

Lists of Departmental Electives

- CE-411 Dynamics of Structures (3-0-0: 6)
- CE-412 Mechanics of Composite Materials (3- 0 -0: 6)
- CE-413 Finite Element methods in Engineering (3- 0- 0: 6)
- CE-414 Advanced Structural Mechanics (3- 0- 0: 6)
- CE-415 Pre-stressed Concrete and Industrial Structures (3 - 0 – 0: 6)
- CE-416 Bridge Engineering (3- 0- 0: 6)
- CE-417 Experimental Stress Analysis (3-0-0:6)
- CE 418 Pavement Management Systems (3-0-0 : 6)
- CE-419 Principles of Remote Sensing (3-0-0: 6)
- CE-420 Information Technology in Construction Engineering (3-0-0:6)
- CE-421 Design of Foundations and Retaining Structures (3–0- 0:6)
- CE-422 Ground Improvement and Ground Engineering (3–0- 0:6)
- CE 423 Quantitative Methods in Construction Management (3-0-0:6)
- CE-432 Hydraulic Machines (3-0-0:6)
- CE-434 Groundwater Hydrology and Management (3- 0- 0:6)
- CE-441 Air Pollution and Industrial Waste Management (3-0-0:6)
- CE-442 Pavement Design (3–0- 0:6)
- CE-443 Computer Aided Design (3–0- 0: 6)
- CE-444 Environmental Management (3 - 0 - 0 : 6)
- CE-445 Solid Waste Engineering (3-0-0:6)

DETAIL OF COURSES

THIRD SEMESTER

CE 201 Surveying (3-0-3 : 9)

Introduction to surveying; linear measurements; chain surveying; compass surveying; accuracy, precision and errors, leveling; plane table; contouring, theodolite surveying, tacheomatic survey; trigonometrical surveying; triangulation; curves; advanced survey instruments; Electronic Distance Measurement, Total station and Global Positioning System, Introduction to photogram-metry and remote sensing.

List of the Experiments

Open and closed Traversing with chain and compass, Road leveling for both longitudinal and Cross sectioning, Fly leveling, Contouring, Plane Table Surveying, Theodolite Traversing, Determination of Tacheometric constants K and C, Area and volume determination by planimeter, Simple Circular Curve with both linear method and instrument method, Setting out of the combined curve, Demonstration of Total Station, Electronic Distance Measurement, Electronic Theodolite, Visual analysis of Satellite Data.

Texts/References

1. T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Vol-I and Vol-II, Pune Vidyarthi Griha Prakshan, 1972.
2. B. C. Punmia, A.K. Jain & A.K. Jain, Surveying, Vol-I and Vol-II, Laxmi Publication Pvt., 1996.
3. T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons, 1994.
4. G. W. Schofield, Engineering Surveying, Butterworth, Heinemann, New Delhi, 2001.
5. G. Joseph, Fundamentals of Remote Sensing, Universities Press, 2003.

CE 202 Solid Mechanics (3-1-0: 8)

Force Transmission and Deformation, continuum, isotropy, homogeneity, conservation of linear momentum, angular momentum and mass, Cauchy Axiom and definition of stress tensor, equation of equilibrium, Principal stress and Principal plane, Strain at a Point: Displacement of a point and relative displacement of line segments, Green Lagrange strain tensor and small strain tensor, Compatibility requirements, Constitutive relations, Relationships between various material constants for linear elastic materials, Boundary Value Problems, Energy Formulation for deformable body: Principle of minimum potential energy, Virtual work method, Failure criteria for materials, Uniaxial tension in bar, thermal stresses. Torsion of right circular section and non-circular section, Bending of Beams, bending moment and shear force diagrams, Stresses due to shear, Shear center, Deflection of beams, Buckling of Columns: Euler's formula, different end conditions and effective length, energy method.

Texts / References

1. S.M.A. Kazimi, Solid mechanics, Tata McGraw Hill, First revised edition, 1996.
2. L. S. Srinath, Advanced Solid Mechanics, Second Edition, Tata McGraw Hill 2003.
3. J.M. Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, 2000.
4. E. P. Popov, Engineering Mechanics of Solids, Second Edition, Prentice Hall of India, 2002.
5. J. M. Gere and S. P. Timoshenko, Mechanics of Materials, CBS Publisher, 1986.

CE 204 Civil Engineering Drawing (1- 0- 3: 5)

Introduction to the code of practice for building drawing: plan, elevation and section of different residential and public buildings.
Introduction to functional planning of residential and commercial buildings
Introduction to drafting packages such as Auto-CAD

Practices: Drawing of plan, elevation, sectional view of various buildings and other Civil Engineering Structures.

Texts/References

1. M. Chakraborty, Civil Engineering Drawing, Third Edition, Bhakti Vedanta book trust, 1999.
2. National building Code of India, 1984, BIS, 2002.

FOURTH SEMESTER

CE -203 Fluid Mechanics (2-1-2:8)

Fluid properties; Pressure measurement; Hydrostatic forces on plane and curved surfaces; Buoyancy and equilibrium; Stability, metacentric height; Types of flow; Continuity; Energy and momentum equations; Velocity distribution and velocity coefficients, practical applications; Navier Stoke equation; Shear stress and pressure gradient; Flow through pipes, Hagen-Poiseuille equation; Turbulence, Prandtl's mixing length, eddy viscosity; Darcy-Weisbach equation for flow through pipes, friction factor, Moody diagram, minor losses, pipes in series and

parallel, equivalent length, pipe network analysis; Water hammer; Boundary layer concept, drag coefficients, control of boundary layer; Dimensional analysis and similitude.

List of Experiments

Measurement of fluid pressure using various manometers and gauges., Experimental study on capillarity, Determination of coefficient of viscosity of a fluid using viscometer, Experimental study on stability of floating bodies, Study on fluid pressure distribution on immersed bodies, Study of different types of flow using Reynold's apparatus, Determination of friction factor in pipes using pipe friction apparatus., Experimental study on flow nets using Hele-Shaw apparatus, Experimental study on cavitations., Study of flow behavior in open channels using tilting flume.

Texts/ References

1. V.L. Streeter and E.B. Wylie, Fluid Mechanics, McGraw Hill, 1997.
2. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 1998.
3. B.F. White, Fluid Mechanics, McGraw Hill, 1994
4. K S. Massey, Mechanics of Fluids, Van Nostrand Reinhold Co., 1979.
5. J. Frabzini, Fluid Mechanics with Engineering Applications, McGraw Hill, 1997
6. J.H. Spurk, Fluid Mechanics – Problems and Solutions, Springer, 2003

CE 205 Structural Analysis- I (3-1-0 : 8)

Different types of structures, Loads on the structural system, static and kinematic indeterminacy, Methods of Analysis: Equilibrium equations, compatibility requirements, Introduction to force and displacement methods, Analysis of trusses: plane truss, compound truss, complex truss and space truss, Arches and suspension cables, three hinged arches and suspension cables, Deflection of Beams, various methods for calculation of deflection, Analysis of indeterminate structures by force methods, flexibility coefficients, Energy methods: Principle of minimum potential energy, principle of virtual work, Castigliano's theorems, Reciprocal theorem, unit load method, Influence line and Rolling loads, beam, frames and arches, Muller-Breslau Principles and its applications to determinate and indeterminate structures

Texts / References :

1. C.S. Reddy, Basic structural analysis, Second edition, Tata McGraw Hill publishing company limited, 1996.
2. D.S. Prakash Rao, Structural analysis: Unified approach, Universities Press, (First edition), 1996.
3. S. Utku, C.H. Norris and J.B. Wilbur, Elementary Structural Analysis, Fourth edition, Tata McGraw Hill publishing company limited, 2003.
4. C.K. Wang, Intermediate structural analysis Tata McGraw Hill publishing company limited, 1986.
5. L. S. Negi and R. S. Jangjijid, Structural Analysis, Tata Mc. Graw, New Delhi, 1997.

CE -206 Geotechnical Engineering – I (2-1-2:8)

Origin of soil, Phase relationships, Identification and classification of soils, Effective stress principle, Permeability of soils, Compressibility of soils, Seepage and flownets, Terzaghi's one-dimensional consolidation theory, Shear strength of soils, Effective stress and total stress strength parameters, Total and effective stress paths, Compaction of soils.

List of Experiments: Visual classification, Atterberg limits, Sieve analysis, Hydrometer analysis, Specific gravity test, Permeability test, Consolidation test, Compaction test, Field density test.

Texts /References:

1. Gopal Ranjan & A.S.R. Rao, Basic and Applied Soil Mechanics, New Age International, 2000.
2. S.R. Kaniraj, Design Aids in Soil Mechanics & Foundation Engineering, Tata McGraw Hill, 1988.
3. Soil Mechanics – T.W. Lambe & R.V. Whitman – John Wiley & Sons, 1969.
4. Soil Mechanics in Engineering Practice – Terzaghi, Peck & Mesri – John Wiley & Sons, 1996.

CE 211 Civil Engineering Materials (3-0-3: 9)

Introduction to structures of solids, ductility, brittleness, strength, stiffness, durability, hardness, toughness; Weakness of materials, Introduction to building materials, Cement: Chemical composition, manufacturing, physical characteristics, hydration, properties of cement compounds, different types of cements, Aggregate: Coarse and fine aggregates, Influence of aggregate on the properties of concrete, aggregate selection. Fresh Concrete: Batching, Mixing, workability, effect of admixture, Hardened Concrete: mechanical properties of hardened concrete, Water-cement ratio, Porosity, Curing of concrete, High performance concrete, Design of concrete mix: IS code

recommendation, British code and ACI code, Brick: Raw materials, drying and burning, Strength and durability, mortar for masonry and strength of masonry, Timber, Seasoning and conversions, properties, tests, defects in timbers, Glass: Chemical compositions, mechanical and optical properties, Various types of glasses, Strengthening of glasses, Metals, steel for reinforced concrete and prestressed concrete construction, structural steel sections, Deterioration of building materials: Corrosion, chloride and sulphate attack on concrete, alkali-aggregate reaction, acid aggregate reactions.

List of Experiments: Physical tests on cement, fine and coarse aggregate, tests for workability, tests on hardened concrete, compression tests on cubes and cylinders, modulus of rupture test, rebound hammer and UPV test, testing of bricks, efflorescence, water absorption and compressive strength, testing of reinforcement bar in tension.

Texts / References:

1. A. M. Nevelle and J. J. Brooks, Concrete Technology, updated, Addison Wesley Longman, International student edition 1999.
2. Neil Jackson and R. K. Dhir, Civil Engineering materials, Macmillan Fourth edition 1988.
3. V. Raghavan, Material science and Engineering: a first course, Prentice Hall of India, Fourth edition 2000.
4. S. C. Rangwala, Engineering Materials, Chaortar Publishing House, Anand, 1985

FIFTH SEMESTER

CE -301 Hydraulics and Hydraulic Structures (2 -1- 2 : 8)

Open channel hydraulics, uniform flow, critical flow, Gradually varied flow, hydraulic jump, unsteady flow; Introduction to pumps and turbines; Channel design, erodable and non erodable channels, silt theories, sediment transport; Introduction to river engineering, meandering, river training works; Introduction to Dam engineering, classification of Dams, design of spillway; Basic principle of design of hydraulic structures; Cross drainage works.

List of Experiments: Determination of resistance coefficient in open channels, Experimental study on variation of specific energy with depth of flow in open channels, Measurement of flow using weirs and notches, Measurement of flow using a Parshall flume, Experiments on gradually varied flow (GVF) in open channels, Experimental study on hydraulic jumps, Experimental studies on centrifugal and reciprocating pumps, Experimental studies on impulse and reaction turbines.

Texts/References:

1. V.T. Chow, "Open Channel Flow", McGraw Hill, 1975.
2. H.M. Chaudhry, "Open Channel Flow", Prentice Hall of India, 1998.
3. S.K. Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 1992.
4. K. Subramanya, "Flow in Open Channels", Tata McGraw Hill, 1998.
5. V.L. Streeter and E.B. Wylie, "Fluid Mechanics", McGraw Hill, 1997.
6. B.F. White, "Fluid Mechanics", McGraw Hill, 1994.
7. B.C. Punmia, "Irrigation and Water Power Engineering", Standard Publishers, 1992
8. J. Frabzini, "Fluid Mechanics with Engineering Applications", McGraw Hill, 1997.

CE -302 Structural Analysis – II (3-1- 0: 8)

Classical method of analysis of framed Structures: Slope deflection method, Moments distribution methods, effect of symmetry and anti-symmetry. sway correction, Approximate methods: Substitute frame methods for gravity load, Lateral load analysis: Portal and Cantilever methods, Matrix method of structural analysis: Stiffness method: Local and global stiffness matrices, assembly, band storage, solution of resulting simultaneous algebraic equation, boundary conditions, application to plane and space truss, analysis of plane frame, grid and three dimensional frame.

Texts / References :

1. C.H. Norris, J.B. Bilbur, S.Utku, Elementary Structural analysis, Fourth edition, Tata McGraw Hill, 2003.
2. A. S. Hall and R. W. Wood, "Frame Analysis", Wiley, 1961.
3. W. Weaver and J. M. Gere, "Matrix analysis of framed structures", CBS, 2000.

4. G.S. Pandit and S.P. Gupta, "Structural Analysis- A matrix approach", Tata McGraw Hill, 1999.
5. M.B. Kanchi, Matrix Methods of Structural analysis, Second Enlarged edition, Wiley Eastern Limited, 1993.
6. C.S. Reddy, Basic Structural Analysis, Second Edition, Tata McGraw Hill, 1996.

CE-303 Geotechnical Engineering – II (2-1- 2: 8)

Types of retaining walls, Earth pressure theories, Sheetpiles and bulkheads; Shallow foundations: Terzaghi's bearing capacity theory, Stress distribution, Immediate and consolidation settlement; Deep foundations: Load carrying capacity of piles, Settlement of pile groups; Foundation types, selection and design; Stability of slopes, Site investigation and subsoil exploration.

List of Experiments: Sample preparation, Direct shear test, Vane shear test, Unconfined compression test; Triaxial shear tests, Unconsolidated undrained test, Consolidated undrained test, Consolidated drained test; Standard penetration test.

Texts / References:

1. Gopal Ranjan & A.S.R. Rao, "Basic and Applied Soil Mechanics", New Age International, 2000.
2. S.R. Kaniraj, "Design Aids in Soil Mechanics & Foundation Engineering", Tata McGraw Hill, 1988.
3. J.E. Bowles, "Foundation Analysis and Design", McGraw Hill, 1996.
4. P.N. Kurian, "Design of Foundation Systems: Principles & Practices", Narosa, 1994.

CE-304 Transportation Engineering – I (3-0-2: 8)

Introduction to Transportation Engineering, Scope of Transportation Engineering related to different modes, Overview of transportation systems characteristics, Highway Development in India, 20- year Road Development plans in India, Preparation of Detailed Project Report (DPR) for new highway projects; Geometric design of highways-IRC and AASHTO guidelines: Evaluation of Aggregate, Granular Base material, Bitumen for road construction purpose, IRC and MORT&H standards for various types of pavement materials, Introduction to SUPERPAVE specifications and equipment, Marshal Mix design procedure; Pavement Design concepts- Design of flexible, rigid pavements as per IRC guidelines, Developments in Pavement Design procedures; Introduction to Pavement Evaluation Techniques; Construction and Maintenance of some bituminous and WBM roads, Highway Economics; Railways: Railway track related terms, Geometric design of track.

List of Experiments: Evaluation of road aggregate for various properties, Evaluation of bitumen and emulsion for various properties, Bituminous Mix Design-Marshall Method, SUPERPAVE, Functional and Structural Evaluation of Pavements using Merlin, Bump Integrator, Benkelman Beam, Falling Weight Deflectometer etc, Traffic engineering studies.

Texts / References :

1. C.J. Khisty and B.K. Lall, "Introduction to Transportation Engineering", Prentice-Hall India, 2003.
2. S.K. Khanna and C.E.G. Justo, "Highway Engineering", Nem chand Bros, 2002.
3. MORT& H, "Specifications of Road and Bridge Works", 4th edition, MORT&H, 2002.
4. Geometric Design of Streets and Highways, AASHTO Book, 1999.
5. SUPERPAVE: SUPERPAVE Mix Design, Asphalt Institute, 2001.
6. N. A. Harold, "Highway Materials, Soil and Concrete", Prentice Hall, 2004.
7. S. C. Arora & S.P. Arora, "A text book of Railway Engineering", Dhanpat Rai, 2001.
- 8 J.S, Mundrey "Railway Track Engineering", Tata McGraw Hill, 2000.

CE-305 Design of Structures – I (3 –1- 0: 8)

Structural steel and their properties; Working stress and plastic design concepts, Rivetted, bolted and welded connections. Design of tension member, tension splices, Compression member, design for axial and eccentric load; splicing, lacing and battens, Flexural members: laterally restrained and unrestrained beams, web buckling, built-up sections; Plate Girder Section and Stiffeners, Column bases: slab base, gusseted base, anchor bolts. Roof trusses: purlins, members, joints. Plastic design of steel members, Introduction to LRF method.

Texts / References :

1. P. Dayaratnam, "Design of Steel Structures", S. Chand & Co., 2003.

2. S. M. A. Kazimi and R. S. Jindal, "Design of Steel Structures", Prentice Hall of India Pvt Ltd, 1988.
3. L. S. Negi, "Design of Steel Structures", Tata McGraw Hill, 1997.
4. S. A. Raz, "Structural Design in Steel", New Age International Publisher, 2002
5. M. Edwin, J. Gaylord and J. E. Stallmeyer, "Design of Steel Structures", Mc Graw Hill, 1991

CE-306 Engineering Geology (3-0-2: 8)

The Earth as a System: Lithosphere, Hydrosphere, Cryosphere and Atmosphere and their interactions; The Solid Earth: Shape, size and interior of the solid earth; Earth Materials: rocks, soils, minerals, clay mineralogy, Engineering and Genetic classification of soils, rocks, rock cycles, rock-water interaction; Strength Properties of Rocks: Rock Mass Strength, Earth Processes and their consequences: Weathering, erosion and deposition; Structures: Folds, Faults, Joints; Earth Dynamics: Plate Tectonics, Earthquakes: Causes, classification, magnitude, intensity, Historical earthquakes, Seismic hazards zoning, strong ground motion, earthquake prediction; Landslides and Subsidence: causes, classification and monitoring; Groundwater: Groundwater resources and quality of ground water; Geology of India: different cratonic blocks, stratigraphy; Geophysical mapping: seismic, resistivity, gravity, radar, geotomography, logging; Site Investigation: S. I. Desk Study; Site Investigation Boreholes; Remote sensing, GIS and GPS : Basic principles and their applications in studying and monitoring Lithosphere, Hydrosphere, Cryosphere and Atmosphere; Rock excavation: Cut Slopes in rocks and clays; Criteria and factors for site selection for Dam, tunnels, waste/radioactive disposal sites.

List of Experiments: Rocks and Minerals and their Engineering Properties (UCS, Schmidt Hammer), Identification by Megascopic Hand Specimen studies of Rock and Mineral Samples, Petrological Microscopic Study of Rock Sections and their Properties-1, Exercise on Structural Geologic Maps, Index test of Intact Rocks, Core Loss and RQD, Stereographic projection and contouring, Characterizing Discontinuity Patterns, Aerial Photo Interpretation for terrain evaluation, Study of Satellite Imageries, Engineering Geologic Maps , Resistivity survey to interpret sub-surface geology, Hydrogeological experiment/ exercise , Field Trip.

Texts / References:

1. A. C Waltham., "Foundations of Engineering Geology, Blackie Academic & Professional, Chapman & Hall ", First Edition, 1997.
2. K. Allan, "General Geology for Engineers", Second Edition, Prentice & Hall, 1995.
3. P. Kesavulu, "Engineering Geology", Oxford University Press, Second Edition, 1999.
4. P. Singh, "Engineering and General Geology", S. K. Kataria and Sons, Sixth Edition, 1999.

SIXTH SEMESTER

CE-307 Environmental Engineering - I (3- 0- 2: 8)

Introduction, Population Forecasting and Water Demand, Physical, Chemical and Biological Characteristics of Water and Wastewater, Wastewater Flow, Basic Microbiology: cells, classification and characteristics of living organisms. Metabolic Processes, Microorganisms in Natural Water Systems, Biological Oxidation of Organic Matter. Introduction to Environmental Chemistry, Stoichiometry and Kinetics of Chemical Reactions, Equilibrium Constant and Solubility Products, pH and Alkalinity. Development of Oxygen Sag Model. Flow sheets for Water and Wastewater Treatment, Sewer Design, Introduction to Solid Waste, Air Pollution and Noise Pollution.

List of Experiments: Solid Analysis; pH, Alkalinity, Turbidity and Conductivity measurements; Estimation of Hardness, Dissolved Oxygen, BOD and COD; Plate Counts and MPN test; Estimation of Fluoride and Copper using colorimetric methods.

Texts / References:

1. H. S Peavy, D. R. Rowe & George Tchobanoglous, "Environmental Engineering", McGraw-Hill International Ed., 1985.
2. Terence J McGhee, "Water Supply and Sewerage", McGraw-Hill, Inc.,1991.
3. Mackenzie L Davis & David A Cornwell, "Introduction to Environmental Engineering", McGraw-Hill, Inc.,1991.
4. Metcalf & Eddy, "Wastewater Engineering- Treatment and Reuse," Tata McGraw Hill, 4th Edn., 2003.
5. Clair N Sawyer & Perry L McCarty, G. F. Parkin, "Chemistry for Environmental Engineers", McGraw-Hill, 1994.
6. APHA, AWWA & WEF, "Standard Methods Examination of Water and Wastewater", Water Environment Federation, 1993.

7. Manual for Sewer and Sewerage – Central Public Health & Environmental Engineering Organisation – Ministry of Housing and Urban Development, Govt. of India, 1993.

CE-308 Construction Technology and Management (3-0-0:6)

Construction as industry and its challenges, Role of construction management, Methods of construction managements, Basic requirements of construction management: Learning structures, Life cycle of construction projects: Examples of real projects and its learning requirements, Stages of awarding contract, types of contract, contract documents, arbitration and settlement of disputes, contract laws and handling of contracts, commissioning of project, Principles of estimation, Examples of estimation of materials for various structures, Principles of general and detailed specifications, Analysis of rate: definition of analysis of rates, prime cost, work charged establishment, resource planning through analysis of rate, PWD schedules, measurement and measurement book, Introduction to network based project management techniques: Defining activities and their interdependence, drawing of network, time and resource estimations, use of network as scheduling techniques, use of network as control techniques i.e. project monitoring, Construction Technology: construction of superstructure and substructures, Quality control, Various items of construction: Earthwork, Excavation, Earth-moving, Drilling, Blasting, dewatering, foundation, Finishing items, painting, flooring, brick works, door, window. Examples of construction of structures such as buildings, bridges, roads, tunnels, industrial structures, Construction safety, Use of information technology in construction industries, Automation in construction industry: a general discussion.

Texts/References:

1. J. Singh, "Heavy Constructon-Planning, equipment and methods", Oxford & IBH Publishing Co. Pvt 1993.
2. B. Sengupta and H Guha, "Construction management and planning", Tata McGraw Hill, 1995.
3. R.L. Peurifoy, W.B. Ledbetter and C.J. Schexnayder, "Construction planning and methods", Fifth editions, McGraw Hill International editions, 1996.
4. D.S. Berrie and B.c. Paulson, "Professional construction management including C.M., Design construct and general contracting", Third edition, McGraw Hill International Editions, 1992.
5. L.S. Srinath, "PERT and CPM principles and Applications", Third edition, Affiliated east-west press Pvt Ltd, 2001.
6. D.G. Carmichael, "Construction engineering Networks: Techniques, planning and management", Ellis Horwood Publishers Chichester 1989.
7. K.K. Chitkara, "Construction project management: planning, scheduling and controlling", Tata McGraw-Hill, 1998.

CE-309 Design of Structures – II (3-0-2: 8)

Working stress and limit state method of design of R.C. Structures, Design of Beam: Singly reinforced, Doubly reinforced beam, Flanged beam, Shear and bond, development length, detailing of reinforcement, Torsion, Serviceability criteria : Deflection and cracking, redistribution of moments, provision for ductility, Design of Slab : One way and two way slab, detailing, Design of Column : Axial loading, Uniaxial bending, Biaxial bending, Slender column, Foundation : Isolated, Combined and raft foundation.

List of Experiment: Testing of Beams: Flexure, Shear and Torsion, Testing of Slabs : Flexure and Punching, Non Destructive Testing, Testing for reinforcement and structural steel section.

Texts / References :

1. S.K. Mallik and A.P. Gupta, "Reinforced concrete design", Oxford and IBH 1999.
2. S.N. Sinha, "Reinforced concrete design", Tata McGraw Hill 2000.
3. A.K. Jain, "Reinforced concrete : Limit state design", Nem Chand and Bros. 1999.
4. S.U. Pillai and D. Menon, "Reinforced concrete Design", Tata McGraw Hill 1999.
5. R. Park and T. Paulay, "Reinforced Concrete Structures", John Wiley and Sons, 1975.

CE-310 Transportation Engineering II (3-0-0: 6)

Introduction to Traffic Engineering, Elementary traffic flow theory, Data collection Techniques and analysis of speed, volume, origin and destination, axle load, parking, accident studies; Signal Design and Signal coordination, Traffic signs, Marking, Intersection

Designs, Queuing Theory, Capacity studies and analysis of urban roads and intersections, Level of service and its estimation, Traffic Congestion; Statistics and probability in Traffic engineering.

Elementary network analysis, Traffic simulation: principles and Tools, Travel forecasting principles and techniques; Trends in Traffic Engineering: ITS, IHVS, ATMS, Electronic Toll, TRANSYF, and Highway Capacity Software (HCS2000)

Texts/ References:

1. Roger P. Roess, William R. McShane & Elena S. Prassas, "Traffic Engineering", Prentice-Hall, 1990.
2. C. J. Khisty and B. K. Lall, "Transportation Engineering: An Introduction", Prentice-Hall India, 2003.
3. L. R. Kadiyali, "Traffic Engineering", Khanna Publishers, 2000.
4. A. D. May, "Traffic Flow Fundamentals", Prentice-Hall, 1990.
5. T. Currin, "Introduction to Traffic Engineering, A manual for Data collection and Analysis", Thomson Learning, 2001.
6. C.S. Papacostas, "Transportation Engineering and Planning", Prentice-Hall India, 2001.

CE-311 Hydrology and Water Resources Engineering (2-1-0:6)

Surface water hydrology - hydrologic cycle, rainfall and its measurement, mean rainfall, runoff; Flow measurements; Infiltration losses; Storm hydrology; Unit Hydrograph; Storm hydrograph; Reservoir planning - Investigations, life of reservoir; Flood estimation and routing, flood forecasting; Surface and sub-surface drainage, water logging, remedial measures, drainage of land; Ground water hydrology - Introduction, types of aquifers, wells, well yield; Soil-Water-Plant relationships, crop water requirement; Layout of canal system; Types and methods of irrigation.

Texts / References

1. V.T. Chow, D.R. Maidment, L.W. Mays, "Applied Hydrology", McGraw Hill, 1998.
2. V.P. Singh, "Elementary Hydrology", Prentice Hall, 1993.
3. H.M. Raghunath, "Hydrology – Principles, Analysis and Design", Wiley Eastern Ltd., 1986.
4. A.M. Michael, "Irrigation – Theory and Practice", Vikas Publishing House, 1987.
5. D.K. Todd, "Groundwater Hydrology", John Wiley & Sons, 1993.
6. K. Linsley, "Water Resources Engineering", McGraw Hill, 1995.
7. S.K. Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 1992.
8. H.P. Ritzema (Editor-in-Chief), "Drainage Principles and Applications", ILRI Publication 16, 1994.

SEVENTH SEMESTER

CE-401 Environmental Engineering – II (3- 0- 0 : 6)

Particle Fluid Mechanics as applied to the settling of Type I and II suspensions. Design and operation of Sedimentation Tanks. Coagulation and Flocculation. Hydraulics of Filtration, Design and Operation of Filter Units. Disinfection Methods. Ion exchange and Adsorption. Water Softening, Manganese and Iron Removal. Wastewater Treatment – Preliminary, Primary and Secondary Treatment Units. Aerobic and Anaerobic Processes. Purpose, theory and design of aeration units. Sludge treatment and disposal. Wastewater treatment by septic tank, wastewater stabilization ponds, aerated ponds and oxidation ditches. Site-visits to Water and Wastewater Treatment Works.

Texts / References:

1. Howard S Peavy, Donald R Rowe & George Tchobanoglous, "Environmental Engineering", McGraw-Hill International Ed., 1985.
2. Terence J McGhee, "Water Supply and Sewerage", McGraw-Hill, Inc, 1991.
3. James M Montgomery, "Water Treatment Principles and Design", John Wiley & Sons, 1985
4. Mackenzie L Davis & David A Cornwell, "Introduction to Environmental Engineering", McGraw-Hill, Inc., 1991.
5. Soli J Arceivala, "Wastewater Treatment for Pollution Control", Tata McGraw Hill, 1999.
6. L D Benefield & C W Randall, "Biological Principles in Wastewater Treatment", Prentice-Hall, Englewood Cliffs, NJ, 1980.
7. Metcalf & Eddy, "Wastewater Engineering- Treatment and Reuse," Tata McGraw Hill, 4th Edn., 2003
8. Central Public Health & Environmental Engineering Organisation- Ministry of Housing and Urban Development, Manual for Water Supply and Treatment, 1991.

9. Central Public Health & Environmental Engineering Organisation – Ministry of Housing and Urban Development, Manual for Sewer and Sewerage, 1993

CE-402 Design Project (1-0-3: 5)

Students are required to do the complete design and drafting of one concrete and one steel structures, such as buildings, water tank, bridges, concrete dam, industrial structures.

Text/Reference:

1. C. E. Reynolds, "Reinforced Concrete Designers Hand Book", E&FN Spon, 1999
2. "Design Aids for Reinforced Concrete to IS:456: 1978", Bureau of Indian Standards, 1980
3. V. K. Raina, "Concrete bridge Practice: Analysis, Design and Economics", Tata McGraw Hill, 2002
4. S. Ramamrutham and R. Narayanan, "Design of Steel Structures", Dhanpat Pub, New Delhi, 1998
5. R. L. Brockenbrough and F. S. Merrit, "Structural Steel Designs Handbook", Mc Graw Hill, 1999
6. American Water Works Association, "Steel Water-Storage Tanks", AWWA, 1998

DEPARTMENTAL ELECTIVE COURSES

CE-411 Dynamics of Structures (3-0-0: 6)

SDOF systems: Equations of Motion, Free vibration, damping, Forced vibrations under harmonic, impulse and general loadings, Response spectrum Generalized SDOF systems: Rigid body distributed mass and stiffness systems; MDOF Systems: Dynamic properties, modal damping, classical damping, modal super position methods; Numerical methods in dynamics: Eigen value analysis, direct integration scheme, Continuous systems: Equations of motion, Hamilton's principle, Lagrangian formulation, Free and force vibration scheme, Wave propagation; Introduction to Random vibration: Random variables, Random process, moment and characteristic function, spectral analysis, response to random excitation; Application of structural dynamics in the design of block and frame foundation.

Texts / References:

1. R.W. Clough and J. Penzien, "Dynamics of Structures", Second edition, McGraw Hill International edition, 1993.
2. Mario Paz, "Structural Dynamics", CBS Publishers, 1987.
3. Anil K. Chopra, "Dynamics of Structures: Theory and applications to earthquake engineering", Prentice Hall of India Ltd., 1997.
4. K. Rao, "Vibration analysis and foundation dynamics", Wheeler, 1998.
5. E. Siniu and R.H. Scanlan, "Wind effects on structures: fundamentals and applications to design", John Wiley and sons, 1997.

CE-412 Mechanics of Composite Materials (3- 0 -0: 6)

Introduction – classifications, terminologies. Macromechanical analysis of lamina – Hooke's law for anisotropic, monoclinic, orthotropic, transversely isotropic and isotropic materials–2D Unidirectional and angle ply lamina – Strength theories of lamina. Micromechanical analysis of lamina –Volume and mass fraction, density and void content – Evaluation of Elastic moduli, Ultimate strength of unidirectional lamina. Macromechanical analysis of laminates – Laminate code, Stress strain relations – In-plane and Flexural modulus, Hygrothermal effects. Failure Analysis and Design – Special cases of laminates, symmetric, cross ply, angle ply, angle ply and antisymmetric laminates, failure criteria and failure modes

Texts/ References:

1. R. M. Jones, "Mechanics of Composite Materials", Taylor & Francis, 1998
2. B D. Agarwal and J. D Broutman, "Analysis and Performance of Fiber Composites", John Willey and Sons, 1990
3. P. K. Mallik, "Fiber reinforced composites : Materials, Manufacturing and Design" Marcel and Dekker, 1993

4. Kaw, K. Arthur, "Mechanics of Composite Materials", CRC Press, 1997
5. P. K. Mallik, "Composite Engineering Hand Book", Marcel and Dekker, 1997

CE-413 Finite Element methods in Engineering (3-0-0: 6)

Basic concepts of engineering analysis, Methods of weighted residuals and variational formulations, Finite element discretization, Shape function, Lagrange and serendipity families, Element properties, Iso-parametric elements, Criteria for convergence, Numerical evaluation of finite element matrices (Gauss quadrature integration), Assemblage of elements, Analysis of plane stress/strain, axi-symmetric solids, Three dimensional stress analysis, Poisson's and Laplace equations, Flow through porous media, Solution technique; Finite element programming, Use of package programs.

Texts / References

1. T. R. Chandrapatula and A. D. Belegundu. Introduction to finite elements in engineering, Third Edition, Prentice Hall of India, 2001.
2. P. Seshu, Text book of finite element analysis, Prentice Hall of India, 2003.
3. J. N. Reddy, An introduction to the finite element method, McGraw Hill Inc. 1993.
4. R. D. Cook. D. S. Malkus. M. E. Plesha, R. J. Witt, Concepts and application of finite element analysis, fourth Edition, John Wiley & Sons, 2002.
5. O.C. Zienkiewicz & R.L.Taylor, "The Finite element method", Butterworth Heinemann (Vol I and Voll), 2000.
6. C.S. Krishnamoorthy, "Finite Element Analysis, Theory and programming", Tata McGraw Hill, 1994.
7. K.J. Bathe, "Finite Element Procedures in Engg. Analysis", Prentice Hall of India, 1996

CE-414 Advanced Structural Mechanics (3-0-0: 6)

Bending of curved beam. Beams on elastic foundation – infinite, semi- infinite and beams of finite length. Analysis of thin plates – Navier's and Levy's solution for rectangular plate, Circular plates. Buckling of column and frames, energy method for computing critical load. Cylindrical shell membrane theory. Dynamic system: discrete and continuous, Lagrange & Hamiltons formulation, Free and forced vibration analysis- convolution integral, mode superposition technique. Approximate methods.

Texts / References

1. S. Tomoshenko, "Strength of materials – Advanced theory and problems", Vol-II Von Nostrand, 2003
2. S.P. Timoshenko & S.W.Krieger, "Theory of plates and shells", McGraw Hill, 1976
3. D.G. Fertis, "Advanced Mechanics of Structures", Marcel Dekker, 1996.
4. A. Chajes, "Principle of structural stability" Waveland Press, 1993
5. Raymond W.Clough, J. Penzien and Ray, W. Clough, "Dynamics of structures", McGraw Hill, 1975
6. L. Meirovitch, "Methods of Analytical Dynamics", McGraw Hill, 1970

CE-415 Prestressed Concrete and Industrial Structures (3-0-0: 6)

Design of prestressed concrete sections for flexure, shear, bond and anchorage forces- minimum weight design; Analysis and design of indeterminate prestressed structures, Choice of cable profiles, Concordancy and linear transformation of cable profile, effect of creep and shrinkage on prestressed concrete structures; Design of end block, Partial prestressing, Definition- principles and design approach, Composite structures; Wind load analysis on Industrial building, Braced and Unbraced Industrial building.

Text s /References:

1. E. G. Nawy, "Prestressed Concrete: A fundamental approach", Prentice Hall, 1995.
2. T.Y. Lin, "Design of Prestressed Concrete Structures", John Wiley, & Sons, 1963.
3. S.K. Mallick and A.P. Gupta, "Prestressed Concret", Oxford & IBH, 1992.
4. G.S. Charles and J.E. Johnson, "Steel Structures-Design and Behaviour", Addison –Wesley, Pub Co., 1997.
5. W.F.Chen & S.Toma, "Advanced analysis of steel frames", CRC press,1994.

CE-416 Bridge Engineering (3-0-0: 6)

Investigation and site selection, hydraulic factors, alignment, traffic aspects, types of bridges; Loading standard, IRC specification, Impact factor, General design consideration, Structural design of highway and railway bridges in masonry, reinforced, pre-stressed concrete and steel; Superstructures: Slab bridge, beam and slab bridge, plate girder and composite bridges, Bearings and expansion joints, Bridge foundation: types of foundation, design of well and pile foundation, Bridge vibration: traffic loading, seismic and wind effect, construction techniques and maintenance.

Texts / References:

1. D. J. Victor, "Essentials of Bridge Engineering", Oxford and IBH, 1980.
2. N. Kridhna Raju, "Design of Bridges", Oxford and IBH, 1988.
3. V. K. Raina, "Concrete bridge Practice: Analysis, Design and Economics", Tata McGraw Hill, 2002.
4. L. Fryba, "Dynamics of Railway Bridges", Thomas Telford, 1996.

CE-417 Experimental Stress Analysis (3-0-0:6)

Introduction to strain measurement, electrical resistance strain gauges, strain gauge circuits; Photoelasticity, Optics of photoelasticity, Photoelastic effect, Isoclinics and Isochromatics, Determination of fringe constant, Methods of stress separation, Frozen stress method; Moire technique; Holography; Photoelastic coating and brittle coating.

Texts / References

1. J.W. Dally and W.F. Riley, "Experimental stress Analysis", McGraw Hill, 1991
2. H. Wieringa, "Experimental Stress Analysis", Kluwer Academic Pub. 2002.
3. R. Budynas, "Advanced Strength and Applied Stress Analysis", Mc. Graw Hill, 1998.

CE 418 Pavement Management Systems (3-0-0 : 6)

Introduction to Pavement Management Systems, Functional and structural condition of pavements, Pavement network, Pavement Distress survey, Rating procedures, Present Serviceability concept, Roughness Measurement and analysis, IRI Index, Skid Resistance Measurement, Structural Evaluation of Pavements by Nondestructive testing, Backcalculation Analysis, Pavement strengthening based on Deflection data, Pavement Distress Identification and equipment, Pavement Condition Prediction Models, Maintenance and rehabilitation techniques, Network and project level Management, PMS based on analytical-empirical method, Future Directions and Research needs in PMS, Highway Development and Management (HDM) for road project investments.

Texts/References

1. M.Y. Shahin, Pavement Management for Airports, Roads and Parking lots, Chapman & Hall, 1994.
2. Haas, R., W. R. Hudson, and J.P. Zaniewski, Modern Pavement Management Krieger Publishing Company, 1984.
3. Hudson, W. R., R. Haas and W. Uddin, Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation., McGraw Hill, 1997.
4. Yang H., Pavement Analysis and Design. Huang, Prentice-Hall, Inc. Englewood Cliffs, 1993.

CE-419 Principles of Remote Sensing (3-0-0: 6)

Introduction to Satellite Remote Sensing; energy source and radiation principles; remote sensing systems, multi-spectral scanners; thermal infrared line scanners, sideways looking airborne radar; Microwave Sensors: Passive and active, data acquisition from LANDSA, ERS, SPOT and IRS satellites, digital enhancement techniques; digital image analysis: visual, digital and classification accuracy, Introduction to GIS, applications of remote sensing for Earth resources management.

Texts/References

1. T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 1994.
2. J.B. Campbell, Introduction to Remote Sensing, Taylor & Francis, London, 1996.
3. F.F. Sabins, Remote Sensing: Principles and Interpretation, W.H. Freeman and Company, New York, 1997.
4. R.N. Colwell (Editor-in-Chief), Manual of Remote Sensing, Vol. I & II, American Society of Photogrammetry, Falls Church, Virginia,

1983.

5. George Joseph, Fundamentals of Remote Sensing, Universities Press, New Delhi, 2003.
6. John R. Jensen, Remote Sensing of the Environment an Earth Resource Perspective, Pearson Education. Delhi, 2003.

CE 420 Information Technology in Construction Engineering (3-0-0:6)

Data and knowledge flow in construction engineering, Introduction to decision support systems (DSS) and management information systems (MIS), Various elements of DSS and MIS.

Data representation; Database management; Data warehousing, access, analysis and visualization; Knowledge discovery in databases: data Mining; Application of Geographic Information system (GIS) and virtual reality. Data flow in estimation, planning, scheduling and construction; Material procurement and inventory management.

Knowledge acquisition and validation, Knowledge representation; Knowledge based decision support systems; Artificial Intelligence and expert systems; Construction problems and their solution.

Elements of Computer networks: Use of computer networks, Concepts of network layer, Application layer: network security, Domain name system (DNS), Electronic mail, the world wide web, multimedia; Controlling and reporting of remotely located construction projects.

Texts/References:

1. E. Turban and J.E. Aronson, Decision support system and Intelligent systems, Prentice Hall of India, 2003.
2. P. Ponniah, Data warehousing fundamentals: A comprehensive guide for IT professionals, John Wiley & Sons Inc. 2001.
3. S. Sadagopan, Management information system, Prentice Hall of India, 1997.
4. A. S. Tanenbaum, Computer Network, Prentice Hall of India, 2003.

CE-421 Design of Foundations and Retaining Structures (3-0-0:6)

Advanced bearing capacity theories; Design of shallow foundations: strip footings, isolated footings, combined footings, rafts; Design of deep foundations: single piles, pile groups, pile caps, caissons, vertical uplift and lateral capacity; Design of retaining structures: rigid and flexible walls, coffer dams, diaphragm walls, braced cuts.

Texts/References:

1. J.E. Bowles, "Foundation Analysis and Design", McGraw Hill, 1996.
2. P.N. Kurian, "Design of Foundation Systems : Principles & Practices", Narosa, 1994.
3. M.J. Tomlinson, "Foundation Design and Construction", Addison Wesley, 2001.
4. M.J. Tomlinson, "Pile Design and Construction Practice", E & FN Spon, 1987.
5. Peck, Hanson & Thornburn, "Foundation Engineering", John Wiley & Sons, 1974.

CE-422 Ground Improvement and Ground Engineering (3-0-0:6)

Soil compaction: laboratory methods, field methods, compaction control; Soil stabilisation: using additives, sand drains, stone columns, lime columns; Grouting: types of grouts, methods of grouting; Soil reinforcement: using strips, geogrids, geotextiles, geomembranes; Dewatering methods; Soil nailing; Underpinning; Tunnelling.

References:

1. T.W. Lambe & R.V. Whitman, "Soil Mechanics", John Wiley & Sons, 1969.
2. Terzaghi, Peck & Mesri, "Soil Mechanics in Engineering Practice", John Wiley & Sons, 1996.
3. M. R. Hausmann, "Engineering Principles of Ground Modification", McGraw Hill, 1990.

CE 423 Quantitative Methods in Construction Management (3-0-0:6)

Introduction to System analysis, system approach in contracting, System analysis of total construction management; Models and simulations.

Construction scheduling: Inventory and crew scheduling, Linear programming, Integer programming, Transportation techniques, dynamic programming.

Decision making in uncertain environments, probability theory, Game theory and bidding strategies.

Material management, inventory theory, supply chain management, Economic aspect of project and Cash flow in construction management.

Value engineering in construction management.

Texts/References:

1.H. N. Ahuja, Construction performance control by Networks, John Wiley & Sons, 1976.

2. H.A. Taha, Operational research An Introduction, Seventh Edition, Prentice Hall of India, 2003.

3. J.R. Evans and E.Minieka, Optimization algorithms for Networks and graphs, Second editions, Marcel Dekker Inc. 1992.

CE-432 Hydraulic Machines (3-0-0:6)

Introduction – pumps, centrifugal pump, reciprocating pump, slip, indicator diagram, air vessels, hydraulic transient, specific speed, characteristic curves, cavitation, multi-stage pumps, screw pump, jet pump; Turbines, classification, Pelton Wheel, Francis Turbine, Kaplan Turbine, specific speed, selection of turbines; Mini power plant – planning; Miscellaneous hydraulic pumps and machines - submersible pump, gear pump, screw pump, sewage pump, hydraulic press, hydraulic accumulator, hydraulic ram.

Texts / References

1. P.N. Modi and S.M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, 1998.

2. J. Lal, "Hydraulics Machines", Metropolitan Book Co., 1969.

3. Edited by Karassik et al., "Pumps Hand Book", Tata McGraw Hill, 1986.

4. T. Jiandong et al., "Mini Hydropower", (1st Ed.) John Wiley & Sons, 1996.

CE-434 Groundwater Hydrology and Management (3-0-0:6)

Introduction to groundwater hydrology; Well and aquifer characteristics; Groundwater flow in aquifers, groundwater recharge, fluctuation of water table beneath a recharge site; Hydraulics of fully and partially penetrating wells in confined, leaky and unconfined aquifers under steady and transient conditions; Analysis of pumping test data; Groundwater investigations; Basin management of groundwater and groundwater quality; Model studies; Sea water intrusion.

Texts/ References

1. D.K. Todd, "Groundwater Hydrology", John Wiley & Sons, 1993.

2. C. Walton, "Groundwater Resources Evaluation", McGraw Hill, 1970.

3. H.M. Raghunath, "Groundwater Hydrology", New Age International, 1993.

4. O.D.L. Strack, "Groundwater Mechanics", Prentice Hall, 1989.

5. S.P. Garg, "Groundwater and Tube Wells", Oxford & IBH Publishing Co., 1993.

CE-441 Air Pollution and Industrial Waste Management (3-0-0:6)

Air Pollutants, their sources and harmful effects on the environment; Meteorology as applied to air pollution and dispersion of air pollutants, Air quality and emission standards, Removal of gaseous and particulate matter. Sources and types of wastes; solid, liquid and gaseous wastes; Water use in industry, industrial water quality requirements; Control and removal of specific pollutants in industrial wastewaters from dairy, fertilizer, distillery, tannery, sugar, pulp and paper, iron and steel, metal plating etc.

Texts / References:

1. K. Wark & C. F. Warner, "Air Pollution-Its Origin and Control", Harper & Row, New York, 1981.

2. N. D. Nevers, "Air Pollution Control Engineering", Mc. Graw Hill International Ed., 1985

3. N. L. Nemerow, "Zero Pollution for Industry: Waste Minimization through Industrial Complexes", John Wiley & Sons, 1995

4. N L Nemerow, "Liquid Waste of Industry: Theoy, Practices and Treatment", Addison-Wesley, 1971.

5.S. J. Arceivala, "Wastewater Treatment for Pollution Control", Tata Mc. Graw Hill, 1999

6.W. W. Eckenfelder, "Industrial Water Pollution Control", Mc. Graw Hill, 2000.

CE-442 Pavement Design (3-0-0:6)

Pavement Materials, Pavement as multilayered structure, subgrade, base and subbase, bituminous materials, individual properties, non-linear models of granular materials and bituminous mixes elastic modulus and Poisson's ratio, concrete pavement, Pavement Design, AASHTO, Shell, Asphalt Institute, Japan, Austroads methods, analytical pavement design, Indian context, overlay design, Pavement Management, Pavement evaluation, Benkelman beam and Falling Weight Deflectometer, pavement maintenance management, financial viability.

Texts / References

1. E. J. Yoder and M. W. Witczak, Principles of Pavement Design, 2nd Edition, John Wiley & Sons.
2. D. Croney and P. Croney, The Design and Performance of Road Pavements, 2nd Edition, McGraw-Hill, International Series in Civil Engineering, 1992.
3. Ministry of Surface Transport, Government of India, Specification for Road and Bridge Work, 3rd revision, Published by IRC, 1995.

CE-443 Computer Aided Design (3-0-0:6)

Principles of Computer aided design. Computer graphics fundamentals. Points and lines; 3D transformation and projections; Plane curve and space curve; Surface description and generation; Hidden line algorithm for wireframe modelling; Surface modelling; Solid modelling; Representation of 3-D objects; Data Structure–Concept of link list, stack, Queue, Tree.

Texts / References

1. S. Harrington, "Computer graphics: A Programming approach", McGraw Hill, 1987
2. D.F. Rogers and J.A Adams, "Mathematical elements of Computer Graphics", McGraw Hill, 1990
3. J.D. Foley, A.V. Dam, S. K. Feiner, J. F. Huges, "Computer Graphics: Principle and Practice in C", Addison Wesley Publishing Company, 1995.

CE-444 Environmental Management (3 - 0 - 0 : 6)

The need for environmental awareness and protection in both natural and man-made systems – effects on atmosphere, water, ecological systems and quality of life. Environmental Impact Assessment and Integrated Environmental Management, Practical applications – cradle to grave concept, life cycle analysis, clean technologies. Environmental Audit, Compliance Audit; Concept of ISO and ISO 14000. Needs of developing countries. Governmental standards for Environmental Protection. Emerging Global Environmental Issues. Environmental Legislation.

Texts/ References:

1. R. G. John and W. C. David, "Environmental Impact Analysis Handbook", McGraw-Hill, 1980
2. R F Fuggle and M A Rabie, "Environmental Management in South Africa", Juta & Co. Ltd., Johannesburg, 1991.
3. R M Harrison (Ed.), "Pollution – Causes, Effects and Control", Whitstable Lithop Ltd, 1990
4. Larry W Canter, Environmental Impact Assessment, McGraw-Hill.

CE-445: Solid Waste Engineering (3-0-0:6)

Solid waste- history, materials flow, the need for integrated solid waste management; Municipal solid waste-characteristics and quantities; Collection Systems-municipal wastes; commercial wastes, recyclable materials; Material separation and processing of municipal solid waste; Combustion and energy recovery-heat value, materials and thermal balances, combustion hardware, undesirable effects; Biochemical process-anaerobic digestion, composting and other processes; Landfills-planning, siting, landfill processes, landfill design, landfill operations, post-closure care and use of old landfills; Current issues in solid waste management.

Texts/ References:

1. P. Aarne Vesilind, William A. Worrel & Debra R. Reinhart, Solid Waste Engineering, Thomson Brooks/Cole, First Edition, 2002.
2. Howard S Peavy, Donald R Rowe & George Techobanoglous, Environmental Engineering, McGraw-Hill International Ed, 1985.
3. Mackenzie L Davis & David A Cornwell, Introduction to Environmental Engineering, McGraw-Hill, Inc, International Edition, 1991.

4. Arcadio P. Sincero & Gregoria A. Sincero, Environmental Engineering – A Design Approach, Prentice-Hall India, 1996.