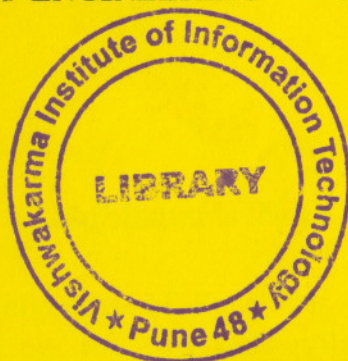


FACULTY OF ENGINEERING

No.

190



Revised Syllabus for the

T.E. (Civil Engineering)

(From 2005-2006)



UNIVERSITY OF PUNE

Price : Rs. 15/-

UNIVERSITY OF PUNE

Proposed Structure of T.E (Civil Engineering) 2003 course

Semester - I

Sub. Code No.	Subject Title	Teaching Scheme Hours per week			Examination Scheme				Total marks
		Lect.	Tut.	Pract/Drg	Paper	TW	Prac	Oral	
301001	Theory of Structures II	4	—	—	100	—	—	—	100
301002	Fluid Mechanics II	4	—	2	100	25	—	50	175
301003	Structural Design I	4	—	4	100	25	—	50	175
301004	Geotechnical Engineering	4	—	2	100	25	—	50	175
301005	Construction Tech. & Machinery	4	—	2	100	25	—	—	125
Total		20	—	10	500	100	—	150	750

T.E. (Civil Engg.) / 3

Semester - II

T.E. (Civil Engg.) / 4

Sub. Code No.	Subject Title	Teaching Scheme		Examination Scheme			Total marks		
		Hours per week							
		Lect.	Tut.	Pract/Drg	Paper	TW	Prac	Oral	
301006	Advanced Surveying	4	—	2	100	—	50	—	150
301007	Project Management & Computer Applications	4	—	2	100	25	—	—	125
301008	Structural Design II	4	—	2	100	25	—	50	175
301009	Environmental Engineering I	4	—	2	100	—	50	—	150
301010	Transportation Engineering I	4	—	—	100	—	—	—	100
301011	Seminar	—	—	2	—	50	—	—	50
Total		20	—	10	500	100	150		750

T.E. (Civil Engg.) / 5

PROPOSED SYLLABUS (2003 - Course)

301001 : THEORY OF STRUCTURES - II

Teaching Scheme : **Examination Scheme :**
Lectures : 4 Hrs./Week **Theory : 100 Marks**

UNIT I.

- Sway analysis of rigid jointed regular rectangular portal frames using slope-deflection method (Involving not more than three unknowns).
- Sway analysis of rigid jointed rectangular portal frames using moment distribution method. (Involving not more than three unknowns). Frames with inclined legs.

7 Hr.

UNIT II.

- Fundamental concepts of flexibility method of analysis. Formulation of flexibility matrix, Application to pin-jointed plane trusses, beams and rigid jointed rectangular plane frames. (system of not more than three unknowns).
- Fundamental concepts of stiffness methods of analysis. Formulation of stiffness matrix. Applications to simple problems of beams and rigid jointed rectangular plane frames. (system of not more than three unknowns)

9 Hr.

UNIT III.

- Approximate methods of analysis of multistoreyed, multibay 2-D rigid jointed frames. (i) Portal method (ii) Cantilever method
- Analysis of beams curved in plan.

7 Hr.*

UNIT IV.

- a) Theory of Elasticity: Concept of stress, stress components, concept of strain, strain components, strain displacement relations. Equations of equilibrium, Boundary conditions. Compatibility conditions. Generalized Hooke's law, Plane stress and plane strain problems, Airy's stress function. Strain rosette analysis.
- b). Elastic Stability Analysis: Axially loaded beam column with initial deformation. Experimental determination of Southwell plot. Derivation of beam-column differential equation Elastic stability

9 Hr.

UNIT V.

- a) Plastic analysis of steel structures: Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theorems, Applications to continuous beams, fixed beams, single bay single storeyed rectangular frames.
- b) Analysis of suspension cables subjected to Self weight and UDL.

8 Hr.

UNIT VI.

- a) Finite difference method - application to deflection problem of beams.
- b) Introduction to Finite Element Methods: Application to Truss and Beam elements.

8 Hr.

Reference Books :

1. Intermediate Structural Analysis: C. K. Wang. - Mcgraw Hill
2. Basic Structural Analysis: Wilbur And Norris
3. Numerical Methods: Krishna Raju.
4. Matrix Methods of Structural Analysis: Pundit-Gupta
5. Theory of elasticity: Timoshenko
6. Theory of elastic Stability: Timoshenko
7. Plastic Methods of Structural Analysis: Neal B. G. - Chapman and Hall
8. Higher engineering mathematics: Erwin Kreyzig
9. Finite Element Analysis: R. D. Cook
0. Finite Element Analysis: KrishnaMurthy

301002: FLUID MECHANICS - II

Teaching scheme : Examination scheme :
Lectures : 4 hrs./week Theory: 100 marks
Practicals : 2 hrs./week Term Work : 25 marks
Oral : 50 Marks

SECTION-I

UNIT-I

Fluid Flow around Submerged Objects :

Practical problems involving fluid flow around submerged objects, Definitions and expressions for drag, lift, drag coefficient, lift coefficient, types of drag. Drag on sphere, cylinder, flat plate and Aerofoil; Karman's vortex street, Effects of free surface and compressibility on drag; Development of lift, Lift on cylinder and Aerofoil, Magnus effect, Polar diagram.

Unsteady Flow :

Types of unsteady flow; Flow through openings under varying head, Fluid compressibility, Celerity of elastic pressure wave through fluid medium; Water hammer phenomenon; Rise of pressure due to water hammer-rigid water column and elastic water column theories; simple cases neglecting friction

Rapid acceleration of flow due to sudden opening of valve, time of establishment of steady state condition of flow-Surge tanks - their functions, location and classification, computation of maximum rise of surge and corresponding time of rise, without friction.

8 Hr.

UNIT-II

Impact of Jet :

Force exerted due to impact of jet on stationary and moving flat and curved surfaces using linear momentum principle. Work done by the forces in case of moving surfaces. Principle of angular momentum, Euler's momentum equation for turbines.

Centrifugal Pumps :

General classification of pumps, Centrifugal pumps, Classification of centrifugal pumps; Working of centrifugal pump-priming. Theory of centrifugal pumps; Centrifugal head impressed due to rotation, Work done by impeller, Heads and efficiencies, Minimum starting speed; Introduction to the design of Radial flow type centrifugal pump; Cavitation in centrifugal pumps.

Performance of centrifugal pumps : Prediction of performance in terms of specific quantities, Specific speed. Characteristic curves; Dimensional analysis and model analysis as applied to centrifugal pumps.

Introduction to reciprocating pump and submersible pump. Comparison of centrifugal pump with the other types of pumps. Selection of pumps.

8 Hr.

UNIT-III

Hydraulic Turbines :

Hydroelectric power generation : Elements of hydroelectric power plant; Hydraulic turbines; Heads and Efficiencies for hydraulic turbines; Classification

of hydraulic turbines, Design of modern hydraulic turbines like Pelton and Francis Turbines and Theory of Kaplan Turbine; Governing of turbines; Cavitation in hydraulic turbines, Introduction to mini and micro hydro power plants.

Performance of hydraulic turbines : Prediction of performance in terms of unit quantities and specific quantities : Specific speed; Selection of turbines based on specific speed; Characteristic curves, Dimensional analysis and Model Analysis as applied to hydraulic turbines; Turbine model testing. Francis, Kaplan and Pelton, Turbines.

8 Hr.

SECTION-II

UNIT-IV

Introduction to open channel flow:

Classification of channels, and Channel flows. Basic governing equations of Channel flow viz. continuity equation, Bernoulli's equation and momentum equation . One dimensional approach, Geometric elements of channel, Velocity distribution in open channel flow.

Uniform flow in open channels : Characteristics and establishment of uniform flow, uniform flow formulae : Chezy's and Manning's formulae; Factors affecting Manning's roughness coefficient; Important terms pertaining to uniform flow, viz. normal depth, conveyance, section factor, hydraulic exponent, Uniform flow computations. Most efficient channel section.

7 Hr.

UNIT-V

Depth-Energy Relationships in Open Channel Flow :

Specific energy of channel flow, Specific energy diagram; Depth-discharge diagram. Critical depth, Conditions for occurrence of critical flow; Froude's number and channel flow classification based on it. Important terms pertaining to critical flow viz. section factor, hydraulic exponent; Critical flow computations; Application of specific energy and critical flow theory to channel transitions.

Specific force : Specific force diagram, depth discharge diagram with respect to specific force; Conditions for occurrence of critical flow with respect to specific force theory.

Hydraulic Jump:

Phenomenon of hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel : Conjugate depths and relations between conjugate depths. Energy dissipation in hydraulic jump; Graphical method of determination of energy dissipation; Various terms related to hydraulic jump; Classification of hydraulic jump; Practical uses of hydraulic jump.

9 Hr.

UNIT-VI

Gradually Varied Flow in Open Channels :

Definition and types of non-uniform flow; Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF; Differential equation of GVF - Alternative forms; Classification of channel bed slopes; Zones of GVF. profiles; Various GVF profiles, their general characteristics and examples of their occurrence; Control section; GVF profiles in composite channels.

Gradually varied flow computations:

Objectives of GVF computations; Methods of GVF computations. Direct Step method, Graphical Integration method; Introduction to advanced methods viz. Standard Step method and Direct Integration method, Ven Te Chow method.

Devices for measurement of velocity and discharge for open channel flow i.e. Current meter, Floats, Venturi flume, Standing wave flume, Stream gauging.

8 Hr.

LIST OF PRACTICALS

Following experiments and assignments based on the above syllabus shall be performed.

(A) Experiments (Any Eight).

1. Flow around a Circular Cylinder.
2. Flow around an Aerofoil.
3. Impact of Jet on flat/curved surface.

4. Characteristics of a Hydraulic Turbine.
5. Characteristics of a Centrifugal Pump.
6. Study of Uniform Flow Formulae of Open channel.
7. Velocity Distribution in Open Channel Flow.
8. Calibration of Standing Wave Flume / Venturi / Parshal flume.
9. Study of Hydraulic Jump as Energy Dissipater.

(B) Assignments (all compulsory) :

- (a) Study of Specific Energy Diagram/Specific Force Diagram.
- (b) Characteristics of various GVF Profiles and computer program on G V F.
- (c) Design of Hydraulic Turbine/Centrifugal Pump.

(C) Compulsory site visit to Hydropower generation plant.

TERM WORK

Term work will consist of a journal giving the detailed report on experiments and assignments performed and visit report.

ORAL EXAMINATION

Oral Examination shall be based on the above term work.

Text Books :

1. Hydraulics and Fluid Mechanics P.N.Modi &S.N.Seth
Standard book house
2. Fluid Mechanics : Streeter and Wylie - Tata McGraw
Hill.

Reference Books :

1. Open Channel Hydraulics : Ven te Chow - Tata
McGraw Hill.
2. Fluid Mechanics ; B F White.
3. Open Channel Flow : K. Subramanya - Tata McGraw
Hill.
4. Open Channel Flow : K. G. Ranga Raju - Tata McGraw
Hill.
5. Engineering Fluid Mechanics ; Garde - Mirajgaonkar,
Nemchand & Bros.

301003 : STRUCTURAL DESIGN - I

Teaching Scheme : **Examination Scheme :**
Lectures : 4 Hrs./Week Theory: 100 Marks
Practical : 4 Hrs./Week Term Work : 25 Marks
Oral : 50 Marks

UNIT I.

- a) Introduction to steel structures and fasteners: Steel as
a structural material, various grades of structural steel,
properties, various rolled steel sections (including cold
formed sections, structural pipe (tube) sections) and
their properties, life cycle cost of Steel Structures.
Introduction to IS. 800, 801, 808, 811, 816, 875, etc.
Behavior of bolted and welded connections (types,
designations, properties, permissible stresses) failure
of bolted and welded joints. Strength of bolt and
strength of weld. Efficiency of joints. Design of simple
bolted and welded connections. Moment resistant
bolted and welded connections, (bending and torsion).
Design of connections: Beam to beam, beam to column
: framed connections.
- b). Design of axially loaded simple members: (a) Tension
members (b) Compression members.

12 Hrs.

UNIT II.

- a). Design of simple and built-up beams: Laterally
restrained and unrestrained, (symmetrical as well as
unsymmetrical sections). Curtailment of flange plates.
- b). Design of welded plate girder and Design of gantry
girder.

12 Hrs.

UNIT III.

- Design of roof truss: Load assessment for DL, LL and WL.
- Design of foot over bridge.
- Introduction to plate less joints in roof trusses (Problems not expected).

12 Hrs.

UNIT IV.

- Design of axially loaded single rolled steel section and built up columns, Laced and battened, Column bases - slab base gusseted base, moment resistant bases.
- Cold form light gauge steel structures: Design of compression members only.

12 Hrs.

Reference Books :

- Arya and Ajmani : Steel Structures - Chand and Brothers -New Delhi.
- Punmia, Jain and Jain : Comprehensive Design of Steel Structures - Standard Book House.
- M. Raghupati : Steel Structures - Tata McGraw Hill
- P. Dayaratnam : Steel Structures - Wheeler Publishing.
- Ramchandra, Vol. I and II : Design of Steel Structures -Standard Book House - "New Delhi.

TERM WORK

- 10 nos. A4 size sheets showing detailing based on whole syllabus

- Based on following topics

- Design of complete industrial building including purlins, roof trusses, Gantry Girder all types of bracing, (2 Nos. of full imperial sheet).
- Residential / Industrial building: secondary beams, main beams, columns, bases, etc. (1 No. of full imperial sheet).
- Design of welded plate girder or Foot-over Bridge.
- Design of a column using cold form light gauge section : (1 No. of full imperial sheet).

- Two site visits: Report shall be prepared mentioning structural details with sketches.

Note :

- Oral Examination shall be based on the above term work.
- From 'B' above, project first is compulsory while out of 2, 3 and 4 any one project shall be taken.

301004 : GEOTECHNICAL ENGINEERING

Teaching Scheme :	Examination Scheme :
Lectures : 4 Hrs./week	Theory : 100 marks
Practical : 2 Hrs./week	TW : 25 marks
	Oral : 50 marks

SECTION-I

UNIT-1

- 1. Properties of Soil** - Introduction to Soil Mechanics, major soil deposits of India such as marine deposits, black cotton soils lateritic soils, alluvial deposits and desert soils. Three phase soil system, particle size and shape, weight volume relationships, index properties of soil - methods of determination and its significance, I.S. classification of soil, unified classification of soils, plasticity chart, field identification of soils. Soil structures and clay mineral-clay minerals, clay water relation, clay particle interaction.

(9 hrs.)

UNIT-2

- 2. Permeability and Seepage** - Capillary water, Darcy's law, Factors affecting permeability, Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS - 5529 (part I)-pumping in test and pumping out test, permeability of layered soils. Seepage forces. General flow equation (Laplace equation), Flownet construction and applications, Anisotropic soil conditions, quick sand condition.

(7 hrs.)

UNIT-3

- 3. Compaction** - Soil compaction phenomena, factor affecting compaction, dry density and moisture content relationship, zero air voids line. Effect of compaction on soil structure, standard Proctor test and modified Proctor test as per IS - 2720, compaction of sand. Field compaction equipment's and methods, placement water content, field control of compaction.

(3 hrs.)

- 4. Stress Distribution in Soils** - Principle of effective stress, physical meaning of effective stress. Elastic properties of soil, Boussinesq theory- point load, line load, strip load, pressure distribution diagram on a horizontal and vertical plane, pressure bulb, Westerguard's theory, equivalent point load method, Newmark chart, contact pressure, approximate stress distribution method.

(5 hrs.)

SECTION-II

UNIT-4

- 5. Shear Strength of Soil** - Stress strain curve, stress at a point-Mohr circle of stress, Mohr-coloumb failure criteria, pore pressure, total and effective stress, Peak and residual shear strength, factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined, triaxial, different drainage condition and vane shear test, Sensitivity and thixotropy of cohesive soils and liquefaction.

(9 hrs.)

UNIT-5

6. Lateral Earth Pressure - Limit analysis and limit equilibrium methods, effect of wall moment on earth pressure, earth pressure at rest, Rankin State of plastic equilibrium, submerged backfill, backfill with uniform surcharge, backfill with sloping surface, layered backfill, Coulomb's theory, Poncelet's and Culmann's graphical method of determination of earth pressure-inclined back of wall.

(5 hrs.)

Stability of slopes- slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil, Taylor's stability numbers, Land slides.

(3 hrs.)

UNIT-6

7. Introduction to Rock Mechanics - Index properties of Rock - Porosity, Density, Permeability and strength, slacking and durability, sonic velocity. Classification of rocks-Goodman (1980) geological classification. Insitu tests of stresses-vertical stress, horizontal stress and effective stress in rock masses, measurements of insitu stresses. Mechanical properties of rock-modes of failure of rocks, behavior of rocks in uniaxial compression, tensile strength of rocks, behavior of rocks in Triaxial compression, failure theory applicable to rock, shear strength of rocks. Elastic of rocks and hardness of rocks.

(7 hrs.)

TERM WORK

- D) A report of the experimental work covering syllabus. Experiment to be conducted are as given below: -
 1. Specific gravity determination by voluminometer / pycnometer / density bottle.
 2. Sieve analysis, particle size determination and I. S. classification
 3. Determination of consistency limits and its use in soil classification.
 4. Field density test by core cutter, sand replacement and clod method
 5. Determination of co-efficient of permeability by constant head and by variable head method.
 6. Direct shear test
 7. Unconfined compression test.
 8. Vane shear test.
 9. Standard proctor test/ Modified proctor test.
 10. California Bearing Ratio test.

In addition to above ten experiments it is required to conduct at least two of the following experiments.

- Triaxial test.
- Swelling pressure test
- Hydrometer / pipette method.
- Differential free swell test

II) Assignments :

Part- A : Sampling- collections and storage of soil samples.

Minimum one of assignments from part-B and part - C should be completed and a report submitted.

Part- B: Assignment on software use -

1. Classification of soils
2. Construction of pressure bulb
3. Graphical presentation of lateral pressure

Part -C:-

1. Poncelet's and Culmann's graphical method for determination of earth pressure.
2. Newmark's chart.
3. Solution of problems on shear strength parameters using graph paper.

TEXT BOOKS

1. Soil Mechanics and Foundation Engineering- V. N. S. Murthy
2. Geotechnical Engineering - P Purushothma Raj

REFERENCE BOOKS

1. Soil Mechanics and Foundation Engineering - S.K.Garg
2. Basic and applied soil mechanics - Gopal Ranjan and A S Rao
3. Geotechnical Engineering Principle and practice- Donald P Coduto, PHI.
4. Engineering Properties Of Soils And Their Measurements- Joseph E Bowles.

SYLLABUS**301005 : CONSTRUCTION TECHNIQUES AND MACHINERY (2003-course)**

Teaching scheme : Examination scheme :

Lectures : 4 Hrs/week Theory : 100 marks, Duration 3 Hrs

Practicals : 2 Hrs/Week Term Work : 25 marks

Unit 1 : Introduction :

Role of construction activity in the National and Global developments, Constructions-labour oriented-equipment oriented-Time, cost, quality, safety parameters-Necessity of Mechanization in Construction industry, types of constructions such as light, medium and heavy duty.

- (a) High Rise structures and their construction techniques : Types, Labour movement, Material conveyance. Erection methods using hoists and cranes, construction difficulties. Demolition techniques.
- (b) Use of precast/prefabricated Elements such as columns beams, slab panels, wall panels, door frames. Use of insitu Construction in foundations. Production techniques, quality control for prefab elements. Autoclave curing. Specialty and precaution at joints. Considerations such as strength, economy, making lightweight, thermal, acoustic and fire insulation in construction.

Unit 2 : Concreting methods

Under water concreting - dredging techniques, use of barges, dewatering systems, pumps, colcreting, concrete pumps, boom placers, slip form technique, jump form technique, tunnel form work. RMC Plant, Transit mixer, concrete pump

Unit 3 : Miscellaneous Techniques:

Guniting. Industrial constructions involving steel structures. Industrial flooring. Production of Crushed sand and crushed aggregates. Pneumatic-drilling equipment, crushers, TBM, Pipe laying method, pneumatic equipment, Air compressor.

Unit 4 : Earth moving Equipment :

Power Shovels, Back Hoe, Drag-line, JCB-Excavator, Loaders Dozer, Scrapers, Use of Trucks, tractor and Dumpers, Work cycle. Hydraulically operated rock breakers, trenching machinery, factors affecting selection, work cycle, out put estimation for operation.

Unit 5 : Road construction Techniques:

Asphalt road- types of asphalt, asphalt mix production and placement, asphalt paver hot mix plant, cold mix plant, dry lean concrete, pavement quality concrete, slip form paver, paving equipment.

Unit 6 : Economic, maintenance and repair of construction Equipments:

Depreciation, equipment working rates, investment cost, repair cost, depreciation cost, cost of fuel and lubricants, cost of labour, overheads, problems based on it, preventive maintenance, record keeping, economic life, economic replacement calculation.

LIST OF PRACTICALS

1. Collection of Pamphlets and information regarding various construction equipment. Information pertaining to the following aspects should be collected.
 - (a) Types, different makes of equipment,
 - (b) Cost, useful life, Area of use,
 - (c) Equipment performance data.

A report on comparative statement should be submitted.

2. Should include visit to construction sites covering minimum two different topics of the above syllabus and preparation of reports with necessary drawings, sketches and photographs.
3. Student should study repetitive civil engineering operation and workout cycle time and cost of production for any two equipments.

Note : Videocassette slides illustrating use of equipment and techniques (should be arranged by the institution).

Reference Books :

1. Earth moving Equipments : Brinton crison.
2. Moving the earth : Nicolas.
3. Management of Construction Equipments : Frank Harris and Ronal MC. Caffer. (Macmillan Publications).
4. Construction Planning Methods Equipment : Peurifoy - Tata McGraw Hill.
5. Construction Equipment Planning and Applications : Dr. Mahesh Verma.

301006 : ADVANCED SURVEYING

Teaching scheme : Examination scheme :
Lectures : 4 Hrs/week Theory : 100 Marks
Practical : 2 Hrs/week Practical : 50 Marks.

SECTION-I

UNIT-I

Geodetic Surveying :

Objects Methods in Geodetic surveying, Trilateration. Classification of Triangulation Systems, Triangulation Figures, Concept of well conditioned triangle and Strength of figure. Selection of stations, Intervisibility and height of stations, Towers, signals and their classifications, Phase of signals and phase correction, Satellite station and reduction to centre. Concept of base line and reduction to mean sea level.

UNIT-II

Triangulation Adjustment:

Kinds of errors, Laws of weights, Determination of most probable values (M.P.V.) of conditioned and independent quantities, Method of Least Squares, Indirect observations, Probable error and its determination, Distribution of error to the field measurements, Normal Equation, Method of correlates, Station and figure adjustment of Geodetic Quadrilateral without central station, Spherical triangle, Calculations of spherical excess and sides of spherical triangle.

UNIT-III

Trigonometrical Levelling :

Terrestrial refraction, Angular Corrections for curvature and refraction, Axis Signal Correction, Determination of Difference in Elevation by single observation and reciprocal observations.

SECTION-II

UNIT-IV

Aerial Photogrammetry :

Objects, Applications, Aerial camera, Comparison of map and aerial photograph, Vertical, tilted and oblique photographs, Scale of vertical photograph, Relief displacement on vertical photograph, Computation of length and height from the photograph, Mirror stereoscope and parallax equation, Measurement of parallax, parallax bar and determining the differential elevation, Flight planning, Ground Control, Radial Line method.

UNIT-V

Modern Surveying Instruments and Techniques :

Principle, construction, working and classification of Electromagnetic Distance Meters (E.D.M.), Electronic Digital Theodolite (EDT) and Global Positioning System(GPS). Electronic Total Station (ETS) and its uses, Application of laser levels and pipeline laser. Introduction to Geographic Information System (GIS)

Remote Sensing : Basic principles, Electromagnetic Spectrum, Classification of remote sensing systems, Platforms for remote sensing, Different types of data products, Applications to Civil Engineering.

UNIT-VI

Hydrographic Surveying :

Objects, Establishing controls, Shore line survey, Soundings, Equipments for measuring soundings and methods of locating soundings, Reduction of soundings, Plotting of soundings, Nautical sextant and its use, Three point problem and its solution by all methods. Tides and Tidegauges.

LIST OF PRACTICALS**(I) Geodetic Surveying and Trigonometrical Levelling: (All Three)**

1. Study and use of Optomechanical or Electronic Digital one second theodolite.
2. Measurement of horizontal and vertical angles with one second theodolite.
3. Finding out elevation of high object by Trigonometrical Levelling.

(II) Hydrographic Survey: (Any Two)

1. Study and use of nautical sextant and measurement of angles.
2. Solution of three point problem by Analytical and any one graphical method.
3. Plotting of river cross section by hydrographic surveying.

(III) Photogrammetry: (Any Two)

1. Study of Aerial photograph and finding out the scale of the photograph.

2. Study and use of Mirror Stereoscope and finding out Air Base Distance.
3. Study of parallax bar and finding out the difference of elevation from differential parallax.
4. Radial Line method of plotting (Photo Triangulation)-Transferring photo details on map.

(IV) Modern Surveying Instrument And Techniques: (Any Two)

1. Study and use of EDM/ EDT/ ETS.
2. Study and use of GPS to establish control on small area.
3. Study and use of Laser Level/ Pipeline Laser.
4. Interpretation of data using GIS software.

(V) Project Work:: (Any One)

1. Adjustment of Geodetic Quadrilateral without central station by approximate method and by method of correlates. (It is desirable to solve the above problem by using computer).
2. Survey of a small property with ETS and preparation of plan using any post processing software.

Note :

1. The Term Work shall consist of record of the above practical exercises in Journal.
2. Practical examination will be based on the above exercises.

Reference Books :

1. Surveying : Vol. II. and III by Dr. B. C. Punmia : Laxmi Publication - New Delhi.
2. Surveying and Levelling Vol. II by Late T.P. Kanetkar and S.V. Kulkarni. - Pune Vidyarthi Publication.
3. Text Book in Surveying - Vol. II and III by Dr. K. R. Arora :Charotar Publishing House, Anand.
4. Surveying for Engineers by J. Uren and W.F. Price (Mc Millan Publication)
5. Introduction to Surveying by Anderson (McGraw Hill Publication)
6. Elements of Photogrammetry by Paul R. Wolf (McGraw Hill Publication)
7. Photogrammetry by Shefford
8. Remote Aerial Photo Interpretation by R. E. Leeder
9. Remote sensing in Civil Engineering by J. M. Kennie and M. C. Matthews.

301007 : PROJECT MANAGEMENT & COMPUTER APPLICATION

Teaching scheme : Examination scheme :
Lectures : 4 hrs/week Theory : 100 Marks
Practicals : 2 hrs/week Term work : 25 Marks

PROJECT MANAGEMENT- SECTION-I

UNIT I.

Categories of project, project life cycle, causes of project failure, project objectives, project organization, matrix structure, communication, meetings, reporting, group functioning, staff relations.

Project Planning and Scheduling : Gantt chart and its limitation. Network planning, Network analysis, - C.P.M. -Activity On Arrows (A.O.A.) - Activity On Nodes (A.O.N), Systems -Critical path and types of floats, Precedence Network Analysis.

UNIT II.

Updating, Crashing, Resource leveling, PERT, Decision making skills and analysis.

Project Time Control,

Project Cost Control,

Decision Making Skills and Analysis

UNIT III

Contract Administration & Materials Management: Contract, Laws - introduction to conditions of contracts - disputes -arbitration concept only, Variation

in prices of construction material, labour, equipment during project execution, insurance. Categories of project, project life cycle, Project Manager - basic education, experience, qualities.

Objectives of material management and its balancing with emphasis on supply management and cost reduction, material requirements, scheduling, monitoring, receipts, storage, inspection. Inventory control - ABC analysis.

UNIT IV

Safety Engineering, Quality Control and Site layout: The problem, safety polices, safety measure in various construction work, protective clothing and safety equipment, accident and first aid. Quality control. Site layout, factor for site layout selection, Site layout for various project such as -road project, building work, dams project.

UNIT V

Study of Numerical Methods

1. Newton Raphson Method
2. Langragian Interpolation
3. Simpson's 3/8 Rule
4. Gauss Quadrature

UNIT VI

Study of algorithm and flowcharting for the designing of softwares for network analysis, use of spread sheets for quotations, daily report, purchase order, payment requisition, DBM, quality control

Term Work

PROJECT MANAGEMENT

List Of Practical

1. Assignment based on C.P.M. : Calculation of Critical path and floats.
2. Assignment based on crashing.
3. Assignment on Resource Allocation.
4. Assignment based on A-B-C Analysis.
5. Study of software for network analysis - use of spread sheet for quotations daily report purchase order - payment requisition.
6. Visit to Construction Company and study of their daily progress reports, payment requisitions, purchase order, receipts etc.

COMPUTER APPLICATION

Computer program-software for programming in (any two)

- Fluid mechanics
- Soil mechanics
- Structural design
- Project management

Computer program-software for programming in (any two)

- Matrix operation and method of solutions of algebraic.
- Newton Raphson method, Runge-Kutta method
- Least square method
- Numerical integration
- CPM, PERT

Reference Books :

1. Critical Path Analysis by Keith Lockyer.
2. Construction Management by S. Seetharaman, Umesh Publications, 5-B, Nath Market, New Delhi.
3. Construction Management and Planning by Senagupta/ Guha, Tata McGraw Hill Publications.
4. Construction Safety hand book by V J Devies, K Thomson by Thomas Ltd
5. Let us 'C'- Y P Kanetkar, B P B Publication
6. Computer Programming in 'C'- Rajaraman, Prentice Hall Publication.
7. Construction Project Management - K.K.Chitkara - TMH Publications

301008 : STRUCTURAL DESIGN - II

Teaching Scheme :	Examination Scheme :
Lectures : 4 Hrs./Week	Theory: 100 Marks
Practical : 4 Hrs./Week	Term Work : 25 Marks
	Oral : 50 Marks

UNIT I.

- a) Introduction to various design philosophies R.C. structures : Historical development, 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, concept of safety - probabilistic approach, semi probabilistic approach, partial safety factors for material strengths and loads. Study of structural properties of concrete.
- b). R.C, section in flexure : Working stress method, M.R. of singly reinforced rectangular R.C. sections, Under reinforced, balanced and over reinforced sections. Limit State Method : Assumptions, Strain variation diagram, stress variation diagram Design parameters for singly reinforced rectangular R.C. section, M.R. of underreinforced and balanced section, M.R. of doubly reinforced rectangular section and flanged section.

UNIT II.

Design of beams for flexure, shear, bond and torsion : Simply supported continuous, cantilever (singly reinforced, doubly reinforced and flanged). Redistribution of moments.

UNIT III

- One way slab - simply supported, cantilever and continuous. Two way slab-simply supported continuous and restrained.
- Design of staircase : Dog legged and open well.

UNIT IV.

- Column : Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements, Design of short column for axial load, uniaxial, Biaxial bending.
- Design of isolated column footing for axial load, uniaxial and biaxial bending. Eccentric footing.

Reference books :

- Limit State Analysis and Design : P. Dayaratnam-Wheeler Publishing Company, Delhi.
- Comprehensive Design of R.C. Structures : Punmia, Jain and Jain- Standard Book House- New Delhi.
- Limit State Theory and Design : Dr. V.L. Shah and Dr. S.R. Karve- Pune Vidyarthi Publication.
- RCC Analysis and Design Vol I & II : Sinha- S. Chand and Co. New Delhi.

Design Assignments (Term work)

- * Design of G + 2 building covering all types of slabs, beams, columns, footing and staircase (Two flights). Full size drawing sheets in four number.
- * Reports of two site visits. (Building under construction) Maximum number of students in a group is limited to three. One drawing sheet shall be drawn by using any drafting software. Dealing of reinforcement as per SP-34.

ORAL EXAMINATION : Oral Examination shall be based on the Term work.

301009 : ENVIRONMENTAL ENGINEERING -1

Teaching scheme : **Examination scheme :**
Lectures : 4 hrs/week Theory : 100 marks
Practicals : 2 hrs/week Practical: 50 marks

Section : I**Unit : I****7 Hrs**

Introduction to Environmental Engineering, Concepts of Ecology, Water Pollution, Air pollution, Noise pollution, solid waste.

Noise pollution- Sources and effects of Noise Pollution.

Sound measurements - Sound pressure, Loudness, Intensity and Cumulative decibel.

Noise control techniques.

Solid waste- Types of Solid Waste, Sources and properties of Solid Waste, Physical composition and chemical composition of Solid Waste

Solid Waste generation- Estimation of Solid waste, Factors affecting generation rate.

On site handling, storage and processing.

Collection of solid waste- Collection services, Types of collection systems.

Processing techniques - Mechanical volume reduction, Thermal volume reduction, Manual component separation.

Disposal methods - Land filling with solid waste, Operation of landfills, Land farming, Deep well injection and incineration.

Unit II

Air pollution- Definition, sources of air pollution, types and classification of air pollutants, Primary and Secondary air pollutants and their importance, Atmospheric stability, mixing heights, plume types and meteorological parameters.

Effects of air pollution on - Human, Animals, Materials and Vegetation.

Global Effects- Photochemical smog, heat island effect, ozone depletion, acid rain.

Working of control equipment like Settling chamber, Inertial separator, Fabric filter, ESP and Wet scrubbers. Control of vehicular pollution.

Unit III

Rainwater Harvesting- Introduction to Rainwater Harvesting system, Need of rain water harvesting, Benefits and Methods of Rainwater Harvesting.

Introduction to water supply scheme.

Conveyance of raw water- Different types of pipes used, Different valves, Designing of rising main.

Quantity- Population forecasting, rate of water consumption for various purposes, factors affecting and fire demand.

Quality- Characteristics, Indian standards and significance.

SECTION - II

Unit IV

Water Treatment: Principles of water treatment processes. Introduction to different types of water treatment flow sheets.

Aeration: Principle and Concept, Necessity, Methods, Removal of taste and odour. Design of aeration fountain.

Sedimentation- Principle, Efficiency of an ideal settling basin, Settling velocity, Types of sedimentation tanks.

Theory of chemical coagulation and flocculation, design of flocculation chamber, mean velocity gradient "G" and power consumption, common coagulants, coagulant aids like bentonite clay, lime stone, silicates and polyelectrolytes. Design of clariflocculator.

Unit V

Filtration: Theory of filtration, Mechanism of filtration, filter materials, Types of filters- Rapid gravity filter, slow sand-filter and pressure filter. Components, materials, underdrainage system, working and cleaning of filters, operational troubles, Design of filters.

Theory of disinfection- Factors affecting disinfection, types of disinfectants, Types and methods of chlorination, break point chlorination, bleaching powder estimation. Miscellaneous methods:

Water softening method- lime-soda and ion exchange method.

Demineralization- Industrial water treatment for boilers and process water. Methods like R.O. and electrodialysis.

Desalination: Significance and methods like solar still and electrodialysis.

Defluoridation technique.

Unit VI

ESR- Design of ESR capacity.

System of water supply- Continuous and intermittent system.

Distribution of water- Different distribution systems and their components, Design of distribution system, Hydraulic analysis of distribution system, Plumbing in buildings.

List of Practicals :-**(A) Determination of**

1. pH and Alkalinity
2. Hardness
3. Chlorides
4. Chlorine demand and residual chlorine
5. Suspended particulate matter, SOX, NOX from air.
6. Determination of Noise levels.
7. Turbidity and optimum dose of alum.
8. MPN
9. Sulphates or Fluorides or Iron

(B) Site visit to water treatment plants. (Minimum two)**(C) Design of various components of water treatment plant.****(D) Study of Software's or programming for analysis of water distribution system or programming for design of water treatment units.**

- Note :**
1. The term work shall consist of record of above Practicals in Journal.
 2. Practical examination will be based on above experiments.

Reference Books :

1. Air Pollution Vol. I - IV - Stern, McGraw Hill.
2. Air Pollution H. V. N. Rao and M. N. Rao, TMH Publications.
3. Environmental Chemistry:- Sharma and Kaur - Goyal Publisher.
4. Water Supply Engg. : S. K. Garg : Khanna Publishers - NewDelhi.
5. Environmental Engg. : Peavy and Rowe, McGraw Hill Publications.
6. Water Supply and Treatment Manual : Govt. of India Publication.
7. Fundamentals of Ecology : Odum - Oxford and IBH Publishing.
8. Environmental Biology : Arora
9. Environmental Engg. : Fair and Geyr - McGraw Hill Publications.
10. Environmental Engg : Metcalf and Eddy - TMH Publications.
11. Environmental Engg. : Steel and McGhee : McGraw Hill Publications.
12. Noise Pollution : G.K.Nagi, M.K.Dhillon, G.S.Dhaliwal Punjab Agricultural University India. Commonwealth Publishers , New Delhi.
13. Rain Water Harvesting: Making water every body's business by CSE (Center for Science and environment) www.cse.org

3010010 : TRANSPORTATION ENGINEERING I

Teaching scheme : Examination scheme :
 Lectur : 4 hrs./week Theory: 100 Marks

SECTION -1**RAILWAY ENGINEERING (50 marks)****UNIT-I 16 Marks 8 Hrs.**

Introduction : History of railways, economy, automization, comfort and consumer service. Advantages of railways as a mode of land transport. Organizational structure of Indian Railways, Classification of Railway Lines

Permanent Way :

(a) **Definition of Track**, Basic Components, Ideal requirements.

(b) **Rails** : Functions, specifications, standard rail sections, Advantages of flat footed rails over other types. Acceptance tests, Weight of rail and its relation to Axle load. Rail defects, Krautkrammer rail flaws detector. Rail creep, causes, effects, measurement, and remedies of creep.

(c) Track Gauges, Standards and Stresses:

- Gauges** : Types, Choice, necessity of uniformity. Track standards related with track structure for BG and MG; Schedules of dimensions I, II, III. Concept of over dimensioning consignment (ODC).

2. **Track Stresses** : Different stresses developed in railway track.

(d) **Sleepers** : Functions, sleeper density and spacing, types such as steel, cast iron, prestressed concrete, synthetic sleepers (Fiber glass and polymer matrix composite sleepers).

(e) **Ballast** : Definition, Functions, Specifications, necessity of blanket/sub ballast, Design of ballast sections, grading and quantity of ballast.

(f) **Formation**: Functions, Suitability for drainage, treatment, failures and remedies. Different cross sections of Track in cutting and embankment.

UNIT- II 18 Marks 12 Hrs.

(a) **Track fittings and Fastenings** : Rail Joints - Fish plated -Limitations and Welded. Methods of Welding such as Electric Flash Butt and Alumino Thermit Welding. Concepts of Short welded rails (SWR), Long welded rails (LWR) and Continuously welded rails (CWR), Advantages of welded joints.

Rail sleeper fastenings: Conventional fastenings and Limitations. Elastic fastenings - Necessity and types such as Pandrol clip and 'W clip or Herbert Meir (HM) fastenings, Arrangement for PSC sleepers.

(b) **Engineering Surveys, Project reports** : Introduction, preliminary investigations, Traffic and Engineering Surveys, Information for preparation of project report.

- (c) **Geometric Design** : Necessity, types of Gradients, curves, Grade Compensation on curves, Alignment, Superelevation, Equilibrium cant; Equilibrium speed, Maximum permissible limits for cant, cant deficiency, cant excess, speed on curves, safe speed on curves using Indian railway formula only for fully transitioned curves. Concept of negative cant, Gauge widening.
- (d) **Points, Crossing and Turnouts** : Functions, components/elements. Switches such as overriding and undercut, crossing number. Angle of crossing, Types of crossings, Listing of types of Turnouts.

UNIT- III**16 Marks****8 Hrs.**

- (a) **Construction and Track Maintenance** : Plate laying methods: Operations involved, Distribution of labour gangs - Tram Line method of plate laying in detail, Requirements of Track material for one kilometer track. Ballast less or slab track. Ballast train and renewal of ballast. Need for maintenance on conventional track structures Common items of track maintenance. Conventional Track maintenance such as Beater packing, Measured shovel packing (MSP) and use of ON and OFF Track Tamping machines (Only concept, advantage and Limitations are expected). Concepts and advantages of Modern Directed Track Maintenance (DTM). Use of Modern Track Management System on Indian Railways. Information to be collected in Permanent Way Inspector's Section Register. Track Quality Assessment and Monitoring.

- (b) **Stations and Yards** : Functions, requirements and types only. Use of Turntable, triangle, Buffer stops, Scotch Block.
- (c) **Signaling** : Objects, classification, Semaphore signal; Location of signals. Temporary signals in emergency such as Caution Indicator, Stop Indicator, Speed Indicator, Introduction to Electrically Operated Signals.
- (d) **Modernization in Railways** : With respect to
 (i) Types of railways., traction, (ii) High speeds
 (iii) Improvements in Track Structure : Components
 (iv) Automization, (v) Safety Aspects. Introduction to Sky bus, Metro Rails.

SECTION-II

(50 Marks)

UNIT-IV : 18Marks 8 Hrs.
Tunnelling

1. General Introduction about Tunnels, Advantages and disadvantages of Tunnels with respect to open cuts. Tunnel Surveying: Surface surveys, transferring centerline, Setting out and Transfer of Levels Underground.
2. Criteria for Selection of size and shape of Tunnels, Meaning and advantages of Twin tunnels, pilot tunnels, portals and construction of shaft and advantages of pilot tunnel. Factors affecting the methods of Tunneling.
3. **Driving Tunnels in Soft ground** : General, Characteristics of soft ground, Needle beam method, and 'NATM' method of Tunnelling in practice, Standing Time for unsupported strata.
4. **Driving Tunnels in Hard ground** : General, Sequence of operation and typical distribution of time for each operations, Meaning of the term 'Faces of Attack', Drill blast method of tunneling for hard strata, Different pattern's drilling.

UNIT-V : 16 Marks 6 Hrs.

1. **Blasting and explosives** : Meaning of the terms-types of explosives, method of blasting in brief, quantity of explosives required for blasting, Mucking, Method of removal of Muck and equipment used.

2. **Dust prevention** : Necessity of Dust suppression and methods of removal of dust. Ventilation - Meaning of the term, Requirements of Ventilating system. Volume of air required, Methods of Ventilation with advantages and disadvantages. Lighting and aspects of drainage in brief.
3. Method of supporting roof consisting of shot creating. Cement grouting, rock bolting, Cast in situ and precast lining.

UNIT-VI : 16 Marks 6 Hrs.

Elements of Docks and Harbour Engineering

1. Introduction, Definition of the terms, Requirements of Harbour and Port, Classification of Harbours with examples. Selection of site for Harbour.
2. Definitions / Meaning of Breakwater, Dock, Quay, Bulkhead, wharves, Jetty, Dolphines, Dock fenders. Importance and use of Tetrapods, Triars, Quadripads and Hexapods.
3. Uses of wet docks and dry/repair docks. Port Facilities-General Idea about Transit sheds warehouses.

Note : Site Visit to Railway Station/Yard/Docks and Harbour.

Reference Books :

1. Railway Track Engineering : J. S. Mundrey, Tata McGraw Hill. Publishing Company Limited, New Delhi.
 2. A text book of Railway Engineering : S. C. Saxena, Arora - Dhanpat Rai and Sons - Delhi.
 3. Principles of Railway Engineering: S.C. Rangwala Charotkar Publishing House.
 4. Transportation Engineering Volume I: V.N. Vazirani and S.P. Chandola.
 5. Harbour, Dock and Tunnel Engineering : R. Srinivasan.
 6. Tunnels and Elements of Docks and Harbours : Prof. G. V. Murthy.
 7. A Course in Docks and Harbour Engineering : Dr. S. P, Bindra - Dhanpat Rai and Sons.
 8. Dock and Harbour Engineering : Hasmukh P. Oza and Gaulam H. Oza. - Charotar Book Stall.
 9. Tunnel Engineering : Subhash C. Saxena - Dhanpat Rai and Sons - New Delhi.
 10. Railway Engg.- M. M. Agarwal - Prabha & Co.
-