(36)

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North Maharashtra University, Jalgaon

Syllabus for Third Year Engineering Degree Course in

CIVIL ENGINEERING

(w.e.f. July, 2000)

NORTH MAHARASHTRA UNIVERSITY JALGAON

THIRD YEAR B.E.-CIVIL ENGINEERING

W.E.F. ACADEMIC YEAR JULY, 2000

TERM-FIRST

SR. NO.	SUBJECT CODE	SUBJECT	TEACHING SCHEME		EXAM. SCHEME		
			Lectures	PR/TU	TH	TW	OR/PR
1	302001	Advanced Surveying	4	2	100	25	25
2	302002	Advanced Fluid Mechanics	4	2	100	25	25
3	302003	Design of Concrete Structures	4	4	100	25	25
4	302004	Irrigation Engg.	4	2 (alternate) week	100	25	--
5	302005	Transportation Engg.	4	1	100	25	--
		Total	20	10	500	125	75
		Grand Total		30			700

TERM-SECOND

SR. NO.	SUBJECT CODE	SUBJECT	TEACHING SCHEME		EXAM. SCHEME		
			Lectures	PR/TU	TH	TW	OR/PR
1	302006	Public Health Engg.	4	2	100	25	25
2	302007	Design of Steel Structures	4	4	100	25	25
3	302008	Engg. Geology	4	2	100	25	--
4	302009	Advanced Theory of Structures	4	1 (TUT)	100	--	--
5	302010	Foundation Engg.	4	2	100	25	25
6	302011	Practical Training special study	-	-	-	25	--
		Total	20	11	500	125	75
		Grand Total		31			700

Max. Total Marks of Term I and Term II = 1400

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. CIVIL ENGINEERING
(w.e.f. July, 2000)
FIRT TERM

302001: ADVANCED SURVEYING (Paper-1)

TEACHING SCHEME	EXAMINATION SCHEME
Lectures : 4 Hrs/week	Theory Paper : 100 Marks (3 Hours)
Practical : 2 Hrs/week	Term Work : 25 Marks
	Practical/[illegible] : 25 Marks

Unit 1 - Geodetic Surveying : Objects; methods in geodetic surveying, Triangulation figures; Strength of figure; classification of trangulation systems; Selection of stations; intervisibility and height of stations, towers, signals and their classification; phase of signals; measurement of angles; instruments used, methods of observation of angles; Satellite station and Reduction to Centre; Eccentricity of signals; Base line measurement, Apparatus used, Base net; equipment used for base line measurement, field work and corrections; Reduction to Mean Sea level; Extension of a base. (9 Hrs., 20 Marks)

Unit 2 - Triangulation Adjustments:- Kinds of errors; Laws of weights, Determination of the most probable values of quantities; The method of least squares; Indirect observations on independent quantities; normal equation; conditioned quantities, The probable error and its determination; Distribution of error to the field measurements, method of correlates, Station adjustment and figure adjustment; adjustment of a geodetic triangle, figure adjustment of a triangle; calculation of spherical triangle; Adjustment of Geodetic quadrilateral, Adjustment of a quadrilateral with a central station by method of least squares. (9 Hrs.,20 Marks)

Unit 3 - Trignometrical Levelling : Terrestrial refraction, orrection for curvature and refraction; Axis signal correction; Determination of difference in elevation by signal observation and by reciprocal observations.

Topographic Surveying : Objects; Distinguishing features, representation of relief; procedure of topographic surveying; fieldwork, horizontal and vertical control; methods of locating contours, location of details, dam survey.

City Surveying : Objects; Horizontal and vertical control; Equipment used, monuments; topographic map, property map, wall map, underground map, City property survey, location of details. (9 Hrs.,20 Marks)

Unit 4 - Photogrammetry : Objects; application to various fields, Terrestrial phogrammetry (only general idea) and Aerial photogrammetry; Aerial camera; comparison of map and vertical photograph; Vertical tilted and oblique phtographs; concept f principal point, nadir point, isocentre, horizon point and principal plane; Scale of vertical photograph; computation of length and height from the photograph; relief displacement on vertical photograph; flight planning; ground control; radial line method; Bionocular vision and stereoscopic fusion, mirror and lens. Stereoscopes, Parallax equation; measurement of parallax and determining difference of elevations, Stereometers; general idea of stereoscopic plotting instruments.

Remote Sensing : Basic principles; photo-interpretation, platforms, applications to Civil Engineering. (9 Hrs.,20 Marks)

Unit 5 - Hydrographic Surveying : Objects; establishing controls; shore line survey, river surveys; soundings; tide gauges, Equipment for taking soundings; signals. The nautical sextant; Measuring horizontal and vertical angles with the nautical sextant; sounding party; ranges making the soundings; methods of locating the soundings; reduction of sounding; the three point problem and methods of solution.

Tunnel Surveying : Instruments used; Laying of centre line on ground, Transfer of centre line, underground checks for deviation of tunnel driving from original centre.

Mine Surveying : Special conditions confronted; Equipment for mine surveys; Correction for side telescope horizontal angles and top telescope vertical angle; The stations and station makers; Measurement of distance and difference in elevation.

Use of Electronics in Surveys : Electromagnetic waves and their properties; Phase comparison; Modulation; Types of EDM instruments, the Geodemeter; the Tellurometer; the Distomat.

(9 Hrs.,20 Marks)

PRACTICAL EXERCISES

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1) One second Theodolite (Any two exercises) :
   i) Measurement of horizontal and vertical angles.
   ii) Measurement of horizontal angles by repetition and reiteration method.
   iii) Finding out the elevation of high object by trignometrical levelling.

2) Hydrographic Survey (Any two exercises) :
   i) Study and use of nautical sextant for measurement of angles.
   ii) Plotting the cross-section of the river by [illegible] method.
   iii) Solution of three point problem.

3) Photogrammetry (Any two exercises) :
   i) To find out the scale of the photograph.
   ii) Study and use of mirror stereoscope and finding out the Air base distance.
   iii) Radial line method of plotting (photo triangulation).
   iv) Use of parallax bar for measuring parallax of two points and finding out the difference of elevation between them.

4) Adjustment of Geodetic quadrilateral by any one method.

5) Study and use of E.D.M. and its principle.

Note : The practical examination will be based on the above exercises.

TERM WORK (25 marks)

The term work shall consists of the record of the above exercises in a journal.

BOOKS RECOMMENDED

1) Surveying and levelling (Vol-II) - T.P.Kanitkar, & S.V.Kulkarni
2) Surveying Vol.II and Vol.III - B.C.Punmia
3) Advanced Surveying - P.Somand, B.N.Ghosh
4) Surveying - Norman Thomas
5) Photogrammetry - Wolf
6) Surveying - Clarks

302002 : ADVANCED FLUID MECHANICS (Paper-2)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (3 Hours)
Practical	: 2 Hrs/week	Term Work	: 25 Marks
		Oral	: 25 Marks

Unit 1 - Boundary Layer Theory : Concept of boundary layer, various thicknesses 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, seperation of boundary layer and control of seperation.

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, flat plate, air foil, Karman's vortex street, Lift, Magnus effect, lift on cylinder and aerofoil, polar diagram.
(9 Hrs.,20 Marks)

Unit 2 - Turbulent Flow Theory : Turbulence phenomenon, instantaneous velocity & temporal mean velocity, scale & intensity of turbulence, Boussinesq's theory, Reynold's expression, Prandtl's mixing length theory, velocity distribution for smooth & rough boundaries, mean velocities in pipes, Karman- Prandtl's equation.

Darcy-Weisbach equation, friction factors for smooth, rough & transitin boundaries, Nikuradse's experiments on artifically roughned pipes, Moody's diagram.

Turbulent flow through pipes, minor losses, pipes in series & parallel, three reservoir problem, pipe network, 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 time of establishment of steady state condition of lw, surge tanks - functions, locations, types (no mathematical treatment).
(9 Hrs.,20 Marks)

Unit 3 - Non-uniform flow in open channels :

Definition & types of non-uniform flow, Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF), differential equation of GVF - alternate forms, different types of GVF profiles, their characteristics & examples of their occurence, control sections, canal transitions.

Computation of GVF surface profiles, Direct step method, Graphical Integration Method, Introduction to other methods like Standard step method, Direct Integration method, Ven Te Chow method, venturi flume & standing wave flume.

Hydraulic Jump :

Phenomenon of hydraulic jump, location & examples of occurence, application of momentum equation to hydraulic jump in rectangular channel, specific force, conjugate depths & relation between conjugate depths, energy loss in hydraulic jump, length of jump, classification & practical uses of hydrauic jump.
(9 Hrs.,20 Marks)

Unit 4 - Impact of Jet :

Impact of jet on stationary & moving flat & curved surfaces using linear momentum principle, workdone, principle of angular momentum, Euler's momentum equation for turbines & pumps.

Hydraulic Turbines :

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

Theory & design of hydraulic turbines, fluid mass subjected to uniform rotation & forced vorticies & centrifugal head, force & torque development, cavitation, governing of turbines, maximum size and selection of type & speed of turbines. (9 Hrs.,20 Marks)

Unit 5 - Centrifugal Pumps :

Types of pumps for different purposes such as self priming, submercibe, multistage, open impeller, axial flow, etc.

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 self priming, cavitation, multistage turbine pumps characteristics & model analysis of turbines & pumps.

Prediction of performance in terms of unit & specific quantities model analysis & characteristic curves.

Selection of pump for specific use such as lift irrigation scheme, sewage pumping, etc. (9 Hrs.,20 Marks)

PRACTICALS :

Following experiments shall be performed (any 5).

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

ORAL : It shall be based on Term work.

BOOKS RECOMMENDED

1) Fluid Mech. & Hyd. Machines - K.Subramanyam
2) Fluid Mech. & Hyd. Machines - Modi & Seth
3) Fluid Mech. & Hyd. Machines - R.K.Bansal
4) Flow in open channel - K.Subramanyam
5) FLuid Mechanics - Streeter & Wyhe
6) Fluid Mech. & Hyd. Machines - A.K.Jain
7) Hydraulics Machines - Jagdish Lal
8) Fluid Mechanics - Mirajgaonkar
9) Hydraulics Machines - Rajpoot

302003 : DESIGN OF CONCRETE STRUCTURES (Paper-3)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (4 Hours)
Practical/ Drawing	: 4 Hrs/week	Term Work	: 25 Marks
		Oral/Sketches	: 25 Marks

Unit 1 :

Introduction of working stress method and limit state method, characteristics value and partial safety factor for loads and materials strength, various limit states.
Limit state of Collapse for flexture, Design of shear reinforcement, Requirements of development length.Design of singly reinforced and doubly reinforced rectangular and flanged sections for flexture.
Design of simply supported, cantilever and continuous beams using I.S. code coefficients.
Design of beams subjected to torsion and bending. (12 Hrs.,25 Marks)

Unit 2 :

Design of slabs, one way, two way, simpy supported slab, continuous slab and cantilever slab, location of joints during construction.
Design of slabs with openings.
Design of sloping slab.
Design of staircase : Dog legged and Open well. (12 Hrs.,25 Marks)

Unit 3 :

Column and column footings subjected to axially compression and bending, Footings Isolated and Combined (rectangular and trapezoidal).
Design of Raft foundation. (12 Hrs.,25 Marks)

Unit 4 :

Design of retaining walls (cantilever and counter fort) for all type of possible loading conditions.
Analysis of multistorey frames, Substitue frame method, Approximate method of analysis for lateral loads, portal and cantilever methods.
Design of underground and ground water tank.
(12 Hrs.,25 Marks)

TERM WORK : It shall be based on syllabus given above and must contain -

1) Analysis, Design and Drawing of (G+3) storey framed structure (minium 2 x 3 bays) including joint details.
2) Study and use of one software for structural design of frame.
3) Assignment problems based on syllabus.

Note : Latest version of IS code should be adopted.

BOOKS RECOMMENDED

1) Reinforced Cement Concrete - Pillai & Menon
2) Limit State Design of Concrete Structures - A.K.Jain
3) Design of R.C. Structures - O.P.Jain & Jaikrishna
4) Reinforced Concrete Design - P.Dayaratnam
5) Reinforced Concrete Design - Shah and Karve
6) Reinforced Concrete Design - S.N.Sinha

302004 : IRRIGATION ENGINEERING (Paper- 4)

TEACHING SCHEME	EXAMINATION SCHEME
Lectures : 4 Hrs/week	Theory Paper : 100 Marks (3 Hours)
Practical/Drawing : 2 Hrs/ alternate week	Term work : 25 Marks

Unit 1 - Introduction to Hydrology : Hydrologic cycle and application of hydrology

Precipitation : Types of precipitation, measurement, analysis of precipitation data, mass rainfall curves, intensity duration curves, depth-area duration analysis, frequency analysis.
Elementary concept of evaporation and infiltration.
Effect of infiltration on runoff and rechange of groundwater, evapo-transpiration. (9 Hrs.,20 Marks)

Unit 2 - Steam Gauging : Selection of site, various methods of discharge measurements, Stage-discharge curve and its extension.
Run off : Factors affecting runoff, rainfall-runoff relationships, runoff hydrograph, unit hydrograph theory, S-curve hydrograph, synthetic unit hydrograph, use of unit hydrograph.
Floods : Estimation of peak flow, rational formula and other methods, Design floods. (9 Hrs.,20 Marks)

Unit 3 - Introduction to Irrigation : Definitions, functions and advantages, necessity and present status in India, Irrigation development in the five year plan.
Water requirement of crop : Soils classification, soil moisture and crop water relationship, factors governing consumptive use of water, principal Indian crops, their season and water requirement, agricultural practices, cropping pattern, calculations of canal capacities. (9 Hrs.,20 Marks)

Unit 4 - Ground water hydrology : Occurences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, yield of basins. Hydraulics of well under steady flow condition in confined and unconfined acquifiers, specific capacity a well, well irrigation : tube wells, open wells, their design and construction.

Water logging and drainage : Causes of water logging, preventive and curative measures, drainage of irrigated lands, reclamation of water logged, alkaline and saline lands, design and spacing of the tile-drain. (9 Hrs.,20 Marks)

Unit 5 - Reservoir Planning : Types of developments : Storage and diversion works. Purpose : Single and multipurposes reservoir, Investigation for locating a reservoir, Selection of site, estimation of required storage, mass curves, reservoir sedimentation, flood routing height of the dam, reservoir operation, economics of reservoir planning, Benefit-cost ratio, application of optimization techniques systems approach.

Lift Irrigation Schemes : Various components and their design principles.
Application of water, water management and distribution, warabandi, rotational application.
Assessment of Canal Revenue : Various methods.
Modern method of Irrigation : Drip, Sprinkler, etc.
(9 Hrs.,20 Marks)

TERM WORK : From each of the following groups minimum two assignments shall be performed.

Group 1 :

1) Marking catchment area on a toposheet and working out average annual rainfall and determining yield.
2) Checking for inconsistancy of precipitation record by double mass curve technique.
3) Frequency analysis of precipitation data (plotting on semilog graph paper).

Group 2 :

1) Development of. flood hydrograph from unit hydrograph and complex storm.
2) Development of unit hydrograph from isolated and composite flood hydrograph.
3) Development of unit hydrographs of different durations using S-curve method.

Group 3 :

1) Determination of canal and reservoir capacity for water requirement of crops.
2) Determination of reservoir capacity from mass inflow and mass demand curve.
3) Benefit cost analysis of water resources project.
4) Determination of yield of well by recuperatin test data.

Group 4 :

1) Design of drainage system in water logged area.
2) Design of micro-irrigation system; either sprinkler or drip irrigation system.
3) Design of lift-irrigation system.

BOOKS RECOMMENDED

1) Irrigation Engineering - K.R.Arora
2) Irrigation Engineering & Hydraulic Structures - S.K.Garg
3) Engineering Hydrology - Subrammnam
4) Irrigation Engineering & Water Power Engineering - B.C.Punmia
5) Irrigation Water Resources and Water Power Engineering - Dr.P.N.Modi
6) Hydrology - Raghunath
7) Ground Water - Raghunath
8) Applied Hydrology - Mutreja
9) Ground Water Hydrology - Todd
10) Irrigation Engineering & Practice - A.M.Micheal
11) Irrigation Engineering - Bharat Singh

302005 : TRANSPORTATION ENGINEERING (Paper-5)

TEACHING SCHEME	EXAMINATION SCHEME
Lectures : 4 Hrs/week	Theory Paper : 100 Marks (3 Hours)
Practical/ Tutorials : 1 Hrs/week	Term Work : 25 Marks

Unit 1 - 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 requirements, stresses, wearing, stresses in ballast, coning of wheels, tilting of rails, functions, 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.

(9 Hrs.,20 Marks)

Unit 2 - Track geometries, gradients, types, alignments, curves, superelevation, equilibrium cant, cant deficiency, maximum permissible speed, negative superelevation, horizontal transition and valley 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, preliminary and detailed, information for preparation of project report, land acquisition plate laying methods, requirement of materials.

(9 Hrs.,20 Marks)

Unit 3 - 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.

(9 Hrs.,20 Marks)

Unit 4 - Tunnels, need, classficiation, 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 strata, 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.

(9 Hrs.,20 Marks)

Unit 5 - Importance of Docks and Harbours for inland water ways and sea routes, classification of harbours, ports and docks, types of harburs, site selection, effects of winds, waves and tides, littoral driefts, defects in harbours, breakwater, types, design, conostruction, 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 purposes and types.
Marine railways, Navigational aids, signals, buoys, light houses, ware house and Transit sheds. (9 Hrs.,20 Marks)

TERM WORK :

1) It will consists 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

TERM-SECOND

302006 : PUBLIC HEALTH ENGINEERING (Paper-1)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (3 Hours)
Practical	: 2 Hrs/week	Term Work	: 25 Marks
		~~Practical~~ Oral	: 25 Marks

Unit 1 - Water Demand : Population forecast, Rate of water consumption for various purposes, factors affecting water consumption, fire demand, Design period for water supply scheme, IS specifications for minimum water requirement.

Sources of water, classfication, quality of various sources.

Quality of water and water testing, physical, chemical, baterio-logical quality of water, various tests for turbidity, chemical test, Hardness, Chloride content, Dissolved Oxygen, pH, Biological Oxygen Demand & Wt-Index, MPN, Nitrogen, etc.

Convevance of raw water - Intake structures, Intake pipe, pump house, rising main, different pipe materials, different valves on rising main. (9 Hrs.,20 Marks)

Unit 2 - Treatment of Water : Theory and design of treatment units, Plain sedimentation tanks, flash mixer, flocculator, clarifier (clarofloculator) tube settler, filter (slow sand, rapid sand and rapid gravity filter), Pressure filter, Disinfection, Theory of disinfection, efficiency of disinfectants.
Prechloronation, Post chlorination, super chlorination, chloride demand, residual chloride, free available residual and combined available residual, disinfection by using iodine, UV rays and ozone.

(9 Hrs.,20 Marks)

Unit 3 - Building Sanitation : Water pipe, raw water pipe, antisiphon pipe, waste pipe, drains.

Building sanitary fittings : Water closet, flushing cisterns, Sinks, Urinals, Traps, Nhani trap, Qully trap, P Q S trap, their functions, uses and locations.

System of Plumbing : Single stack system, one pipe system, two pipe system, choice, priniples governing design of building drainage, ayuot plan f building water supply and drainage system, Inspection chambers.

Sewage Flow : Sources of sewage, variations in sewage flow, storm water run off, ground water infiltrain. Design of sanitary sewers, minimum size of sewers, vel cities in sewers and gradients of sewers, Sewer materials. choice f materials, testing of sewer pipes, Manhles, street inlets, flushing devices. Pumping of sewage, pumping of sludge, Types of pumps.

(9 Hrs.,20 Marks)

Unit 4 - Characterstics of Waste Water : Physical, chemical and biological charcateristics, Waste waste analysis, interpretation and practical significance of test results, Important microorganisms in waste water and their importance in waste water treatment systems, aerobic and anaerobic cycles, bacterial growth, kinetics of biological growth.

Stream Sanitation : Self purification of natural streams, streams standards and effluent standards, oxygen Sag curve.

Waste Water Treatment : Necessity of treatment, process design.

Theory and design of primary treatment units :
Screens : Types of screens, design of screen chamber, screening, disposal screenings.
Grit Chamber : Sources of grit, velocity n grit chamber, design of grit chamber including proportional flow weir, disposal of grit.
Sources of oil and grease, importance of removal, design of equipments for removery oil and scum.
Primary Sedimentation Tank : Necessity, design of PST with inlet and outlet details, sludge and its removal, PST effluent characteristics. (10 Hrs.,20 Marks)

Unit 5 - Theory and Design of Aerobic Secondary Treatment Units
Oxidation Pond : Bacterial-algae symboisis, design of oxidation ponds as per attitude, disposal of pond effluent, advantages and disadvantages of oxidation ponds.
Aerated Lagoon : Principle, aeration method, design of A.L., advantages and disadvantages.
Trickling Filter : Biological principle, different T.F.media and their characteristics, Design of standard rate or high rate filters, single stage and two stage filters, recirculation, Ventilation, operational problems, control measures, Rotating Biological contractors.
Activated SLudge Process : Biological principle, cmparison of high rate, standard rate and extended aeration units. Design of standard rate and extended aeration units, Sludge volume index, Sludge buking and control.
Theory and Design of Anaerobic treatment Units :
Septic Tanks : Suitable conditions and siuations, biological principle, design of septic tanks, various methods of treatment and disposal of septic tanks, effluents (Soakpits, Soak-trenches, upflow filters and disinfection). Precautions to be taken in location soil absorption systems.
Anaerobic Degesters : Principle of anaerobic digestion, stages of digestion : Bio-gas production, its characteristics and application. Factors governing anaerobic digestion, Design of anaerobic digesters, SLudge disposal method advantages and disadvantages. (10 Hrs.,20 Marks)

TERM WORK : It shall be based on following practicals.

PRACTICALS :

1) Determination of various forms of alkalinity.
2) Determination of turbidity and optimum dose of alum.
3) Determination of chloride demand.
4) Determination of chloride, fluoride and sulphate.
5) M.P.N. Test.
6) Dissolved oxygen & BOD.
7) Determination of soilds-Total, suspendable, volatile, settable and non-settable.
8) COD.
9) Conductivity bridge and microscopic study of organism.
10) Design of pipe line (water supply and sanitary) for a domestic housing complex.
(Students should perform any 7 out of first 9 experiments and practical no.10 compulsory).

BOOKS RECOMMENDED

1) Public Health Engineering (Water Supply & Sanitary) - Hussain
2) Public Health Engineering (Water Supply & Sanitary) - Kshirsagar
3) Water Supply Engineering - S.K.Garg
4) Sanitary Engineering - S.K.Garg
5) Water Supply Engineering - B.C.Punmia
6) Sanitary Engineering - B.C.Punmia
7) Sanitary Engineering - Matkaff

302007 : DESIGN OF STEEL STRUCTRES (Paper- 2)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (4 Hours)
Practical/ Drawing	: 4 Hrs/week	Term Work	: 25 Marks
		Sketches /Oral	: 25 Marks

Unit 1 :

i) Rivetted and welded connections subjected to forces and moments, lug angles, beam to beam and beam to column connections, framed connections, unstiffened seat connections.
ii) ISI Notations of weld and weld connection and rivetted connections.
iii) Design of Tension members and compression members.
iv) Design of axially loaded columns , compund columns, lacing and battening. (11 Hrs., 25 marks)

Unit 2 :

i) Design of simple and built up beams (laterally restrained and unrestrained).
ii) Design of members subjected to the axial loads and bending moments.
iii) Design of column bases, Gusseted base, Grillage foundation subjected to bending. (11 Hrs., 25 marks)

Unit 3 :

Design of Rivetted and Welded Plate Girder, Components of Plate Girders, Stiffners, Splices, Design considerations, Tension flange, Compression flange, Curtailment of Cover Plate, Economic depth of Plate Girder, Connections of various components of plate girder.
Stiffners - Types and Design.
Splices - Web Splice, Flange angle splice, Flange plate splice.
Design of Gantry Girder. (12 Hrs.,25 marks)

Unit 4 : Design of Trusses (Roof trusses)

Components of a truss - chord and web member, Panels and Panel joints, Heel joint, Peak joint, Ties and Struts, Types of strusses, Dead load on roof trusses, Live load, Snow load, Wind load and wind loads, Pressures on roofs and walls, purlins, roof coverings, Design of roof trusses.
Structural steel tubes, permissible stresses for various grades of steel tubes, Tube connection and Design of tube trusses, Design of foot over bridge. (12 Hrs., 25 Marks)

Note : The design shall confirm to the latest version of IS : 800, IS : 875 and IS : 816.

TERM WORK : It shall consists of -

1) Design of single storeyed structure consisting of beams and columns and column bases and their connections. (Two imperial size sheets)
2) Design of Plate Girder including curtailment and splices (one imperial size sheet).
3) Design of any one type of truss (Prat truss, N truss etc.) (One imperial size sheet) including connection details.
4) Assignment based on above syllabus (Short problem).

BOOKS RECOMMENDED

1) Design of Steel Structure - S.K.Dugga1
2) Design of Steel Structure - Dayaratnam
3) Design of Steel Structure - Ramchandra
4) Design of Steel Structure - Punmia
5) Design of Steel Structure - Vazirani & Ratwant
6) Design of Steel Structure - Arya & Ajwani

302008 : ENGINEERING GEOLOGY (Paper-3)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (3 Hours)
Practical/	: 2 Hrs/week	Term Work	: 25 Marks

Unit 1 - Introduction : Objects, Scope and subdivisions.
Rock and minerals, rock forming minerals, primary and secondary minerals.
Igneous Rocks : Mineral composition, felsic and mafic minerals. Textures : reasons for textural variation, crystalline matter and glass; dependence of degree of crystallisation and shape and size of crystals on conditions of cooling. Conditions of cooling of plutonic, hypabyssal and volcanic rocks. Gas cavities and secondary infillings in volcanic rocks, Classification.
Study of common rock types prescribed in practical work.
Secondary Rocks : Rock weathering, decomposition and disintegration, favourable conditions, processes and products of decomposition and disintegration. Transport and deposition.
Classification : Residual, sedimentary, chemical and organic deposits.
Sedimentary deposits : Agents of transprt. Textural characteristics of aqueous, aeolian and glacial deposits, Clastic texture, Stratification and lamination, Current bedding, Consolidation by welding and cementation, Grain size classification, Study of common rocks prescribed in practical work.
Metamorphic Rocks : Agents and types of metamorphism, Metamorphic textures, Contact, cataclastic, dynamothermal and plutonic metamrphism, Study of common rocks prescribed in practical work.
(9 Hrs.,20 marks)

Unit 2 - Structural Geology : Outcrop, Dip and strike, Conformable series, Unconformity and overlap, Different types of faults and folds in rocks, Modes of occurence of igneous rocks, Joints.
Physical Geology : Geological action of running water, river valley deveopment, Waterfalls, ox-bow lakes, flood plain deposits, deltas. Rejuvenation and resulting features such as canyons, river terraces and incised meanders.
(9 Hrs.,20 marks)

Unit 3 - Groundwater : Meteoric, connate and juvenile water, Waterable and depth zones, Relation between surface relief and water table, Perched water table.
Influence of textures and structures of rocks on ground water storage nd movement, Pervious and impervious rocks, Geological cnditions favourable for natural springs and seepages, depression and contact springs, Hot springs and geysers. Wells and drillholes, Fluctuations in water table leveles, effects of dams and canals, effect of pumping, cone of depression, circle of influence, Conservation of ground water, Artesian wells, gelogicall conditions that produce artesian pressure, Water bearing capacity of common rocks.
Earthquakes, Geological considerations for choosing sites of buildings in sesmic areas.

Indian Geology : General principles f stratigraphy, Age of the earth and divisions of geological time, Physiographic divisions of India and their characteristics, Geological history of peninsula, Study of formations in peninsula and the significance of their structural charcaters in major civil engineering activities, economic minerals and building stones.
(9 Hrs., 20 marks)

Unit 4 - Preliminary Geological Investigation : Use of geoogical maps, Aerial photographs, Remotlely sensed imegeries, Verification of surface data by subsurface exploration, Drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts. etc. Compilation and interpretation of information obtained from these. Correlation of surface data with results of subsurface exporation. Limitations of driling, Comprative reliability of data obtained by driling and excavation.

Engineering significance of geological structures such as stratification, dips, folds, faults, joints, crush zones, faullt zones, dykes etc.

Land Slides : Causes, Use of Remotey sensed Imegeries for identification of land sides, Role of water, stablity of slopes in consolidated material, influlence of dip and sope, safe and unsafe slopes, Prevention of landslides, keeping slopes free from water, retaining walls, Vegetation, slope treatment. Precautions to be taken while aligning roads, etc. across hils and making cuts in hill sides. (9 Hrs.,20 marks)

Unit 5 - Tunnelling : Influence of geological conditions on design and construction methods. Preliminary geological investigation for tunnels. Important geological considerations while choosing alignment. Difficulties during tunnelling as related with lithology, nature and structures of material to be excavated. Role of groundwater, Geological conditions likely to be troublesome. Suitability of common rock types for tunnelling, Unlined tunnels.

Geology of Dam Sites : Dependence of strength, stability and water tightness of foundation rocks on their physical characters and geological structures, Infuence of geological conditions on the choice of type and design of dam, Precautions to be taken to counteract unsuitable conditions, treatment of leaky rocks, faults, dykes, crush zones, joints, unfavourable dips, etc. Earthquakes in regions of dams.

Geology of Reservoir Sites : Dependence of water tightness on physical properties and structures of rocks, Geological conditions suitable and unsuitable for reservoir sites, Precautions of amount of siltation in reservoir. Conditions likely to cause leakage through reservoir rim, Importance of ground water studies and effects of raising of the water table.

(9 Hrs.,20 marks)

TERM WORK : It shall be based upon following -

1) Study of the following minerals :

Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, iceland spar, gypsum, satinspar, fluorite, barytes, tourmaline, beryl, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite, azurite, malachite.

2) Study of the following rock types :
Granites, Syenites, Diorites, Gabbros, Rhyolites, Trachytes, Andesites, Basalts, Varieties of Deccan Trap rocks, Volcanic breccias, Pegmatites, Dolerites, Graphic granites.
Laterites, Bauxites, Conglomrates, Breccias, Sand stones, Quatzites, Grits, Arkose, Shales, Mudstone, Chemical and organic lime stone.
Marbles, Quartzites, Varieties of Gneisses, Slates, Phyllites and varieties of Schists.

3) Construction of gelogical sections from contoured geological maps, interpreting geological features without drawing section, solution of engineering geological problems such as alignment of dams, tunnels, roads, canals, etc. based on geological maps.

BOOKS RECOMMENDED

1) A Text Book of Engineering Geology - R.B.Gupte

2) Engineering Gelogy for Civil Engineers - D.V.Reddy

3) Groundwater Hydrology - David Tood

4) Environmental Geology Keller

5) Geology of Maharashtra - G.B.Deshpande
(GSI Publication)

302009 : ADVANCED THEORY OF STRUCTURES (Paper-47)

TEACHING SCHEME
Lectures : 4 Hrs/week

Tutorials : 1 Hr/week

EXAMINATION SCHEME
Theory Paper : 100 Marks (3 Hours)

Unit 1 - Basic concepts of Structural Analysis : Types of skeletal structures, static and kinematic indeterminancy, equilibrium and compatibility conditions, stress strain relations, force displacement relations, concept of linear/non- linear structures. Energy theorems - Castigliano's Theorems, Theorem of least work, Reciprocal Theorem, Miller Breslars principle, Concept of complementary energy.
Fundamental concepts of Force method and the Displacement method of analysis.
Analysis of various types of two hinged arches.
Analysis of Indetrminate trusses : i) Externally and ii) Internaly indeteminate.

(9 Hrs.,20 marks)

Unit 2 - Slope deflection method applied to continuous and rigid jointed regular frames, Transverse and rotational yielding of supports.
Moment distribution method applied to continuous beams and rigid jointed rectangular frames, Translational and rotational yielding of supports, Introduction to Kanies method.

(9 Hrs.,20 marks)

Unit 3 - Plastic Analysis of Steel Structures : Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, Application to continuous, fixed and single bay single storey rectangular frames.

(9 Hrs.,20 marks)

Unit 4 - 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 joited plane truss and rigid jointed frames (involving not more than three unknown).

(9 Hrs.,20 marks)

Unit 5 - 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 supports, Temperature and lack of fit, Hand solution of simple problems on beams, plane trusses and rigid jointed plane frames (involving not more than three unknown).

(9 Hrs.,20 marks)

BOOKS RECOMMENDED

1) Theory of Structures - C.S.Reddy
2) Theory of Structures - C.K.Wang
3) Theory of Structures - Punmia B.C.
4) Theory of Structures - Ramamrutham
5) Theory of Structures - Vazirani

302010 : FOUNDATION ENGINEERING (Paper-5)

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Theory Paper	: 100 Marks (3 Hours)
Practical/ Drawing	: 2 Hr/week	Term Work	: 25 Marks
		Oral	: 25 Marks

Unit 1 - Soil Exploroation, Sampling and Testing : Subsurface exploration trail pits, shafts, boring, geophisical 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 general 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. (9 Hrs.,20 marks)

Unit 2 - Consolidation Theory : Terzaghi theory, consolidation test relative consolidation, time fitting curves, rate of settlement, Normally consolidated and over consoloidated preconsolidation pressure, Consolidation test, 3D consolidation theory.
Elastic Settlement : Contact pressure, elastic stresses and strains, pressure bulb, elastic settlement, empirical relaltion for settement of bases, Total and differential settlement, tolerable settlement, I.S. Criteria, effect of lowering water table. (9 Hrs., 20 marks)

Unit 3 - Shallow Foundations : Spread footings, minimum deoth 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. (9 Hrs, 20 marks)

Unit 4 - 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 Cotton Soils, Characteristics of B.C.soil, problems, Swelling potential, under-reamed piles, design principles and construction techniques.
(9 Hrs., 20 marks)

Unit 5 - 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 braced and cellular, cantilever and anchored sheet piles.

Machine Foundation : Mechanical vibrations, single degree freedom system, free and forced vibrations, damped systems, natural frequency, resonance, magnification, vibration parameters, vibration test, dynamic modulus, coefficient of elastic uniform compression, Block foundation design Balkan method, isolation and control of vibration, screen and barriers.
Problems in foundation engineering. (10 Hrs., 20 marks)

TERM WORK : It shall consists of following :-

A)

1) Preparation of soil exploration, programming and testing report for any two of the following including bore logs.
   i) Multi 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 presenttion of results.

5) Sketches of various types of sheet piles and cofferdams.

6) Sketches of various types of shallow foundations and deep foundations.

B) Home assignements based upon above syllabus.

BOOKS RECOMMENDED

1) Foundation Engineering - Punmia B.C.

2) Foundation Engineering - V.N.S.Murthy

3) Foundation Engineering - Kasmalkar

4) Foundation Engineering - Peck Hensons & Thorn born

5) Foundation Design - Joseph Bowles

6) Foundation Design - W.C.Teng

7) Soil Mechanics & Fondation - Dr.Alam Singh

8) Foundation Design Manual - N.V.Naik

9) Foundation Design and Construction Practice - M.J.Tomlinson

10) Handbook of Machine Foundation - Shrinivasan & Vaidyanathan

11) Hand book of Foundation Engineering - Winterkorn & Fang

12) Foundation Engineering - G.F.Leanand

302011 : PRACTICAL TRAINING/SPECIAL STUDY (Paper- 6)

TEACHING SCHEME	EXAMINATION SCHEME Term Work : 25 Marks

Every student should complete any one of the following for the award of termwork marks :

1) Practical training at any Civil engineering construction site for a period of two weeks and submit a training report by competetnt authority not below the level of AE (SDO).

OR

2) Special study report on a recent topic from reported literature and submit a report on it during second term.

NOTE :-

Practical training is to be carried out in summer vacation after SE Second term examination and/or during mid termbreak between First and Second term of TE-Civil course.

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WS5/SPP/SYLL/TECIVIL/NM