, sugar, steel industries, ISI standards for industrial effluent disposal on land, water and sewers. Population equivalent, Concept CETP & zero effluent system. (04)

REFERENCE BOOKS

1. Sawyer and Mc Carty, (1994), "Chemistry for Environmental Engg." International student Edition, McGraw Hill Book Company, New York.
2. 2. IS Standards   2490 - 1974 , 3360 – 1974, 3307 – 1974, Indian Standard Institution, Manak Bhavan, New Delhi.
3. "Manual on sewage and sewage treatment CPHEO", Ministry of Urban
4. development, New Delhi.
5. Metcalf and Eddy, (1974), "Waste Water Engg., Treatment and Reuse", Tata McGraw Hill, New Delhi.
6. "Standard Methods" – APHEA, American Public Health Association, 1015 Fifteenth Street, NW Washington DC.
7. Garg S. K., (1999), "Environmental Engg.- II", Volume – II,   Khanna Publishers, New Delhi.
8. Birdie G.S., (1987), "Water Supply and Sanitary Engineering", Dhanpat Rai and Sons, New Delhi.

CIE 409 STRUCTURAL DESIGN –IV   [3 1 0 4]

Total number of lectures – 48

Basic Concepts of Prestressing: Need for high strength concrete and High tensile steel - Stress strain characteristics and properties.   Advantages and applications of prestressed concrete.   (02)

Basic principles of prestressing - Load balancing concept, stress concept, centre of thrust. Pretensioning and Post tensioning systems, tensioning methods and end anchorages.   (06)

Losses of prestress - Various losses in pretensioned and post tensioned systems, determination of jacking force.   (06)

Analysis of sections for flexure - Stresses in concrete due to pre-stress and loads, stresses in steel due to loads.   (06)

Camber and deflections - Prediction of short term and long term deflections of uncracked members; I.S. code provisions; Cable layouts.   (06)

Limit state of collapse and serviceability – Criteria for limit state, I.S. Code recommendations- Ultimate flexural and shear resistance of sections; shear reinforcement. Limit state of serviceability - Control of deflection and cracking. Classifications of PSC structures.   (08)

Transmission of pre-stress in pre-tensioned members: transmission length, bond stress. Anchorage stresses in post tensioned members, bearing stress and bearing tensile force - stresses in end blocks - Methods, I.S. code provisions for the design of end block reinforcements.   (06)

Design of pre-tensioned and post-tensioned symmetrical and unsymmetrical sections. Permissible stresses, design of pre-stressing force and eccentricity, limiting zone of pre-stressing force and eccentricity, cable profile – Magnels chart.
                                                                              (08)

REFERENCE BOOKS

1. Krishna Raju N., "Pre-stressed Concrete", 2007, Fourth Edition, Tata McGraw Hill, New Delhi.
2. Dayaratnam P., "Pre-stressed Concrete Structures", 1996, Oxford and IBH Publications, New Delhi.
3. Mallick S. K. and Gupta A. P., "Pre-stressed Concrete", 1983, Oxford and IBH, New Delhi
4. Lin T.Y. and Ned. Burns H., "Design of Pre-stressed Concrete Structures", 1982, John Wiley and Sons, New York.
5. Natarajan V., "Fundamentals of Pre-Stressed Concrete", 1976, BIP, Bombay.
6. Libby J.R., "Modern Pre-stressed Concrete", 1986, CBS Publishers, New Delhi.

CODE BOOK

1. IS:1343-1980, Code of Practice For Prestressed concrete, Bureau of Indian Standards, New Delhi, 1981.

CIE 411 COMPUTER LAB – II [0 0 3 1]

Total number of lectures – 14

1. Analysis of plane trusses, space trusses, plane frames, grids and space frames using NISA software package. (04)

2. Analysis of plane trusses, space trusses, plane frames, space frames using STAAD software package. (03)

3. Design of trusses and frames using STAAD package. (03)

4. Study of GIS and Remote Sensing software packages (02)

5. Demonstration of packages in Engineering Management – MS-Project, and Estimation. (02)

CIE 413 ENVIRONMENTAL ENGG. LAB [0 0 3 1]

Total number of practical classes – 13

Determination of solids - total solids, suspended solids, dissolved solids, volatile solids, Fixed solids, settlable solids. (01)

Turbidity determination and Jar test. (01)

Determination of Alkalinity, Acidity and pH. (01)

Determination of Calcium, Magnesium and total Hardness. (01)

Determination of Chlorides (01)

Determination of dissolved oxygen. (01)

Residual chlorine and chlorine demand. (01)

Determination of percentage available chlorine in Bleaching powder. (01)

Determination of Iron and Fluorides. (01)

Determination of B.O.D. (01)

Determination of C.O.D. (01)

Total count test and MPN determination

Determination of Ammonical Nitrogen and Nitrates. (01)

Demonstration of High volume sample and sound lever meter.

Demonstration of determination of oil, grease and Sulphates. (01)

REFERENCE BOOKS

1. Standard Methods for the Examination of Water and Waste Water – ALPHA – AWWA – WPCF
2. Sawyer and Mc Carty, (1994), "Chemistry for Environmental Engineering", McGraw Hill, New York.
3. IS – 3025 – 1964 – Methods of Sampling and Test (Physical and Chemical) for Water Used in Industry, IIT New Delhi.
4. Drinking water Standards IS – 10500-1991.

PROGRAM ELECTIVE – III
CIE 421 DESIGN OF FOUNDATIONS AND EARTH RETAINING STRUCTURES [3 0 0 3]

Total number of lectures – 38

Bearing capacity : Brinch Hansen's , Meyerhoff's and Skempton's bearing capacity equations, Plate load test and penetration tests, Design principles of Shallow foundations: Isolated, combined and raft foundations. (09)

Piles subjected to lateral loads: Broms theory, Principle and design of sheet piles and anchors bulk head. (07)

Retaining walls: Design of cantilever, counterfort and soil reinforced retaining walls. (06)

Well Foundation: Bearing capacity, Lateral stability - Terzaghi's method and IRC method. (03)

Foundations in expansive soils: Problems of foundations on expansive soils, Remedial measures. (03)
Cofferdams: Types, design and analysis for stability. (02)

Machine Foundations: Degree of freedom , General criteria - Mass -spring - dash pot model, Block foundation subjected to vertical, horizontal and rocking vibrations, Elastic half space approach - vibration isolation. (08)

REFERENCE BOOKS

1. Bowles J.E., (1997), "Foundation Analysis and Design", McGraw Hill, New York.
2. Winterkorn H.F and Fange H.Y., (1991), 'Foundation Engineering Hand book", Van Nostand Reinhold Company, New York.
3. Teng W.C., (1981), "Foundation Design", Prentice Hall of India, New Delhi.
4. Swami Saran, Design of Substructures, Oxford and IBH Publishers.
5. Srinivasalu P and Vaidyanathan C.V., (1987), "Hand Book of Machine Foundations", Tata McGraw Hill.
6. Poulos H.G. and Davis E.H., (1980), "Pile Foundation Analysis and Design", John Wiley and Sons, New York.

CIE 423 GROUND WATER ENGINEERING [3 0 0 3]

Pre-requisite: CIE- 305 WATER RESOURCES ENGINEERING

Total number of lectures – 37

Fundamentals of Groundwater flow: General hydrodynamic problems, Darcy's law and range of its validity. Soil anisotropy, circulation of groundwater in isotropic and anisotropic media. Aquifers, types of Aquifers, Aquiclude, Aquitard and Aquifuge. Geohydrological zones in India. (05)

Mechanics of well flow: Aquifer characteristics, steady uniform flow, steady radial flow to a well. Flow in several wells, Flow between a well and a recharge well. A well in a uniform flow, Method of images, partial penetration of wells. (06)

Aquifer Parameters: Introduction to unsteady flow in a aquifer pump tests, Radial flow to a well in an extensive confined aquifers. Boundary conditions. (08)

Wells: Well design criteria, selection of site for wells, types of wells, well characteristics. Well efficiency, construction, production tests and maintenance. Artificial and natural pack production well, screens and casings. (07)

Groundwater Management: Exploration for groundwater, available surface and sub surface methods, Groundwater recharge, Groundwater in coastal belts, Salt water intrusion and encroachment. (06)

Quality of Groundwater: Standards for different uses of groundwater, Dangerous effects of groundwater. Remedial measures. (05)

REFERENCE BOOKS

1. Todd D.K. (1980), "Groundwater Engineering", John Wiley, New York.
2. Walton W.C. (1970), "Groundwater Resources", Mc-Graw-Hill co. New York.
3. Bouwer H. (1978), "Groundwater Hydrology", Mc-Graw-Hill co. New York.
4. Raghunath H.M. (1987), "Groundwater", Wiley Eastern Ltd., New Delhi.
5. Karanth K. R. (1980), "Groundwater Assessment", Tata Mc-Graw Hill, New Delhi.

CIE 425 DESIGN OF HYDRAULIC STRUCTURES (3-0-0- 3)
Pre-requisite**:** CIE 305   WATER RESOURCES ENGINEERING

Total number of lectures - 38

Gravity dams: Non-overflow section, forces acting on gravity dams, design of gravity dams by step method. Introduction to other methods like trail load, finite element, slab analogy etc. Stresses in dams, stress concentration in openings of dams, design of sluices, air vents and galleries.   (06)

Spillways: Types of spillways, design of spillways, energy dissipators, gates, types of hoist.   (04)

Earth dams: Investigations, design of cross-section of dams, slope stability analysis, settlement analysis.   (04)

Arch and Buttress dams: Types of arch dams, thin cylinder theory. Types of buttress dams, general design principles – upstream deck, downstream apron, buttresses, allowed stresses.   (05)

Design of weirs and barrages on permeable foundations: Introduction, causes of failure of weirs, creep theory, Khosla's theory.   (05)

Design of canal sections: Design of unlined canals- Introduction, design formulae. Kennedy's theory and Lacey's theory-drawbacks and comparison. Design of lined canals - Design parameters, design procedures, types of lining.   (06)

Design of canal masonry structures:
Canal falls- Definition, types, design of trapezoidal notch fall.
Canal regulators- Design of cross regulator and distributary head regulator.
Cross drainage works- Types, design of acqueducts and siphon acqueducts.
                                                                            (08)

REFERENCE BOOKS

1. W.P.Justin & Creacer(1954), " Engineering for dams", Vol I,II &III, Wiley Publications.
2. Kushlani.K.B, "Irrigation-Practice & Design", Vol. III & IV.
3. Leliausky.S(1958), " Irrigation and hydraulic design", Vol.III, John Wiley Publications, Newyork.
4. Sharaar, et.al., " Earth and rockfill dams".
5. R.S.Varshney(1978), " Concrete dams", IBH Publishers, Delhi.
6. M.A.Harr(1962), " Groundwater and seepage", MGH Publications.
7. Garg.S.K(1976), "Irrigation and hydraulic structures", Khanna Publications, Delhi.
8. Dennis D.L(1968),"Arch dams", Institute of Engineers, London.

CIE 427 ADVANCED REINFORCED CONCRETE DESIGN [3 0 0 3]

Total number of lectures – 36

Design of portal frame – Single storey and single bay. Introduction to approximate method of analysis of multi-storey frames   (08)

Design of Silos and bunkers   (06)

Design of Water tanks: Overhead tank-Intze type with supporting structure (12)

Design of beams curved in plan   (05)

Design of grid floors   (05)

REFERENCE BOOKS

1. Krishnaraju N., "Advanced Reinforced Concrete Design", 2005, Second Edition, CBI Publishers, New Delhi.
2. Punmia B.C., "Reinforced Concrete Structures", Volume II,1992, 5th Edition Lakshmi Publications Pvt. Ltd., New Delhi.
3. Verghese P.C. , "Advanced Reinforced Concrete",2005, Prentice Hall India, New Delhi.
4. Shah H.J., "Reinforced Concrete Structures", 1998, Charotar Publishers, Anand.
5. Unnikrishna Pillai and Devadas Menon, "Reinforced Concrete Design", 1998, Tata McGraw Hill Publishing Company Limited, New Delhi.

CODE BOOKS:

1. IS:456-2000, Plain and Reinforced Cement Concrete Code of Practice , Bureau of Indian Standards, New Delhi, 2000.
2. SP16:1980, Design Aids For Reinforced Concrete to IS:456-1978, Bureau of Indian Standards, New Delhi, 1992.

CIE 429 BRIDGE ENGINEERING   (3-0-0-3)
Pre Requisite CIE 306 Transportation Engg. – II

Total number of lectures – 36

Introduction: Definitions, components of a bridge, classification, importance and standard specifications.   **(05)**
Investigation for bridge: Site selection, data drawing, design discharge linear water way, economical span, location of piers and abutments, vertical clearance above HFL, scour depth. Traffic projection, investigation report, choice of bridge type.   **(06)**
Standard specification for Road Bridge: IRC bridge code, determination of dead loads and live loads, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water current buoyancy effect, earth pressure, temperature effect, deformation stresses, Secondary stresses, erection stresses, seismic forces. **(06)**
Culverts: RCC slab culvert, pipe culverts and box culvert.   **(04)**
Concrete Bridges: T-beam reinforced concrete bridges and
Pre-stressed concrete bridges, continues bridges, cantilever bridges.   **(09)**
Sub structure: Different types of bridge bearings, piers and masonry abutments, different types of foundation and their choices, wing walls.   **(08)**

REFERENCE BOOKS

1. Ponnusamy S, "Bridge Engineering" Tata McGraw Hill Publishing Co., New Delhi , 2008
2. Whitney, C.S, Bridges, Greenwich House,1983
3. Singh, V.P Wells and Caissons, Nemchand & Sons,1979
4. N.K.Raju, " Design of bridges", Oxford & IBH Publishing Co. pvt. ltd.
5. D.J.Victor," Essentials of bridge engineering", Oxford & IBH Publishing Co. pvt. ltd.
6. Indian Road Congress Codes No.5,6,18,21,24, Jamnagar House, Shah Jahan Road, New Delhi.

CIE 431 ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING   [3 0 0 3]

Total number of lectures – 38

Definition and importance, Planning and Management of impact studies

(03)

Impact identification - Matrices, networks, checklists   (04)

Description of affected environment, indices and indicators for describing affected environment.   (05)

Prediction and assessment of impacts on air, surface water, soil and groundwater, noise, biological, cultural and socio-economic environment.   (14)

Decision methods for evaluation of alternatives.   (02)

Public participation in environmental decision making.   (02)

Documentation and environmental monitoring,- case studies.   (04)

Environmental audit, meaning, importance, - case studies.   (04)

REFERENCE BOOKS

1. Larry. W. Canter, (1996), "Environmental Impact Assessment", McGraw Hill International editions, New York.
2. CIRIA special publication 96, construction industry Research and information Association.
3. Mhaskar. A.K, "Environmental Audit", Media Enviro, Pune.

CIE 402 PRACTICAL TRAINING [- - - 1]

A practical training of minimum three weeks has to be carried out by each student at the end of fifth or sixth semester.

CIE 404 PROJECT SURVEY [- - - 2]

Field Survey of the

1. Road Project - Plan, L.S., C.S's, block levelling at C.D. locations Earthwork calculations etc.   (02 days)

2. Irrigation Project – Plan, L.S., C.S's block levelling at weir and sluice locations, capacity contours. Computation of capacity and earthwork involved.   (02 days)

CIE 499 PROJECT WORK [- - - 20]

Students have to do project work related to analysis/design/construction of Civil Engineering Structures. The project work may be carried out either in the Institute or in Construction Company.

Under Graduate

CIE – 340 Advanced Mechanics of Solids

CIE – 342 Environmental Management

CIE – 344 Contract Management

CIE – 346 Advanced Fluid Dynamics

CIE – 348 Introduction to Finite Element Method of Analysis

CIE – 350 Introduction to Remote Sensing and GIS

CIE – 352 Strength of Materials

Post Graduate

Energy and Environment

Non distructive testing of Materials – Can be offered at UG level also – VI Semester

Advanced Strength of Materials