SYLLABUS OF

THIRD YEAR (CIVIL)

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

(w.e.f. 2007-08)

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N STRUCTURE OF TEACHING AND EVALUATION

T.E. (Civil) w. e. f. 2007 - 08

FIRST TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	P R	O R
1	Structural Design & Drawing – I	4	-	4	4	100	50	-	25
2	Fluid Mechanics- –II	4	1	2	3	100	25	-	25
3	Geotechnical Engineering – I	4	-	2	3	100	25	-	25
4	Transportation Engineering – I	4	1	-	3	100	25	-	-
5	Numerical Methods in Civil Engineering	4	-	2	3	100	50	-	-
	Total	20	2	10		500	175	-	75
	Grand Total	32			750				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	P R	O R
01	Structural Design & Drawing – II	4	-	4	4	100	50	-	25
02	Theory of Structures – II	4	1	-	3	100	25	-	-
03	Geotechnical Engineering – II	4	-	2	3	100	25	-	-
04	Transportation Engineering – II	4	1	-	3	100	25	-	-
05	Environmental Engineering – I	4	-	2	3	100	25	-	25
06	Testing of Materials	-	-	2	-	-		-	25
07	Practical Training/Mini Project/Special Study	-	-	-	-	-	25	-	-
	Total	20	2	10		500	175	-	75
	Grand Total	32			750				

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N .
SYLLABUS OF THIRD YEAR (CIVIL)
TERM-IST (w.e.f. 2007-08)
STRUCTURAL DESIGN AND DRAWING-I

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 4 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(4 Hours Duration)
Term Work: 50 Marks
Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

A) Introduction to various design philosophies of R.C structures: working stress method, ultimate load method, limit state method , limit state of collapse, limit state of serviceability, limit state of durability, characteristic strength, characteristic load, partial safety factors for material strengths and loads. Study of structural properties of concrete.

B) Limit state method for flexure: (Singly Reinforced Rectangular Section) assumptions, stress & strain diagram, MR of Balanced, under reinforced & over reinforced RC sections.

C) MR of Doubly reinforced & flanged section

UNIT II **(12 Hours, 25 marks)**

Design of beams for flexure, shear and bond

A] for simply supported & cantilever beams.

B] for continuous beams using IS code coefficient method.

UNIT III **(12 Hours, 25 marks)**

A] Design of one way simply supported, cantilever & continuous slabs

B] Design of Two way simply supported & continuous slabs

C] Design of dog legged stair case.

UNIT IV **(12 Hours, 25 marks)**

A] Column: Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements, Design of short column for axial load.

B] Design of short column for axial load, uniaxial & biaxial bending.

C] Design of isolated pad footing for axial load & uniaxial bending.

TERM WORK:- shall consist of following

Design of G + 2 building covering slab, beam, column, footing & stair case.

A design report shall be prepared showing details on half imperial drawing sheets. A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.

A report on at least one site visit shall be submitted in term work.

BOOKS :

1) Limit State Analysis and Design : P. Dayaratnram – Wheeler Publishing company, Delhi.
2) Comprehensive Design of R.C. Structures : Punmia, Jain and Jain – Standard Book House –New Delhi.
3) Limit State Theory and Design : Dr.V.L.Shah and Dr.S.R. Karve – Pune Vidyarthi Publication.
4) RCC Analysis and Design Vol.II and I : Sinha – S.Chand and Co., New Delhi.

FLUID MECHANICS - II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 2 Hour/Week	(3 Hours Duration)
(Two lecture for unit tests)	Term Work: 25 Marks
	Oral --------: 25 Marks

UNIT-I **(10 Hours 20 marks)**

Boundary Layer Theory : Concept of boundary layer, various thickneses of boundary layer, application of momentum equation (no derivation), boundary layer over a flat plate, laminar and turbulent boundary layers, local and average drag coefficients, hydrodynamically smooth and rough boundaries, separation of boundary layer and control of separation.

Fluid Flow around submerged Bodies : Practical problems involving fluid flow around submerged objects, definitions and expressions of drag & lift, drag & lift coefficients, types of drag, drag on sphere, cylinder, airfoil. Karman's vortex street, Lift, Magnus effect , lift on cylinder and aerofoil, polar diagram.

UNIT-II **(9 Hours 20 marks)**

Turbulence Flow Theory : Turbulence phenomenon, instantaneous velocity & temporal mean velocity, scale & intensity of turbulence, Boussinwsqs theory , Reynold's expression , Prandtls mixing length theory, velocity distribution for smooth & rough boundaries, mean velocities in pipes, Karman Prandtls equation.

Darcy Weisbach equation, friction factors for smooth, rough & transition boundaries, Moodys diagram.

Turbulent flow through pipes, minor losses, pipes in series & parallel, three reservoir problem (no trial & error solution), siphon.

Unsteady flow through pipes : Celerity of pressure wave in an elastic pipe, water hammer phenomenon, pressure changes due to changes in valve opening – simple cases neglecting friction. Surge tanks – function, locations, types (no mathematical treatment for surge tank.)

UNIT-III **(9 Hours 20 marks)**

Definition & types of non-uniform flow, Gradually varies Flow (GVF) and rapidly varied flow (RVF), differential equation of GVF- alternate forms, different types of GVF profiles, their characteristics & examples of their occurrence, control sections.

Computation of GVF surface profiles by Direct step method, venture flume, standing wave flum.

Hydraulic Jump :

Phenomenon of hydraulic jump, example of occurrence, application of momentum equation to hydraulic jump in horizontal, frictionless, rectangular channel., specific force, conjugate depths & relation between conjugate depths, energy loss in hydraulic jump, length of jump, classification & practical uses of hydraulic jump.

UNIT-IV **(10 Hours 20 marks)**

Impact of Jet : Impact of jet on stationary & moving , flat & curved surfaces using linear momentum principle, workdone, principle of angular momentum , Eulers momentum equation for turbine & pumps (No derivation)

Hydraulic Turbine :

Elements of hydro elastic power plant, unit & specific quantities, hydraulic turbines, classification of hydraulic turbines, heads & efficiencies of hydraulic turbines.

Theory & design of hydraulic turbines (Pelton, Francis & Kaplan turbines), force and torque development, cavitation, governing of turbines, speed of turbines.

UNIT-V **(8 Hours 20 marks)**

Centrifugal Pumps :

General classification of pumps, classification of centrifugal pumps, specific speed, working of centrifugal pump, priming, theory of centrifugal pump, workdone by impeller, energy losses, heads & efficiencies, minimum starting speed, priming, cavitation, multistage turbine pump.

Model analysis of turbines & pumps. Prediction of performance in terms of unit & specific quantities, characteristic curves of turbine and pump.

PRACTICALS :

Any seven of following experiments should be performed.

1) Study of boundary layer on a flat plate.
2) Flow through pipes (laminar & turbulent) and determination of friction factor.
3) Drag and lift on airfoil.
4) Drag on cylinder.
5) Measurement of different parameters of hydraulic jump (model) in laboratory, OR Study of hydraulic flume. / jump on actual hydraulic structure on canals or dam near the college by arranging visit.
6) Venture flume / standing wave flume.
7) Velocity distribution in open channel .
8) Characteristics of Pelton wheel.
9) Characteristics of Francis turbine or Kaplan turbine.
10) Characteristics of centrifugal pump.

TERM WORK:

Termwork will consist of a journal giving details of at least seven out of 10 experiments above. Minimum seven experiments should be performed.

ORAL:

Oral shall be based on term work.

REFERECNE BOOK

1) Fluid Mechanics : Dr. A.K.Jain
2) Hydraulic and Fluid Mechanics : Dr. P.N.Modi , Dr. S.M. Seth.
3) Hydraulic and Fluid Mechanics : R.K.Bansal.
4) Flow in Open channels : Dr. K. Subramanya.
5) Theory and applications of Fluid Mechanics : Dr. K. Subramanya.
6) Fluid Mechanics : Dr.Grade and Mirakgaokar.
7) Fluid Mechanics : Streeter and Wylie.
8) Hydraulic Machines – Jagdish Lal
9) Hydraulic Machines – Rajpoot.

GEOTECHNICAL ENGINEERING – I

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks
Oral : 25 marks

UNIT I **(9 Hrs.,20 marks)**

a) soil as engineering material:- origin and formation of soil, geological processes, soils of India, geotechnical problems, three phase system, definitions and functional relationships.
b) Geotechnical properties:- physicochemical properties, engineering properties, volume weight relationships. Atterberg's limits, sieve analysis, identification of soil, I.S. classification system

UNIT II **(9 Hrs.,20 marks)**

a) Stresses in soil:-geostatics stresses, stresses due to surface loading, Boussinesq's westerguards theories, point load, area load and strip load, newmarks chart, stress strain relation ship soil modulus, elastic settlement.
b) Soil compaction, M.D.D. and O.M.C. , standard proctors test heavy compaction test, concept of stabilization , different methods of stabilization.

UNIT III **(10 Hrs.,20 marks)**

a) flow of water through soils: soil water, capillarity, Darcy's law laboratory measurement of permeability, flow through layered soils, simple field measurement, laplace equation, flow net, its construction and uses, seepage force, quick sand, critical gradient, reverse filters.
b) Consolidation Theory:- Terzaghi theory, consolidation test, time fitting curves, rate of settlements, Normal consolidated and over consolidated deposits, Pre consolidation pressure.

UNIT IV **(9 Hrs.,20 marks)**

a) shear resistance in soil:- pore pressure and effective stresses failure theories , Mohr - Coulomb's law of shear strength direct shear test, traxial test, unconfined compression test, vane shear test, drained loading , factors affecting the shear strength.

UNIT V **(9 Hrs.,20 marks)**

a) Earth pressures:- Rankine's state of plastic equilibrium at rest, active and passive states, effect of surcharge, wall friction, back fill behind smooth wall , Rankine's theory , Coulomb's theory determination of lateral earth pressure by analytical and graphical methods.(culmann's and poncelete's construction.)
b) Stability of slopes:- finite and infinite slopes , natural and man made slopes, modes of failure, slip circle method, swedish circle method, method of slices,critical height of slopes, stability number, landslides, Remedial measures.

TERM WORK:-

Term work shall comprise of any Ten experiments out of following set :

1) Field density by core cutter method , sand replacement method.
2) Sieve analysis and particle size determination or hydrometer analysis.
3) Specific gravity determination by voluminometer/ pychnometer
4) Determination of liquid limit and plastic limit
5) Determination of shrinkage limit
6) Determination of co-efficient of permeability by constant head or by variable head permeameter
7) Direct shear test

8) Unconfined compression test
9) Vane shear test
10) Proctor's test (MDD / OMC)
11) Tri- axial test
12) C.B.R. test or Consolidation test
13) Differential free swell test or swelling test.

REFERENCE BOOK:

1) Soil Mechanics and Foundation Engineering - V.N.S. Murthy.
2) GeoTechnical Engineering- Gulhati and Datta.
3) Basic and Applied Soil Mechanics- Gopal Ranjan, A.S.R.Rao
4) Modern Geotechnical Engineering & Foundation - Dr. Alam Singh
5) GeoTechnical Engineering – T.N. Ramamurthy and T.G.Sitharam.
6) Geotechnical Engineering - Garg
7) Geotechnical Engineering – C. Venkatramaiah.

TRANSPORTATION ENGINEERING - I

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorials: 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to railways as a Civil Engineering transportation system, permanent way components, Gauges on Indian railways, need of uniformity of gauge in view of problems of change of gauge, track structure and standards,rails requirments, stresses, wearing, stresses in ballast, coning of wheels, tilting of rails, fuctions, axle loads, defects, rail failure, causes of rail failure, sleepers, types, sleeper density, suitability of engineering materials for use as sleepers, manufacturing, testing and handling of concrete sleepers, rails joints, types, rail fastenings, welded rails, ballast, materials for ballast, requirements, specifications and design of ballast section, typical profiles of track and permanent way, cross sections in banking and filling.

UNIT-II **(9 Hours 20 marks)**

Track geometries ,gradients, types, alignments, curves ,superelevation , equilibrium cant ,cant deficiency, maximum permissible speed, negative superelevation

Horizontal transition and vally curves, Train resistance due to friction , wave action ,track irregularities, wind ,gradient curvature, compensated gradient for curve,resistances due to starting and accelerating,tractive efforts, types of traction, necessity and essentials of good trade management, creep effect and remedy, modern methods of track management, Engineering surveys, priliminary and detailed, information for preparation of project report ,land acquisition plate laying methods requirement of materials.

UNIT-III **(9 Hours 20 marks)**

Points and crossings , functions, constituents of turnouts, types of switches, terms used in crossings , standard turnouts, types of layouts, Diamond crossing , scissor crossing ,signals and interlocking , types of signals and principles of interlocking , CTC and ATC system , types , locations and layouts of stations , equipments for stations and yard platforms , loading gauges, locosheds, need of modernisation of railways, tracks for superhigh speed trains.

UNIT-IV **(9 Hours 20 marks)**

Tunnels, need, classification, choice of open cuts and tunnels, bridge action time and pressure relief, shapes and size, tunnel cross sections, shafts, types and constructions ,Pilot tunnel, tunnelling in rocks, heading and benching method, drilling, blasting, mucking ,ground support ,rock bolting and strata anchoring, lining, shotcreting, Tunnelling in soft stratra, problems encountered, methods of tunnelling, shield method of tunnelling, loads coming on tunnel crown, modern methods of tunnelling –TBM, bentonite slurry, safety measures about dust prevention, ventilation, lighting and drainage in tunnel.

UNIT-I **(9 Hours 20 marks)**

Importance of Docks and Harbours for inland water ways and sea routes, classification of harbours,ports and docks, types of harbours, site selection effectsof winds, waves and tides, littoral drifts, defects in harbours, breakwater , types, design. Construction,quay and quay walls, wharves, fenders, dolphins, piers, slips, moles, berths , pier heads, Jetties, Quay walls, Dock walls, Design criteria, wet docks , dry docks , Reel and bilge blocks, lock purpose and types.

Marine railways, Navigational aids, signals, buoys, light houses, ware house and Transit sheds.

TERM WORK:

1) It will consist of home assignments based on above syllabus and
2) Visit to a Railway station and study its layout..
3) A problem on calculation of loads on tunnel crown.

BOOKS RECOMMENDED

1) Railway Engineering –Rangwala
2) Railway Engineering - Oza
3) Railway Engineering – S.C. Saxena
4) Railway Engineering – Antia
5) Tunnel Engineering –Rangwala
6) Tunnel Engineering – S.C . Saxena
7) Tunnel Engineering – Oza
8) Docks & Harbour- Rangwala
9) Docks & Harbour -Oza

NUMERICAL METHODS APPLICATION IN CIVIL ENGINEERING

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks
Oral --------: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to Numerical Computation, Errors and approximation –storage, approximation, truncation, round off, absolute and percentage errors

Solution of simultaneous algebraic equation by Gauss Elimination method, Gauss Seidel method, Gauss Jordan method, partial pivoting, methods of iteration and its condition for convergence.

Solution of linear algebraic and transcendental equations by method of simple iteration, bisection, false position, Newton Raphson Method, Generalized Newton Raphson Method.

UNIT-II **(9 Hours 20 marks)**

Liner Programming–Structures, Assumptions, Advantages, Limitations, General Mathematical Model, Guidelines for formulations

Graphical Solution Method – Extreme point enumeration approach, Iso-profit(cost) function line approach, Maximization, Minimization and Mixed Constraints LP problem, Multiple Optimal solution.

Simplex Method – Standard Form of an LP problem, Reduction of Feasible solution to basic feasible solution, Simplex Algorithm for Maximization & Minimization Cases, Two phase method, Big-M method.

UNIT-III **(9 Hours 20 marks)**

Curve Fittings & Interpolation –

Linear Regression, Polynomial Regression, Multiple Linear Regression,

General Linear Least Squares,

Newton's divided difference interpolating polynomials,

Lagrange Interpolating polynomials,

Non-linear regression, Coefficient of interpolating polynomials.

Engineering Application of curve fitting.

UNIT-IV **(9 Hours 20 marks)**

Numerical Differentiation & Integration –

High accuracy differentiation formula – First Derivative & Second Derivatives, Richardson Extrapolation,

Trapezoidal rule, Simpson's one third and $3/8^{th}$ rule, Open Integration Formula, Multiple Integral,

Newton Cotes Algorithm,

Gaussian Quardature – Legendre Polynomials and Hermite Polynomials

UNIT-V **(9 Hours 20 marks)**

Solution of ordinary differential equation – Taylor's series method, Euler's method, Modified Euler's method, Runge Kutta method, Predictor Corrector Method.

Partial Differential Equation – Introduction to initial value and boundary value problem, Finite difference methods for the solution of one dimensional wave equation two dimensional (parabolic and elliptic) and higher order PDE.

TERM-WORK -

The term-work shall consist of computer programs along with the input and output file, flow chart/algorithm and numerical assignments from the list below –

COMPUTER PROGRAMS *– (Minimum five)*

(1) Gaussian Elimination Method / Gauss Jordon Method
(2) Method of Bisection / method of false position
(3) Newton Raphson Method / Method of Simple Iteration
(4) Method of Least Square / Newton Interpolation / Lagrange Interpolation
(5) Euler's Method / Modified Euler's Method / Runge Kutte Method

NUMERICAL ASSIGNMENT *– (Minimum three)*

(1) LPP – Graphical Method
(2) LPP – Simplex Method
(3) Curve Fitting
(4) Boundary Value Problem
(5) Simpson's One third/ Simpson's 3/8 rule
(6) Lagrange Formula / Gaussian quardature

BOOKS SUGGESTED –

1 –Steven C Chapra & Raymond P. Canale, "Numerical Methods for Engineers", Tata Mc-Graw HillCompany Limited, New Delhi, 2002

2 –Schilling & Harries, "Applied Numerical Methods for Engineers", THOMSON, Brooks/Cole, Newyork, 2000

3 –S.Rajasekaran, "Numerical Methods in Science & Engineering", A.H.Wheeler & Company Private Limited, 2000

4 –Sharma J.K., "Operation Research", MACMILLAN India Limited, 2003

5 –Jain, Iyenger & Jain, "Numerical Methods", New Age Publishing Company, New Delhi, 2004

6 –Sastry S.S., Introductory Methods of Numerical Analysis", Prentice Hall (India) Limited, New Delhi, 2000

7 –Kanti Swaroop & P.K.Gupta, "Operation Research", Sultan Chand & Sons, New Delhi, 1998

8 –S.S.Rao, "Optimization Theory and Application", Wiley Eastern Limited, 1999

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N .
SYLLABUS OF THIRD YEAR (CIVIL)
TERM-IIND (w.e.f. 2007-08)
STRUCTURAL DESIGN AND DRAWING-II

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 4 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(4 Hours Duration)
Term Work: 50 Marks
Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

A) Introduction to steel structure, steel grades, Rolled sections. Types of connections Strength of weld & Rivet Value. connections subjected to axial force.
B) Design of axially loaded tension members
C) Design of axially loaded compression members

UNIT II **(12 Hours, 25 marks)**

A) Design of built up columns. Design of lacing. Introduction to battened column.
B) Design of Roof Truss for DL, LL & WL (Excluding purlin design)

UNIT III **(12 Hours, 25 marks)**

A) Design of Laterally restrained and unrestrained simple beams. Design of purlin.
B) Design of Welded plate Girder including Curtailment of flang plate, stiffeners, splices & welded connections.

UNIT IV **(12 Hours, 25 marks)**

A) Design of Column bases: Slab base & Gussetted base.
B) Design of connections subjected to moments. Beam to beam & beam to column connection (framed connections)
C) Design of foot over bridge.

TERM WORK:- shall consist of following

1) Design of roof Truss
2) Design of an industrial building
3) Design of welded plate Girder.
3) A report on at least one site visit.

Drawing shall be on half imperial sheets. At least one sheet of above 3 designs shall be in A3 / A4 size sheets using drafting software.

BOOKS :

1) Design of Steel Structures –L.S. Negi
2) Design of Steel Structures –S. K. Duggal.
3) Design of Steel Structures – Dr.Ram Chandra
4) Design of Steel Structures – Arya and Ajmani.
5) Design of Steel Structures – Dr. B.C.Punmiya.

THEORY OF STRUCTURE II

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorial : 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(12 Hours 20 marks)**

A) Basic concepts of Structural Analysis:- Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, stress-strain relations, force-displacement relations. concept of linear /non-linear structures. Energy theorem, Miller Breslau principle, concept of complementary energy, Fundamental concept of Force and the Displacement method of analysis.

B) Analysis of beams and frame by energy methods, (up to two unknown)

C) Slope deflection method, applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown).

UNIT-II **(10 Hours 20 marks)**

A) Moment distribution method applied to continuous beams and rigid jointed rectangular frames, transnational and rotational yielding of supports.

B) Approximate analysis of multistory frames for vertical and lateral loads, substitute frame, portal frame and cantilever method.

UNIT-III **(10 Hours 20 marks)**

Fundamental concept of flexibility :- Method for structural analysis , flexibility coefficient, matrix formulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, temperature and lack of fit, hand solution of simple problems on beams, pin jointed plane truss and rigid jointed frames (involving not more than three unknown)

UNIT-IV **(8 Hours 20 marks)**

Fundamental concept of Stiffness:- Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, Degree of freedom.

Influence coefficients, physical significance, effect of settlement and rotation of trusses and rigid jointed plane frames (involving not more than three unknown)

UNIT-IV **(8 Hours 20 marks)**

Plastic Analysis of Steel Structures :- introduction, Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, application to continuous, fixed and single bay single storey rectangular frames.

TERM WORK :

It shall consist of assignments based on above syllabus.

REFERENCE BOOKS

1. Pandit & Gupta -Structural Analysis,TataMcGrawHill,Pub. Co.Ltd ., New Delhi
2. Wang C.K.-Intermediate structural analysis, McGraw Hill, New York.
3 Kinney- Streling J. Indeterminate structural Analysis, Addition Wesley.
1. Reddy C.S.-Basic Structural Analysis Tata McGraw Hill Pub. Co. New Delhi.
2. Norris C.H. Wilbur J.B. and Utkys.-Elementary Structural Analysis, 4/e, Tata McGraw Hill Pub. Co.Ltd.
3. Weaver W & Gere J.M-Matrix Method of framed Structures CBS Publishers & Distributors, Delhi.

4. Ghali A & Neville M. Structural Analysis- A Unified classical and matrix Approach ,Chapman and Hall, New York. .

TEXT BOOKS

1. Theory of Structure – Punmia B.C.
2. Theory of Structure – Ramamrutham
3. Theory of Structure Vol II– Gupta and Gupta

GEOTECHNICAL ENGINEERING – II

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorial : 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(10 Hours 20 marks)**

Soil Exploration, Sampling and Testing:- Subsurface exploration trail pits, shafts, boring, geophysical tests wash, boring, representative and undisturbed samples, bore hole sampling, laboratory evaluation of foundation parameters, field testing, penetration tests , plate load test, bore hole tests.

Bearing Capacity:- Load settlement curve, local and ganeral shear, terzaghi b.c. analysis, B.C. factors, mayorhoff and hansel equations, rectangular, square and round footings, effects of water table and depth, bearing capacity of layered soils, effect of eccentricity, B.C. of rocks.

UNIT-II **(9 Hours 20 marks)**

Elastic settlement :- Contact pressure, elastic stresses and strains, pressure bulb, elastic settlement, empirical relation for settlement of basses, total and differential settlement, tolerable settlement, I.S. criteria, effect of lowering water table.

UNIT-III **(9 Hours 20 marks)**

Shallow Foundations :- Spread footings, minimum depth plain and R>C>C> footings, allowable soil pressure, use of SPT blow count, I>S> charts, wall footings, column footings, combined footings, raft foundations, floating foundations, grillage foundations.

UNIT-IV **(9 Hours 20 marks)**

Pile Foundation:- purpose of piles, pile classification carrying capacity – static method, pile load test, dynamic methods, use of cone test ; group action felds rule, rigid block method ; negative skin friction, shearing of loads, settlement of group.

Foundation on black cooton soils:- characteristics of B.C. soil, problems, swelling potential, under-reamed piles, design principles and construction techniques.

UNIT-V **(10 Hours 20 marks)**

Piers and Caissions :- Hand excavated and drilled piers, method of installation, use of drilling mud, caissions and foundation walls open, box, pneumatic caissons, sinking method, sand island method, caisson disease, capacity and settlement of piers and caissons, well foundation.

Sheet piles and cofferdams:- temporary supports and braced sheetings for excavations, pressure distribution cofferdams bracked and cellular, cantilever and anchored sheet piles.

Machine Foundation : Mechanical vibrations, single degree freedom systems, free and forced vibrations, damped systems, natural frequency, resonance magnification, vibration parameters , vibration test, dynamic modules ,coefficient of elestic uniformcompression, block foundation design Balken method, isolation and control of vibration screen barriers.
Problems in foundation engineering .

Tutorial: It shall consists of following based upon above syllabus.:-

A) 1) Preparation of soil exploration, programming and testing report for any two of the following including bore logs.
   i) Multy storey building.
   ii) Dam.
   iii)Bridge.
   iv) Harbour.

2) Study of plate load test and presentation of test results.
3) Study of standard penetration test and presentation of result.
4) Study of pile load test and presentation of results.
5) Sketches of various types of sheet piles and coffer dams.
6) Sketches of various types of shallow foundations and deep foundations.

B) Home assignments based upon above syllabus.

BOOKS RECOMMENDED :-

1. Foundation Engineering - Punmia B.C.
2. Foundation Engineering - Kasmalkar
3. Basic and Applied Soil Mechanics- Gopal Ranjan, A.S.R.Rao
4. GeoTechnical Engineering- Gulhati and Datta.
5. Foundation Design – Wayne. C. Teng.

TRANSPORTATION ENGINEERING–II

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorials: 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(10 Hrs.,20 marks)**

a) Role of transportation in the development of nation, component of transportation. Principal of highway planning, road development and planning in India, highway financing, Introduction to privatization in transportation projects.
b) Highway alignment:- requirements, factors controlling highway alignment, engineering surveys for highway location, basic requirements for an ideal alignment, special requirement for hill roads.
c) various types of roads, method of construction, quantity of material required and quality control. (Embankment WBM, BM, DBM Layer constructions only)
d) Geometric design:- Cross section, element width, camber, design speed, sight distance, overtaking sight distance, super elevation, gradient, requirement and design of horizontal and vertical alignment.

UNIT-II **(10 Hrs.,20 marks)**

a) Traffic Engineering:- Traffic characteristics, vehicle characteristics, traffic studies and the use, traffic operation , traffic control devices, types of road intersection.
b) Behavior of highway materials:- Properties of sub grade and pavement components, materials, material interaction. Test on sub grade soil, aggregate and bitumen material, test on bitumen and aggregate , requirements of bitumen mixes, marshal tests, stabilized soil mixes.
c) Introduction of pavement design:- Factors in design of flexible and rigid pavement, group index and C.B.R. method, westergaurd analysis of wheel load stresses in rigid pavement I.R.C. recommendations.
d) Typical problems in highway:- Drainage surface and subsoil, pavement failure, evaluation, maintenance.

UNIT-III **(9 Hrs.,20 marks)**

Airport planning:- The important characteristics of airport which influence judicious and scientific planning of airport selection of site for airport important term.

a) Airport layout: - Location of terminal building, aprons and hangers, design criteria, characteristics of good layout for an airfield, zoning requirements regarding the permissible height of constructions and the land use within the airport boundary.
b) Aviation organization and their function, airport drainage surface , subsurface drainage. Airport authority of India's bylaws.
c) Runway and Taxiway:- Influence and wing characteristics on orientation of runways, use of wind rose diagrams basic patterns of runways, basic recommendation regarding length, width and gradients of runways and taxiways.
   Lighting, marking and signs:- approach, runway, taxiway lighting, runway taxiway marking, taxiway sign systems.
d) Heliports:- Main characteristics of Helicopters, nature of helicopters transport, site selection for helicopters. Typical layouts, protection of approach and departure paths, elevated heliports.

UNIT-IV **(9 Hrs.,20 marks)**

a) Classification of bridges, selection of site , determination of design discharge, linear waterway , economical span, location of piers and abutment, afflux, scour depth.

b) Standard specification for bridges:- I.R.C. bridge code, width of carriage way and clearance, loading, Indian railway bridge loading, forces acting on bridge structures, design consideration, aesthetics of bridge design.

UNIT-V **(9 Hrs.,20 marks)**

a) Various types of bridges, culverts slab, pipe and box type, R.C.C. bridge "T" beam, half hollow girder, balanced cantilever, continuous girder, rigid framed arch, bow string girder, prestressed concrete bridges, steel bridges, plate girder, box girder, truss, arch cable stayed, cantilever and suspension bridges, temporary and movable bridges, floating pontoons bridges.

b) Selection of a suitable type of bridge, types of bridge foundation, their choice and method of construction, bearing and their types, design consideration.
Introduction to different techniques of erection of bridge , super structure and bridge maintenance.

TERMWORK:-

T.W. shall be based on Assignment given in lecterns hours.

REFERENCE BOOKS:-

1. Highway Engineering by Justo Khanna.
2. Highway Engineering by Rangwala.
3. Highway Engineering and Airports by K.L. Bhanot & S.B. Sehgal.
4. Airport Engineering by Rangawala.
5. Airport Engineering by G.Venkatappa Rao.
6. Bridge Engineering by S.P.Bindra.
7. Bridge Engineering by S.Ponnuswamy.

ENVIRONMENTAL ENGINEERING - I

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks
Oral --------: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to Water Supply – Planning and necessity, brief description of different elements of water supply scheme

Water Demand – types, total requirement, per capita demand, factors affecting per capita demand, variations, effect of variation in different component of water supply scheme, design period,

Population – growth of population and forecasting method.

Sources of Water for WSS – Surface sources such as ponds and lakes, streams and rivers, storage reservoirs. Ground water sources such as infiltration galleries, infiltration wells and springs. Quality and quantities of water from different sources, Factors governing the selection of particular source for WSS.

UNIT-II **(9 Hours 20 marks)**

Intake structures – purpose, types such as canal intake, reservoir intake, river intake, intake tower etc, factors governing the location

Hydraulic Design of Intake well, Intake pipe, Jack well, pump house, open dug well (production well)

Pipes for conveyance of Water – (only different class of pipes, available sizes and suitability) AC pipes, MS pipes, CI/DI pipes, PVC pipes, GI pipes,

Stresses in pipes, Water Hammer Effect, Forces at Bends- Thrust Blocks

Hydraulic Design of Rising Main & Gravity Main,

Pipe Appurtenances (Purpose & Functioning) – Air Valves, Sluice Valves, Butterfly Valves, Pressure Relief Valves, Drain/Scour Valves

Pumps for WSS – Types of pumps in common use such as centrifugal, vertical turbine, submersible pumps, their suitability, Estimation of power of motor of pump, Economical diameter of pumping main

Reservoirs (Purpose, Location and Capacity)– Ground Service Reservoirs, Elevated Service Reservoirs, Master Balancing Reservoirs, Pressure Break Tank

UNIT-III **(9 Hours 20 marks)**

Quality of Water - Objectives of determination of quality, Pure water,

Physical Characteristics – Units of measurement, Reasons for their presence & Methods of determination of Colour, Taste and Odour, Turbidity (Turbidity Rod, Jakson Turbidity meter, Nephelometer), Specific Conductivity, Temperature

Chemical Characteristics – Units of measurement Reasons for their presence and determination of total solids, pH value, Hardness, Chloride Content, Nitrogen in its different forms, Alkalnity, Dissoloved Oxygen

Biological/Bacteriological/Microscopical Characteristics – Classification of Micro-organisms, Tests for Biological Characteristics of water (Total Count Test, E-Coli Test). E-Coli Test – (Presumptive Test, Confirmed Test and Completed Test) Determination of Coliform Index (E-coli index) and MPN index

Standard of water with respect to different characteristics as per norms of WHO and BIS

UNIT-IV **(9 Hours 20 marks)**

General Water Treatment of Surface Water – Objective of treatment of water, different elements of WTP for treatment of normal surface water.

Screening – Coarse and fine screens

Aeration Fountain – Types, Necessity and design

Plain Sedimentation – Theory of sedimentation (Laminar and Turbulent Settling of particles), Design Concept, Scouring of deposited particles, Different types of sedimentation tank, Inlet and outlet arrangements

Sedimentation aided with coagulation – Theory of coagulation & flocculant settling, Various types of coagulants and their suitability, Feeding Devices, Mixing Devices, Design of Flash Mixer, Flocculation tank & clarifier (Clariflocculator), Management of sludge in coagulation-sedimentation process

UNIT-V **(9 Hours 20 marks)**

Filtration – Theory of filtration – mechanical straining, flocculation and sedimentation in filter media, biological metabolism, electrolytic changes,

Filter Material – Types, characteristics and requirement of good filter material

Types of filters and their classification

Slow sand filters – Details of features, Operation and design criteria of Different elements of SSF (Tank, filter media, base material, inlet & outlet arrangements, Appurtenances. Efficiency & Performance of SSF

Rapid Sand Filters – Necessity, Details of features, Operation and design criteria of Different elements of RSF (Tank, filter media, base material, under drainage system, inlet & outlet arrangements, Appurtenances, Back wash arrangements). Operational Troubles in RSF, Efficiency & performance of RSF

Pressure Filters – Necessity, Details of Features and working, Efficiency and suitability, Advantages and Disadvantages

Disinfections – Purpose, Brief descriptions about Various Methods of disinfections (boiling, treatment with excess lime, ozone treatment, Iodine treatment, Treatment with potassium permanganate and silver treatment)

Chlorination – Disinfecting action, dosage, different forms of chlorination (Liquid chlorine, bleaching powder, chlorine di-oxide, chloramines, chlorine di-oxide), Types of Chlorination – Plain, Pre, Post, Double, Break point, Super Chlorination and Dechlorination. Importance of Chlorine residual and Testing.

TERM-WORK -

The term-work shall consist of minimum eight experiments and five assignments from the list below –

Experiments – (Any eight)

(1) Determination of pH
(2) Determination of Turbidity and optimum dose of alum
(3) Determination of Total Dissolved Solid
(4) Determination of different forms of alkalinity
(5) Determination of Total and mineral acidity
(6) Determination of Carbonate and Non-carbonate hardness in water
(7) Determination of Chlorine demand of water
(8) Determination of Dissolved Oxygen Content
(9) Determination of Fluoride Content
(10) MPN Test

Assignment – (Any five)

(1) Population Forecast of a town by three methods
(2) Design of Aeration Fountain

(3) Design of Flash Mixer
(4) Design of Clariflocculator
(5) Design of Slow Sand Filter
(6) Design of Rapid Sand Filter
(7) Visit Report of a Water Supply Scheme including WTP

BOOKS RECOMMENDED –

- Garg S.K., "Water Supply Engineering", Khanna Publisher, New Delhi
- Punamia, Jain & Jain, "Water Supply Engineering", Laxmi Publications, New Delhi
- Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
- Modi P.N., "Water Supply Engineering", Standard Publications, New Delhi
- Rangwala, "Water Supply and Sanitary Engineering", Charotar Publishing Company, Anand
- Raju, "Water Supply and Waste Water Engineering", Tata McGraw Hill Publishing Company, New Delhi
- Sincero & Sincero, "Environmental Engineering – A Design Approach", Prentice Hall International, New Delhi
- Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
- Benergee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
- Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

TESTING OF MATERIAL

Teaching Scheme:

Practical: 2 Hour/Week

Examination Scheme:

Term Work: 25 Marks

Oral --------: 25 Marks

List of Practicals to be conducted for Term work

1. Tension Test on metal.
   - Mild steel.
   - Tor steel
2. Hardness test on metal.
3. Impact Test on metal (Izod charpy Test)
4. Test on bricks.
   - Water absorption.
   - Compressive Strength.
5. Test on Tiles.
   - Abrasion and transverse test for floor tile.
6. Test on Timber.
   - Moisture content.
   - Bending.
7. Road Aggregates
   - Abrasion Test
   - Impact Test
8. Test on Bitumen.
   a. Penetration.
   b. Ductility.
   c. Softening point.
   d. Specific gravity.
   e. Flash and fire point.
   f. Viscosity test.
9. Bituminous mix design using Marshall stability test.

BOOKS RECOMMENDED.:-

Civil Engineering Materials by Janardhan Jha.
Civil Engineering Materials by Sushilkumar .
Civil Engineering Materials by Vazirani and Chandola.
Civil Engineering Materials by Rangwala.
Civil Engineering Materials by S.V. Deodhar.
Civil Engineering Materials by D.S. Arora.
Relevant BIS codes