

B.TECH CIVIL ENGINEERING SYLLABUS VIII SEMESTER

HYDRAULIC STRUCTURES 8111 C

Unit I

Dams : Classification, Gravity dams : site selection, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

Unit II

Arch dams : site selection, different types, design.
Buttress dams - types and designs.

Unit III

Earth & Rockfill Dams : Types , site selection, causes of failure and design criteria, typical earth dam sections, estimation and prevention of seepage. stability analysis.

Unit IV

Spillways : Types and selection, design of ogee , side channel and chute spillways, energy dissipation devices. Spillway crest gates and sluice gates, design principles of vertical lift and radial gates.

Unit 5

Hydropower Plants : Types of hydropower plants, General features of hydroelectric schemes, Elementary study of power house structures, under ground power houses, selection of turbines, turbine setting, Cavitation draft tubes, surgetanks.

Text Book :-

1. Hydraulic Structures by Narayanan & Novak.
2. Irrigation Engineering & Hydraulic Structures by S.K.Garg.
3. Earth & Rock-fill Dam by H.D.Sharma.
4. Concrete Dams by R.S.Varshney

GEOTECHNICAL ENGINEERING –II 8112 C

Unit I

Bearing Capacity and Shallow Foundation : Bearing capacity - Ultimate and allowable theories of bearing capacity - Terzaghi, Balla, Skempton, Meyerhof & Hansan. I.S.Code on B.C., Determination of BC ,factors affecting BC, limits of total and differential settlement, correction for rigidity , foundations - types & selection, footing, rafts and floating foundation.

Foundation on expansive and collapsible soils, characteristics and treatment of expansive soils, construction techniques including use of CNS layer and under reamed pites. Considerations for collapsible soils.

Unit II

Stability of Slopes – Types of failure of finite and infinite slopes, stability of infinite slopes in sands and clays, stability of infinite slopes by method of slices, friction circle methods, Taylor's. Stability number , Analytical and Graphical methods.

Unit III

Deep Foundation : Philosophy of deep foundation, piles , estimation of individual and group capacity of piles in cohesive and noncohesive soils, static and dynamic approaches. Pile load

test, settlement of pile groups, negative skin friction, , piles under tension, inclined and lateral loads.

Unit IV

Well Foundation : Equilibrium of well and analysis for stability, caissons, cofferdams, Design of sheet piles under various end conditions well foundation for bridges and aspect of design tilt and shifts, remedial measures.

Sheet Piles (Bulk Heads) : Rigid and flexible retaining walls, Determination of anchor force and depth of penetration, reinforced earth retaining walls, concept , analysis, materials and applications.

Unit V

Machine Foundation : Modes of vibration, determination of natural frequency, criteria for design , effect of vibration on soils, vibration isolation. Design of block foundation for impact type of machinery.

Soil Improvement Techniques : Soil stabilisation using lime, bitumen and mechanical energy, Compaction - field and laboratory methods, proctor compaction, Vibro floatation and Geosynthetics.

Text Books :

1. Soil Mechanics & Foundation Engineering by Arora.
2. Soil Mechanics & Foundation Engineering by VNS Murthy.
3. Analysis and Design of Structures by Swami Saran.
4. Foundation Analysis and Design by Bowtes.
5. Soil Mechanics and Foundation Engineering by Terrzaw and Perle.
6. Soils and Foundation by Liu and Evitt.

ELECTIVE- III

PAVEMENT DESIGN 8113 C (i)

Unit I

1. Equivalent Single Wheel Load (ESWL) : Definition , calculation of ESWL, repetition of loads and their effects on the pavements structures.

Unit II (20 Marks)

2. Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements. Stress distribution through various layers, Boussinesque's theory, Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and north Dakota cone method.

Unit III (20 Marks)

3. Rigid Pavements : Evaluation sub-grade, Modulus - K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses. warping stresses, frictional stresses, critical combination of stresses, critical loading positions, rigid pavement design. IRC method, PCA chart method, joints, design and construction & types.

Unit IV (20 Marks)

4. Evaluation of Existing Pavements : Benkleman beam method, Service ability Index Method.

Unit V (20 Marks)

5. Strengthening of Existing Pavements : Rigid and flexible overlays and their design procedures.

Text Book :-

1. Highway Engineering by S.K.Khanna & C.E.G.Justo.
2. Pavement Design by Yoder & Witezak.
3. Conc. Road Design by HMSO.
4. IRC specifications for design of flexible and Rigid Pavement

ELECTIVE-III

FLUID TRANSPORTATION ENGINEERING 8113 C(ii)

Unit I

Mechanism of Solid transportation by Fluids :

Types of fluids and basic equations of flow, rheology and classification of complex mixtures. fundamentals of two phases, flow-phase separation and setting behaviour.

Unit II

Sediment Transport in open channels :

Rigid mobile boundary channels, motion of grain on channel bed, analysis of sediment motion , bed forms, hydraulics of channels, alluvial channels.

Unit III

Slurry Pipe Lines :

Introduction to slurry pipeline system mechanics of hydraulic transport of solids by pipe lines, transport of setting solids, flow of non-setting slurries, design methods.

Unit IV

Terminal Facilities :

Selection and design of equipments for terminal facilities.

Pipe Protection :

Factors affecting life of pipeline system and methods of protection.

Unit V

Pneumatic conveyance, hydraulic capsule pipelines, methodology associated with slurry pipeline.

Text Book :-

1. Fluid Transportation Engineering by S.W.Yoan.

ELECTIVE-III

AIR QUALITY MONITORING & CONTROL 8113 C (iii)

1. Air pollution problem : Economics and social aspects, historical episodes of air pollution.
2. Sources of Air pollution : Effects of air pollution on health, animal, plants and materials. role of meteorological condition, properties of typical air pollutants, air diffusion and concentration pollutants, general diseases caused by air pollutants. toxicity of various pollutants.
3. Sampling and Analyzing of Air Pollutants : Instruments pollution survey, standards of air pollution.
4. Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.
5. Air pollution in control legislation , public education pollution standards, status of air pollution control in various countries.
6. Industrial Hygiene : Concept and importance , factory involved in environmental hazards, industrial ventilation occupational diseases, control methods.

Text Book :-

1. Air Pollution by C.R.Philips.

ELECTIVE-III

MODERN FOUNDATIONS 8113 C (iv)

Unit I

(a) Foundations in Special Soils : Foundations in expansive soils, foundations in soft and compressible soils, foundations in over consolidated desiccated soils.

(b) Modern Soil Testing : Centrifugal testing of soil models, pressure meter testing of soils.

Unit II

Modern Foundation Techniques : Drilled piers, reinforced earth, and reinforced concrete retaining walls with relieving shelves. Diaohragam walls and bored pile walls , the stabilizing action of drilling mud, root , piles, vibrofloatation, stone columns, sand wicks

Unit III

Shells in Foundation : shell as a structural form,. Classification of shells used in foundation. Design of shell foundation – hyperbolic paraboloidal shell, conical shell, inverted dome shell, construction of shell foundation, in-situ construction, precast construction.

Unit IV

Foundations for special structures : Foundations for water tanks, chimneys and cooling towers, telecommunication and transmission line towers. Foundation for guyed structure, industrial structure and for ground storage tanks.

Unit V

Foundations for underground structure : Bedding of conduits, tunnels, underground power houses.

Foundation for Coastal and offshore structures : Marine piles, foundations for offshore drilling platforms, and foundations for offshore defence installations.

Text Book:

1. Modern foundations by Arockia Samy.

ELECTIVE-III

COMPUTATIONAL METHODS IN STRUCTURAL ENGINEERING 8113 C (v)

Unit I

Matrix Method for Skeletal Structural Analysis : static and kinematic matrices, principle of virtual work, force and displacement methods with application to plane and space frame problems. Organisation of computation, programming computations, equation solvers-Gauss elimination method, LDLT method, Cholesky method.

Unit II

Computer implementation of plane frame and plane truss problems.

Unit III

Structural Optimization : Concave and Convex functions, Zeroth , first and second order methods of optimization.

Unit IV

Constrained Optimization - Kuhn Tucker conditions, Linear programming , Duality and sensitivity, Integer Programming, Exterior and Interior penalty functions, Geometric programming.

Unit V

Introduction to finite Element Method : Discretisation, Displacement and force models, shape function, use of parametric and local coordinates, convergence criteria, Numerical Integration.

Text Book :-

1. Computational Methods in Structural Engineering by Swami Saran & Gupta.
2. Matrix Methods by Kanchi.

ELECTIVE-III

HYDRAULICS SYSTEM MODELLING 8113 C (vi)

Unit I

Development of water resources, demand of water, availability of water, estimation of surface water flow at ungaged site.

Unit II

Computation of extreme flow :

Concept of probability in hydrology, design flood for hydraulic structure, methods of flood frequency analysis, computation of peak flow from precipitation, measurement of peak discharge.

Unit III

Conveyance System :

Methods of conveyance of water, resistance equations for flow, design of rigid boundary channels, design of loose boundary channels.

Conduit System :

Types of pipes, laying of pipes and joints , forces and stresses in pipe band, pipe line analysis and design, methods of supplying water, storage and distribution reservoir, pipe materials, large conduit design. Hydraulic transient analysis.

Unit IV

Water Distribution System Analysis :

Types of pipe network, equivalent pipes, pumps in water distribution system, Network with loops, flow equation, node equation loop equation, numerical solution technique – linear theory method, Newton –Raphson method. Hardy-Cross method, application of water distribution softwares. Water distribution system models.

Unit V

Drainage System :

Types of drainage systems, Urban drainage system, Agriculture drainage system, Roadways drainage system, Airport drainage system, computer applications.

Text Books :-

1. Water supply & Sanitary Engg. – V.N.Naziram & S.P.Chandole – Khanna Pub.
2. Hydrology & Hydraulic System –Ram S.Gupta , Printice Hall , New Delhi
3. Fluid Mechanics & Fluid Machinery – S.K.Som & Biswas

ELECTIVE-III

STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING 8113 C(viii)

Unit I

Single DOF system – Undamped and Damped response to Harmonic and periodic excitation, response to arbitrary, Step, Ramp and pulse Excitations.

Unit II

Numerical Evaluation of dynamic response – time stepping methods, methods based on interpolation of Excitation, Newmark's and Wilsons – q method, analysis of Nonlinear Response. Introduction to frequency domain analysis.

Unit III

Elements of seismology - Definitions of the basic terms related to earthquake (magnitude, intensity), seismographs.

Earthquake response of structures – Nature of dynamic loading resulting from earthquake, construction of response spectrum for elastic and inelastic system.

Unit IV

Multiple DOF system : Stiffness and flexibility matrices for shear building and forced vibrations-undamped and damped, model and response history analysis, system with mass and elasticity.

Unit V

Earthquake resistant design of structures, design of structures for strength and serviceability, ductility and energy absorption, provisions of IS : 1893 and IS : 4326 for a seismic design of structures, ductile detailing IS : 13920.

Reference books :-

1. Chopra ,A.K., Dynamics of structures – Theory and applications to earthquake engineering , Prentice Hall of India, New Delhi.
2. Berg, G.V., Elements of Structural Dynamics, , Prentice Hall of India, New Delhi.
3. Paz Mario, Structural Dynamics, CBS Publishers, Delhi.
4. Clough R.W. & Penzien J., Dynamics of Structures , McGraw Hill, New York.

ELECTIVE-IV

INDUSTRIAL WASTE TREATMENT 8114 C (ii)

Unit I

Problem of Water Pollution : Effects of wastes on streams and sewage treatment plant. natural purification of stream. oxygen sag curve. allowable organic load on stream classification of stream , stream standards and effluent standards. requirement of water for different purposes.

Unit II

Measurement of Water Volume : Sampling of waste waters, grab and composite samples. analysis of waste water . biochemical oxygen demand. chemical oxygen demand and pH value of waste. toxicity of waste by bio-eassay method.

Unit III

Pretreatment of Wastes : Volume and strength reduction, salvage of materials, recovery of bye products , reuse of waste water.

Unit IV

Conventional Methods of Treatment of Waste Water : Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal. advance methods of treatment. such as reserve osmosis, ion exchange, electrodyalysis, algal harvesting etc. low cost treatment plants. common effluent treatment plant, design and operation.

Unit V

Combined Treatment of Waste Water Sewage : Energy requirement optimization and budget. municipal regulation. sewer rental charge instrumentation in waste water treatment plants, collection of data, operation and maintenance of plants, water pollution control board. Brief study of industrial processes and treatment methods of waste water from common industries, such as textile dairy, paper and pulp tannery, distillery.

Hazardous wastes - Impact handing and disposal.

Text Book :-

- 1.Waste Water Treatment for Pollution Control by Soli J.Arcieivala.

- 2.Environmental Engineering by G.N.Pandey and G.C.Carney.
- 3.Industrial Waste Water Source Control by Nancy Rilkmen and Clay Jones.
- 4.Pollution Control in process industries by S.P.Mahajan.
- 5.Environmental Industrial Pollution control by P.R.Trivedi and Gurdeep Raj.
- 6.Industrial Water Pollution Control by Eckenfelder .
- 7.Principles of Industrial Waste Treatment by C.Fred Gurnham.

ELECTIVE-IV

COMPUTATIONAL FLUID DYNAMICS (CFD) 8114 C (ii)

Unit I

Introduction and overview of CFD , need , solution accuracy, consistency, stability and its method of analysis, Lax –Equivalence theorem, typical practical problems and models.

Unit II

Mathematical models of fluid dynamics, Equations of motions, Compressible and Incompressible flows, inviscid flows, viscous laminar and turbulent flows, Navier-Stockes equations, Laplace & Poisson Equation.

Unit III

Computational techniques, finite difference methods, Explicit and Implicit formulations, Finite element methods, Weighted residual, finite Volume method , panel method.

Unit IV

Numerical Integration , Newton-cotes, Guass-Legendre quadrature, essential and necessary, Dirichlet Neumann, Newton boundary condition, coordinate transformations.

Unit V

Physical aspects of grid generation, element geometries, structured and unstructured mesh, mesh refinement, conformal mapping, algebraic grid generation, transfinite interpolation, Delaunay triangulation and voronoi diagram.

ELECTIVE - IV

PROJECT MANAGEMENT & OPERATION RESEARCH 8114 C (iii)

PROJECT MANAGEMENT

1. Role of construction sector in national development , need of effective management of construction projects. Case studies of cost and time overrun of projects. Factors causing project implementation variances and construction management success.

2. System approaches to management and organization theory, communications and human relations, management of human resources, management of motivation. the contrasting model of human motivation & behavior. Case studies of construction projects with personnel management problems.

3. Management of estimation, sanction, contracts, planning after award of contract. Safety programme and settlement of disputes of a construction project.

4. Management of project coordination, project control system, construction materials and equipment, productivity in construction and quality control. Marketing management for construction sector. Study of M.B.O. and M.B.E. and other studies of management.

OPERATION RESEARCH

5. Computer Applications/ CAD in construction industry, Management information system for construction project through PERT/CPM network analysis and computers.

6. Study of optimization techniques for decision making in construction, introduction to operation research, Operation research procedure, various types of models. Bays decision procedure for construction project management.

7. Sample Applications of Operation Research Techniques using following mathematical models; Assignment, allocation, transportation and programming model's (LP, NLP and dynamic) coordination models.

8. Inventory models, Waiting line models, gaining models competition models, replacement models, investment models and simulation techniques.

Text Book :-

1. Construction Engineering & Management by S.Sitaraman.

ELECTIVE-IV

ELEMENTS OF SOIL DYNAMICS AND MACHINE FOUNDATION 8114 C

Unit I

Importance of soildynamics, different types of dynamic loads, permissible dynamic, its relation with frequency.

Theory of Vibration : Free and forced vibrations - undamped and damped for single degree of freedom system. Harmonic and transient conditions. Mass Spring-Dashpot model and calculation of response magnification. Transmissibility of force.

Unit II

10

Determination of natural frequency of soil foundation system - empirical and semi-empirical methods. Dynamic Soils constants C_u , C_v , C_ϕ , C_ψ , G_r and D factors affecting determination and approximate values. Calculation of dynamic amplitude, Lysner's lumped parameter approach.

Unit III

10

Approaches to design of Machine Foundations, types and foundations for different types of machines , nature of dynamic forces produced by common machines, design criteria and permissible amplitudes.

Principles of design of machine foundations, one design of impact type of reciprocating of machine.

Unit IV

10

Effects of dynamic loads on bearing capacity and earth pressure and slope stability. Design of retaining wall subject to dynamic earth pressure or stability analysis under earthquake forces.

Unit V

10

Body and surface waves, Elastic theory Velocities of waves, its determination in laboratory, effects of Rayleigh surface wave on engineering structures.

Compaction of soils under dynamic loads, vibro-flotation , factors affecting and presentive measures.

Text Book :-

1. Soil Dynamics by Shamsheer Prakash.
2. Soil Dynamics by B.M.Das.
3. Handbook of M/c Foundation by Srinivasan & Vaidanathaln

ELECTIVE IV

ADVANCED STEEL DESIGN 8114 C (v)

Unit I

Plastic Analysis of simple and continuous girders for different loads and rolling loads. Theorems to calculate collapse loads and methods based on them. B.M.S. at collapse.

Unit II

Plastic analysis of portal frames and gable frames.

Unit III

Design of beams for strength, stability and serviceability criteria.

Unit IV

Design of portal frames and gable frames.

Unit V

Design of light gauge steel structures.

Text Book :-

1. Design of Steel Structures by P.Dayaratnam
2. Plastic Methods of Analysis by B.G.Neal
3. Design of Steel Structures by A.S.Arya & J.L.Ajamani
4. Design of Steel Structures by L.S.Beedle
5. Design of Steel Structures by B.C.Punamia

ELECTIVE IV

HIGHWAY CONSTRUCTION AND TESTING 8114 C (vii)

UNIT-I

Type of Highway constructions, Water bound macadam (WBM), wet mix macadam (WMM), dry lean concrete (DLC), stabilized roads, bituminous construction and cement concrete construction.

UNIT-II

Type of Bituminous constructions, Interface treatments, wearing courses for roads and bridge deck slabs, selection of wearing courses under different climatic and traffic conditions, construction techniques and gravity control.

UNIT-III

Highway materials, Aggregates, Binders, additives, and there suitability. Aggregates- Physical and strength characteristics, gravity requirements and proportioning, texture, polishing and skid resistance.

UNIT-IV

Bituminous binders- Classification, characteristics and application, road tars, rheological characteristics- adhesion and stripping, penetration index, viscosity, temperature susceptibility, modified binders.

UNIT-V

Bituminous Mixes- Design of bituminous mixes and methods of testing, Marshall method, concrete paving mixes- mix design methods, IRC method, Road note no. 4.

Books:

- 1.H.M.S.O.(London) , Bituminous materials in road construction.
- 2.Kerbs and Walker , Highway materials, McGraw hill book co.
- 3.H.M.S.O.(London). Concrete roads.
- 4.Khanna and Justo, Highway engineering. Nemchand brothers. Roorkee.

GEOTECHNICAL ENGINEERING LAB –II 8115 C**List of Experiments**

1. Consolidation test
2. Plate load test
3. Cyclic plate load test
4. Static cone penetration test
5. Standard cone penetration test
6. Block vibration test.

MAJOR PROJECT 8116 C

Each candidate shall work on an approved Civil Engg. Project and shall submit design and a set of drawings on the project.