

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED
TEACHING AND EXAMINATION SCHEME
Third Year (Civil Engineering) New
W.E.F. 2010-2011
(Revision-2010)

S. No.	Name of the Subject	Teaching scheme (Hours/Week)	Examination Scheme (Marks)				
			Paper	Test	Term Work	Practical	Total
PART-I							
1	Engineering Geology and Seismology	4	80	20	-	-	100
2	GeoTechnical Engineering -I	4	80	20	-	-	100
3	Theory Of Structure II	4	80	20	-	-	100
4	Water Resources Engineering-I	4	80	20	-	-	100
5	Design Of structure-I(Steel)	4	80	20	-	-	100
6	Transportation Engineering I (Highways and Railways)	4	80	20	-	-	100
7	Engineering Geology and Seismology (lab)	2	-	-	25		25
8	GeoTechnical Engineering-I(lab)	2	-	-	25	25	50
9	Water Resources Engineering-I (lab)	2	-	-	25	25	50
10	Design Of structure(steel)-I (lab)	2	-	-	25	25	50
11	Transportation Engineering-I (lab)	2			25		25
Total of Part-I		34	480	120	125	75	800
PART-II							
1	GeoTechnical Engineering -II	4	80	20	-	-	100
2	Theory Of Structure -III	4	80	20	-	-	100
3	Design of Structure -II (R.C.C-W.S.M.)	4	80	20	-	-	100
4	Transportation Engineering-II (Airport, Bridges, Tunnels)	4	80	20	-	-	100
5	Construction Management	4	80	20	-	-	100
6	Surveying - III	4	80	20	-	-	100
7	GeoTechnical Engineering -II(lab)	2	-	-	25	25	50
8	Design of Structure-II (lab)	2	-	-	25	25	50
9	Surveying -III(lab)	2	-	-	25	25	50
10	Seminar	2	-	-	50	-	50
Total of Part-II		32	480	120	100	100	800

Note: Minimum two tests should be conducted for each theory subject and average of best two tests should be considered.

PART-I
ENGINEERING GEOLOGY & SEISMOLOGY

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Section-I

Unit-1

Introduction: Definition, scope and subdivisions, applications of Geology in Civil Engineering.

Physical Geology: Major surface relief of the earth, Denudation interior of the earth.

Geological Work of the River: Normal cycle of erosion, processes and features of erosion and deposition, transportation, Civil Engineering Significance.

Geological work of Wind: Process and features of erosion and deposition, transportation, Civil Engineering significance.

Volcano: Central and Fissure types, Product of Volcano, Post volcanic products, Geysers, Fumaroles etc.

Mountain: Types, Examples. (07hrs)

Unit-2

Mineralogy and Petrology:

Mineralogy: Definition, Physical properties of mineral, Classification of Minerals.

Petrology: Definition, Rock cycle.

Igneous Rocks: Origin, Textures and Structures, Classification, Concordant and Discordant intrusions, Civil Engineering significance, Study of Important Rocks.

Secondary Rocks: Formation, Classification.

Residual Deposits: Soil, Laterite and Bauxite and their importance.

Sedimentary deposits: Formation, Textures, Classification and structures, Study of important Rocks, Civil Engineering significance.

Chemical and Organic Deposits:

Metamorphic Rocks: Agents and types of metamorphism, Stress and antistress minerals, structures,

Products of Metamorphism, Study of Important Rocks. (09 hrs)

Unit-3

Structural Geology: Outcrop, Strike and Dip, Unconformity-types, Outliers and Inliers overlap.

Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance.

Joint: Types, Civil Engineering considerations. (05 hrs)

Section-II

Unit-4

Building Stones: Requirements of good building stones (Dependence of strength, durability, ease of dressing, availability of blocks of suitable size and appearance on mineral composition, Textures and field structures) Suitability of common rocks as building stone.

Ground Water: Sources of ground water, Water table, Zones of ground water, Porosity and Permeability,

Types of Aquifer, Conservation of Ground Water. (04hrs)

Unit-5

Earthquake: Introduction, Causes, Seismic Waves, Isoseismal lines, Recording of earthquakes, Scale, Effect, Reservoir Induced Seismicity, Distribution of Earthquake in World and India, Seismic Co-efficient for construction, Seismic Zone (Map) of India.

Landslides: Types, Causes, Stability of hill slopes, prevention of Landslides, Earthquake seismic Characteristics and sedation to plate motion, Internal Structure of Earth, site response studies and microzonation.

Preliminary Geological Investigation: Steps in geological investigations for project site, Engineering consideration of structural features.

Exploratory Drilling: Observations, Preservation of cores, core logging, core recovery, R.Q.D. Graphical representation of core log, Limitation of exploratory drilling method. (8 hrs)

Unit-6

Geology of Dams and Reservoirs: Preliminary geological survey, influence of geological conditions on location, Alignment, Design and types of Dam, Suitable and unsuitable geological conditions for locating a Dam site, Site improvement techniques, Dams on Carbonate Rocks, Sedimentary Rocks, Folded strata and Deccan traps, Suitable and unsuitable geological conditions for reservoir site.

Geology of Tunnel and Bridge: Definition, Civil Engineering terms, Difficulties during tunneling, influence of geological conditions of tunneling, Lining after Tunneling, Geological consideration while choosing tunnel alignment, Tunnel in folded strata, Sedimentary rocks and Deccan traps, Dependence of types of bridge on geological conditions. (09 hrs)

REFERENCE BOOKS

1. Engineering and General Geology- By Prabin Singh, S.K. Katariya and Sons Delhi.
2. Principles of Petrology- By G.W. Tyrrell, B.I. Publication Pvt.Ltd. New Delhi.
3. Principles of Physical Geology- By A. Homes. ELBS Chapman & Hall London.
4. Structural Geology- By M.P. Billings, Prentice Hall Of India Pvt. Ltd. New Delhi.
- 5 A Text book of Geology- By P.K. Mukerjee, The World Press Pvt. Ltd. Calcutta.
- 6 Geology Hand Book in Civil Engineering- By R.F. Legget, Mc Graw Hill, New York.
- 7 Principles of Engineering Geology and Geotechnics- By D.P. Krynine and W.R. Judd, CBS Publishers and Distributors, New Delhi.
8. Engineering Properties of Rocks- By L.W. Farmer, Chapman and Hall London.
9. Experiments in Engineering Geology – By KVGK Gokhale & D.M. Rao, TMN New Delhi.
10. A text book of Engineering Geology- By R.B. Gupte
11. Earthquake Forecasting and –By H.N. Shrivastava
12. Engineering Geology of Civil Engineering – By Dr. D.V. Reddy, Oxford & IBH Pub. Co. Ltd. New Delhi.
13. Engineering Geology –By B.S. Satyanarayanswami, Dhanpat Rai & Sons.
14. Ground Water Hydrology –By Toood D.K., John Wiley & Son New York.
15. Engineering Geology Laboratory Manual.
16. Rulley's Elements of Minerology –By H.H. Read, CBS Publishers & Distributors Delhi.

GEOTECHNICAL ENGINEERING - I

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

UNIT 1:

A) STRUCTURE OF SOILS:

Origin, General types of soils, soil particle structure, size, shape, specific surfaces, inter particle forces, in soil mass, structure of clay minerals, soil mass structure, single grained, flocculent, dispersed and Honeycomb, Influence of clay minerals on engineering behavior.

B) THE THREE PHASE SYSTEM:

Phase Diagram, Void ratio, Porosity, Percentage Air Voids, Air Content, Degree Of Saturation, Moisture content, Specific gravity, Weight relationship, Volume relationship, problems.

(08 hrs.)

UNIT 2:

A) INDEX PROPERTIES OF SOILS:

Water content, Specific gravity, particle size distribution (Sieve analysis, Sedimentation analysis theory by Hydrometer method), particle size distributions curve relative density of cohesion less soils, consistency of cohesive soils, Determinations of liquid limit and plastic limit, shrinkage limit, Determinations of in situ density, voids ratio and density index problems.

B) CLASSIFICATION OF SOILS:

Purpose of Soil classification, basis for soil classification, Particle size classification – Textural, HRB Unified and IS Classification. Field Identification of Soils.

(08 hrs.)

UNIT 3 :

PERMEABILITY OF SOILS:

One dimensional Flow-Darcy's law, discharge velocity, seepage velocity, validity of Darcy's law, laboratory methods of permeability determination. Average permeability of stratified soil masses. Method test, factors affecting permeability, problems.

(04 hrs.)

UNIT 4. : COMPRESSIBILITY:

A) CONSOLIDATION:

Initial, Primary & Secondary Consolidation, comparison of compaction and consolidation, Spring Analogy, Terzaghi's one dimensional consolidation theory, Degree of Consolidation, Consolidation test, co-efficient of compressibility, co-efficient of volume change, co-efficient of consolidation, compression index, factors affecting compressibility, Normally consolidated and over consolidated clay, pre consolidation pressure and its determination, Laboratory consolidation tests. lab methods of determining co-efficient of compressibility and consolidation. Time fitting methods.

B) COMPACTION:

Object lab test, zero – air void line, standard proctor test, modified Proctor test, factors affecting compaction. Field compaction method, suitability of equipments, placement water control.

(10 hrs)

UNIT 5 :

SHEAR STRENGTH OF SOILS:

Concept of shear strength , Mohr's strength theory , Mohr's coulomb theory, conventional and modified failure envelopes, total and effective shear strength parameters , concept of pore pressure , factor affecting shear strength of soils , sensitivity and thixotropy of clay. shear strength measurement :direct shear test. Triaxial compression test, unconfined compression test , vane shear test.
(05 hrs)

UNIT 6:

EXPLORATION & IN – SITU SOIL MEASUREMENT:

Methods of exploration, planning, soil boring, soil sampling, rock core sampling, standard penetration test SPT, co-relations, Dynamic cone penetration test, static cone penetration test (CPT) correlation between SPT & CPT, field plate load test (PLT), Electrical resistivity method .
(05 hrs)

REFERENCE BOOKS:

1. Soil Engineering in theory and Practice – Alam Singh and Chowdhary G.R.
2. Soil Mechanics and Foundation Engineering- K.R.Arora.
3. Soil Mechanics and Foundation Engineering – Punmia B.C.
4. Soil Mechanics and Foundation Engineering – V.N.S Murthy.
5. Geotechnical Engineering – C. Venkatramaiah.
6. Geotechnical Engineering- S.K.Gulati & Manoj Datta.
7. Geotechnical Engineering – Purushothama Raj.
8. Basic and Applied Soil Mechanics – Gopal Rajan & ASR Rao.

THEORY OF STRUCTURES - II.

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Unit 1:

- 1) Basic Theorems of structural Mechanics, Maxwell's reciprocal theorems, Muller Breslau's Principle, Applications of these theorems (04)
- 2) Redundant pin-joint Trusses with degree of redundancy up to two, Lack of fit, Temperature stresses. (06)

Unit 2:

- 1) Analysis of indeterminate structures by slope deflection method (06)

Unit 3:

- 1) Analysis of indeterminate structures by moment distribution method. (06)

Unit 4:

- 1) Analysis of beams and frames by Kani's method. (08)

Unit 5:

- 1) Analysis of two hinged arches, influence lines for B.M. and S.F., Rib-shortening, temperature stresses. (06)
- 2) Elastic center Analysis of fixed symmetrical arches. (04)

Unit 6:

- 1) Analysis of indeterminate beams and frames by Strain energy method (05)

REFERENCE BOOKS:

- | | |
|--|------------------------|
| 1. Theory of structures | Timoshenko and Goodier |
| 2. Basic Structural analysis | C.S. Reddy. |
| 3. Theory of Structures | S. Ramamurtham. |
| 4. Mechanics of Structures | Vazrani and Ratwani. |
| 5. Indeterminate Structural analysis | J.S. Kenney |
| 6. Modern Methods in Structural analysis | B.N. Thedani. |

Water Resources Engineering - I

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Section - A

UNIT 1:

- a) Engineering hydrology - Definition, scope & its application. Hydrological cycle & Hydrologic equation. Water budget in India .
- a) Precipitation - Mechanism, forms & types of precipitation.
Artificial rain.
- b) Rain gauges - Types (Non-automatic, automatic & radar measurement) , Location of rain gauges. Estimation of optimum number of rain gauges, missing rainfall data, mean areal precipitation. Study of hyetograph, DAD curves, mass curve, double mass curve, rainfall - frequency curve, intensity - duration - frequency curves. PMP & its estimation. (7 Hrs.)

UNIT 2:

- a) Evaporation : Process, factors affecting, measurement & estimation. Methods to reduce evaporation.
- b) Evapo - transpiration (ET) : Process, factors affecting, measurement and estimation. PET & AET, consumptive & non-consumptive uses.
- c) Infiltration : Process, factors affecting & measurement.
Infiltration equations & indices. (6 Hrs.)

UNIT 3:

- a) Run-off : Process, types, factors affecting, measurement & estimation. Rainfall - Run off relationship & its estimation. Catchments - Definition, types & characteristics.
- b) Hydrographs : Flood hydrographs, base flow separation & Unit hydrograph (UHG). Construction of UHG, assumptions made, uses & limitations of UHG. Conversion of UHG by S-Curve technique. Instantaneous & Synthetic UHG. (7 Hrs.)

Section - B

UNIT 4:

- a) Floods : Design flood, methods of estimation - (Empirical formulae, UHG method, Frequency analysis, Gumball's, Log Pearson Type - III distribution methods.) Benefits of flood estimation, flood control techniques, flood zoning & flood routing.
- b) Stream Gauging : Objects, methods - (Area -Velocity, moving boat, using chemicals etc.) Selection of gauge site, stage-discharge relationship, flow mass curve & flow duration curve. (7 Hrs.)

UNIT 5:

Ground Water (G.W.) : G.W. occurrences, resources & G.W. potential in India . G.W. discharge & re-charge. Comparison of G.W. & Surface water. Types of Sub-surface water & aquifers, Aquifer parameters. Well hydraulics - Steady flow conditions for un-confined & confined aquifers. Open well - safe yield, pump tests & comparison of open well & tube well. G.W. exploration, various types of pumps used & its selection. (6 Hrs.)

UNIT 6:

- a) Irrigation Engineering : Definition, necessity, advantages & dis-advantages of irrigation. Present status & future development of irrigation in India . Types of soil & its suitability for different crops. Moisture content in soil, depth & frequency of irrigation. Types of irrigation - Canal irrigation (Gravity), Percolation tank, Bandhara irrigation. Pressure irrigation - Sprinkler, Drip & Lift irrigation. Advantages & limitations of each type of irrigation.
- b) Crop water requirement : Factors affecting, principal Indian crop seasons. Duty, delta, base period & its relationship. Factors affecting duty & methods to improve it. Crops grown in Maharashtra/India & its duty, delta & base period. Crop rotation & its significance. Methods of water assessment & irrigation efficiencies.
- c) Water logging : Definition, causes, effects & remedial measures. Drainage of irrigated lands - reclamation of water logged, alkaline & saline lands, design & spacing of the tile drains. (7Hrs.)

Text books :

- 1) Subramanya S. : Hydrology, Laxmi Publication, Delhi .
- 2) Dr. Reddy Jayarami P. : Hydrology, Laxmi Publication, Delhi .
- 3) Dr. P.N. Modi : Irrigation, Water Resources & Water power Engg.

Reference Books :

- 1) Raghunath H.M. : Hydrology Wiley Eastern Ltd., New Delhi .
- 2) Sharma R.K. : Hydrology & Water Resources Engg.
- 3) S.K. Garg : Hydrology & Water Resources Engg.
- 4) Linsley R.S. : Applied Hydrology.
- 5) A.M. Michael : Irrigation Theory & Practice.
- 6) Dr. Punmia B.C. : Irrigation & Water Power Engg.
- 7) S.K. Garg : Irrigation & Water Power Engg.
- 8) Dr. Arora K.R. : Irrigation Engg.

DESIGN OF STRUCTURE (STEEL) -I

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

This is a basic course to introduce basic concepts behind design of Steel Structures. This course acts as a prerequisite for the elective course Advanced Structural Design.

Unit 01:

- A. **Steel as a structural material**, various grades of structural steel, properties, various rolled steel sections (including cold-formed sections, structural pipe (tubes) sections and their properties. Introduction to IS: 800, 808, 816, 875, etc. Life-cycle cost of Steel Structures.
- B. **Structural Fasteners :**
- Behavior of bolted and welded connections. Failure of bolted and welded joints. Strength of bolt and 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. [8 hrs]

Unit 02:

Design of axially loaded members: Tension members, Compression members. [6 hrs]

Unit 03:

Design of column subjected to axial load and biaxial moment including base design. Design of axially loaded built-up columns, laced and battened Column bases: Slab base, Gusseted base, Moment resistant bases. [6 hrs]

Unit 04:

Design of Steel roof truss, including end connections. [6 hrs]

Unit 05:

Design of simple and built-up beams: Laterally restrained and unrestrained (Symmetrical as well as unsymmetrical sections). Curtailment of flange plates. [6 hrs]

Unit 06:

Design of riveted plate girder, Design concept of gantry girder and Foot-over Bridge. [8 hrs]

Text Books

- Punmia, Jain & Jain – Design of steel structures – Standard book house.
- Ramchandra – Vol. – I & II – Design of Steel structures – Standard book house.
- Arya & Ajmani – Design of Steel Structures -Chand & brothers, New Delhi.

Reference Books

- M. Raghupati - Steel structures – Tata McGraw heel .
- P. Dayaratnam - Steel structures – Wheeler publication.
- Duggal – Steel Structures.

Transportation Engineering I

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Unit 1 : Introduction

Role of transportation in society, objectives of transportation system, different types of modes, planning and co-ordination of different modes for Indian condition.

04 hrs

Unit 2 : Railway Engineering

Merits of Rail transportation, Railway gauge & problems due to non uniformity of gauge, C/s of permanent way and track component , Sleepers – function and types , sleeper density, Ballast- function and different types of ballast materials , Rails – coning of wheels and tilting of rails, rail cross section, wear & creep of rails, rail fastening. Geometrics :- Gradient, transition curve widening of gauge on curves, cant and can deficiency.

08hrs

Unit 3 : Point & Crossing

Design of turnouts, descriptions of track junctions, different types of track junctions. Yards : details of different types of railway yards and functions.

Signaling & interlocking : - classification of signals, interlocking of signals and points, control of train movement.

Construction and maintenance of railway track, method of construction, material requirement , maintenance of track , modernization of track and railway station for high speed trains, special measures for high speed track.

08 hrs

Unit 4: Highway Planning

- Classification of road, History of road development in India, present status of roads in India.
- Highway alignment, basic requirement of ideal alignment, factors governing alignment.
- Highway location survey, map study, reconnaissance, topographic survey, highway alignment in hilly areas, drawing and report presentation.

03 hrs

Unit 5: Geometric design of highway

- Vehicular characteristics, highway c/s elements, clearance, width of carriage way, shoulder right of way, width of road way, camber and its profile.
02 hrs
- Design speed, sight distance, perception time, break reaction time, analysis of safe sight distance & analysis of overtaking sight distance, intersection sight distance
02 hrs
- Horizontal curve: - Design of super elevation & its provision, min. radius of horizontal curve, transition curve, widening of pavement.
03 hrs
- Gradient: different types of gradient, grade compensation curve, and vertical curve design factors, summit curve, valley curve, introduction to geometric design software.
03 hrs

Unit 6: Pavement Design and Traffic Engineering

- Pavement Material: - Sub grade material properties and classification, importance of CBR, requirements of aggregates for different types of pavement, different types of aggregate, Bituminous material – test on bituminous, material properties and grades of bitumen.
- Pavement Design : - Different method of pavement design, comparison of flexible and rigid pavement, flexible pavement design – GI Method, IRC approach, introduction to AASHTO

- method, Stress on rigid pavement due to temperature variation and combine loading and temperature stress, introduction to pavement design software's.
- c) High way maintenances: - Drainage necessity and types, strengthening of existing pavement objectives & types of overlay.
 - d) Speed study, presentation of data, journey time and delay studies, O-D Survey, need and uses, parking survey- need, types, traffic signs and marking, signals and traffic regulation, intersection types at grade & grade separation, factors influencing design. **9 hrs**

Recommended books:-

- 1] A Course of Railway Engineering By Saxena S.C., S.P. Dhanpat Rai and Sons.
- 2] Principal of Railway Engineering by S.C. Rangwala.
- 3] Indian Railway Track by Agrawal M.M. Sachdeva press New Delhi.
- 4] Highway Engineering by Justo & Khanna.

ENGINEERING GEOLOGY & SEISMOLOGY Laboratory

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Term Work: 25 marks

PRACTICAL WORK (Any Eight)

1. Megascopic study of Rock forming minerals.
2. Megascopic study of Ore forming minerals
3. Megascopic study of Igneous Rocks.
4. Megascopic study of Secondary Rocks.
5. Megascopic study of Metamorphic Rocks.
6. Study of Geological Maps.
7. Study of Structural Geological models.
8. Study tour to the places of Engineering Geological importance.
9. Core Logging

TERM WORK

A journal containing full record of above practical work shall be examined as Term Work. Oral examination based on above practical course.

GEOTECHNICAL ENGINEERING – I Laboratory.

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

TERM WORK:

The term work shall consist of a record of laboratory experiments as mentioned below.

1. Determination of Specific Gravity.
2. Field density test.
3. Determination of particle size distribution of soil
 - a) Sieve Analysis.
 - b) Wet Analysis
4. Determination of Atterberg's limit.
5. Permeability test, variable and constant head.
6. Standard proctor compaction test.
7. Direct shear test.
9. Triaxial compression test.
10. Consolidation test.
11. Static cone penetration test.
12. Standard penetration test.

(NOTE:- Minimum six experiments from 1 to 8 will be carried out, Experiments 9,10,11&12 will only be demonstrated.)

PRACTICAL / ORAL EXAMINATION

The Practical / Oral examination is based on the term work mentioned above.

Water Resources Engineering – I Laboratory

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

Term work : It consists of at least 08 assignments from the following :

- 1) Numerical on Rainfall - frequency curve.
- 2) Numerical on DAD curve.
- 3) Estimation of PET by Pen man's method.
- 4) Numerical on Rainfall - Run off relationship.
- 5) Development of UHG from flood hydrograph & flood hydrograph from UHG (2 numerical)
- 6) Conversion of UHG by S-Curve technique (2 numerical)
- 7) Numerical on flow duration curve.
- 8) Numerical on confined aquifer / Un-confined aquifer/ pump test on open wells. (3 numerical)
- 9) Estimation of flood by Gumbell's method.
- 10) Areal precipitation - Thiesson polygon, Isohyetel methods / numerical on optimum numbers of rain gauges / missing rainfall data. (3 numerical)
- 11) Flood routing (river routing) by Muskinghum method.
- 12) A brief report on - Lift, sprinkler, drip & Bandhara irrigation.

Practical Exam. : It consists of oral exam based on above term work.

DESIGN OF STRUCTURES(STEEL) – I Laboratory

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

Design Assignments Shall Consist of any Two of the Following:

1. Design of complete industrial building with mezzanine floor.
- 2 Design of welded/Riveted plate girder

OR

2. Design of foot over bridge.

- To the scale sketching would be done in the sketch book by hand and then the drawings would be drafted using Drafting Package/ Auto Cad. Six half imperial size drawing sheets would be drawn using drafting software/ Auto CAD
- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- Emphasis would be given on structural detailing of various connections in structural steelwork.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

One site visits would be carried out as a part of term work. Oral Examination would also include a sketching session.

Transportation Engineering –I Laboratory

Teaching Scheme

Practical: 2 hrs/week

List of Practical's [At least 7 to be performed]

- 1] Impact test on aggregate.
- 2] Abrasion test on aggregate.
- 3] Crushing test on aggregate.
- 4] Shape test on aggregate.
- 5] Ductility test on bitumen.
- 6] Penetration test on bitumen.
- 7] Softening point test on bitumen.
- 8] Viscosity test on bitumen.

Examination Scheme

Term Work: 25 marks

PART-II

GEOTECHNICAL ENGINEERING - II

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

UNIT 1:

STRESS DISTRIBUTION IN SOIL:

Boussinesqu's analysis for vertical pressure and its distribution in a soil mass, vertical stresses due to concentrated load, vertical pressure under uniformly loaded circular area & rectangular area. Pressure distribution diagram, pressure isobar, significant depth vertical pressure due to line load, & strip load, Equivalent load method, preparation & use of Newmark's influence chart, principal stresses & max shearing stresses, contact pressure below foundation. (6 hrs.)

UNIT 2:

EARTH PRESSURE:

Earth pressure at rest, active & passive states, Ranking & Coulomb's earth pressure, Trial wedge method, columni's method & Rebhann's method graphical method for active earth pressure, lateral wall pressure, retaining from earthquake walls, types, proportioning & stability. (7 hrs.)

UNIT 3 :

STABILITY OF SLOPES:

Factors contributing to slope failure, infinite and finite slopes, General considerations & assumptions, Stability analysis of infinite slopes in sands & clay, Methods of stability analysis of slopes of finite height, pore pressure coefficients, pore pressure determination, Types of failure of earth fill dam, coulomb's method, method of slices, Modified method of slices, Friction circle method, Taylor's stability number, stability problem in earth fill dam, tension cracks. (7 hrs.)

UNIT 4. :

SEEPAGE ANALYSIS:

Seepage pressure, Uplift pressure Quicksand, Properties and Construction of Flow Net, 2-Dimensional Laplace equation for flow net, Properties and Construction of Phreatic line in earth dam, Phreatic line in earth dam with horizontal filter, Phreatic line in earth dam with no filter, Flow through zoned earth dam, piping mechanism. (6 hrs.)

UNIT 5 :

A) GROUND LEVEL CONTROL:

Ditches and sumps, well point system- Single stage & multiple stages, deep well drainage, vacuum method, electro-osmosis method, protective filters.

B) GROUND IMPROVEMENT TECHNIQUES:

Objects, classification, Mechanical modification, Hydraulic modification physical modification, chemical modification, modification by use of admixtures, modification by grouting- Types of

grout, Desirable characteristics, Grouting Pressure, Grouting methods. Ground anchorage- Rock bolting & Soil nailing, Reinforced earth. (8 hrs.)

UNIT 6:

GEOSYNTHETICS:

Nomenclature, materials, Types of Geosynthetics, physical, chemical & mechanical properties of geosynthetics, functions of geosynthetics in various civil engineering projects. General principles in various applications such as Geo textile reinforced soil retaining structure, land slide protection in earth dam, tunneling. (6 hrs.)

REFERENCE BOOKS:

9. Soil Engineering in theory and Practice – Alam Singh and Chowdhary G.R.
10. Soil Mechanics and Foundation Engineering- K.R.Arora.
11. Soil Mechanics and Foundation Engineering – Punmia B.C.
12. Soil Mechanics and Foundation Engineering – V.N.S Murthy.
13. Geotechnical Engineering – C. Venkatramaiah.
14. Geotechnical Engineering- S.K.Gulati & Manoj Datta.
15. Geotechnical Engineering – Purushothama Raj.
16. Basic and Applied Soil Mechanics – Gopal Rajan & ASR Rao.
17. Engineering Principles of ground modification- M.P. Housman
18. Engineering with Geosynthetics- Prof. G.V. Rao & V.S. Raju..

THEORY OF STRUCTURES – III

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Unit 1:

[7 hrs]

Matrix flexibility method – Transformation of forces – Element flexibility to system flexibility. Analysis of statically indeterminate beams and rigid jointed plane -frames – effect of support settlements and elastic supports. Matrix flexibility method Analysis of pin-jointed frames –effects due to lack of fit and temperature changes.

Unit 2:

[7hrs]

Matrix stiffness method – Transformation of displacements – Elements stiffness to system stiffness – Application to continuous beams – effects of support settlements and elastic supports. Matrix stiffness method — Application to pin-jointed plane frames - support settlements – lack of fit and temperature effect.

Unit 3:

[6 hrs]

Introduction to Rayleigh-Ritz and Finite Element Method

Rayleigh-Ritz Method: Potential energy theorem, application to axially loaded members and beam bending problems,

Unit 4:

[6 hrs]

Theory of Elasticity

Strain displacement relation, strain compatibility equations, Generalised Hooke's law, Plane stress and Plane strain conditions, stress compatibility and strain compatibility equations. Principal planes and principal stress in 3-D.

Unit 5:

[6 hrs]

Theory of Plasticity: Introduction, Assumptions, Shape factor, plastic section modular, collapse mechanism, fundamentals theorems of plastic analysis, plastic analysis methods, plastic analysis of steel beams, steel frames, plastic design of steel beams and frames.

Unit 6:

[8 hrs]

Plates and Shells:

Laterally loaded plates with small deflection theory, Cylindrical bending of thin rectangular plates, Kirchhoff's thin plate theory, Governing differential equation, Membrane Theory of thin cylindrical shells.

Text Books

1. Pandit, G.S. and Gupta, S.P., Structural Analysis – A Matrix Approach, Tata McGraw Hill Publishing Co., New Delhi, 1997.
2. McGuire, W., and Gallagher, R.H., Matrix Structural Analysis, John Wiley & Sons, New York, 1998.
3. Rajasekaran, S., and Sankarasubramanian, G., Computational Structural Mechanics, Prentice Hall of India Pvt. Ltd., New Delhi, First Edition 2001.
4. Indeterminate Structural Analysis – S.J. Kinney, Oxford IBH Publishing Co., 1999.
5. B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Theory of Structures –Laxmi Publications, New Delhi, 2004.
6. Jain A.K. and Arya A.S., Structural Analysis, Vol.II, Nemchand Publishers, Roorkee, 1996
7. Bhavikatti, SS, Structural Analysis Vol.1 and 2, Vikas Publishing House Pvt Ltd.,New Delhi-4, 2003

Reference Books

1. Wang, C.K., "Intermediate Structural Analysis", McGraw Hill Publishing Co., New York, 1989.
2. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., New Delhi, 1996.
3. Matrix analysis of framed structures – William Weaver, Jr & James M. Gere, CBS Publishers & Distributors, Delhi, 1995
4. Manicka Selvam V.K., Elementary Matrix Analysis of Structures, Khanna Publishers, Delhi, 1994
5. Vaidyanathan, R and Perumal, P, Structural Analysis Vol.1 and 2 Laxmi Publications, New Delhi, 2004.
6. Jain A.K. and Arya A.S., Structural Analysis, Vol.II, Nemchand Publishers, Roorkee, 1996

**T.E. (CIVIL ENGINEERING) PART-I
DESIGN OF STRUCTURE-II (WSM RCC)**

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Unit-1: INTRODUCTION

Introduction: Introduction, Load & Forces, Concrete Reinforced Cement Concrete, Advantages & Disadvantages of RCC construction, Grade of Concretes, Basis of Design, Introduction to working stress method. (04)

Unit-2: BEAMS

Beams: Introduction, End supports, Assumptions, Permissible stresses in steel & concrete, Modes of failure, Analysis & Design for single Reinforced section, Doubly Reinforced section, Flanged sections, (T & L) Beams, Cantilever Beam, based on Flexure, Shear, Torsion. (10)

Unit-3: SLABS

Slabs: Design of one way slab, two way slab, Cantilever and continuous slab by using IS code methods. (IS 456-2000) (06)

Unit-4: COLUMNS & FOOTING

Columns & Footing: Introduction, Types of columns, Design of short columns under axial load, uniaxial load and biaxial bending. Design of isolated footing, square, circular and rectangular. (08)

Unit-5: STAIRCASE

Staircase: Introduction, types of staircases, Design of dog legged staircase. (06)

Unit-6: RETAINING WALL

Retaining wall: Types of Retaining wall, Introduction, Forces on retaining, Mode of failure, Stability checks, General design requirements, Design of cantilever type retaining walls. (06)

TEXT BOOKS

1. Reinforced concrete structure –By Dr. I.C. Syal & Dr. A.K. Goel, S Chand & Co. Ltd. New delhi..
2. Design of reinforced concrete structure –By S. Ramamurtham, Dhanpat Rai Publishing Co. New Delhi.
3. Design of concrete structures –By Ramchandra Virendra Gehlot, Scientific Publishers (India), Jodhpur.

REFERENCES:

1. Reinforced concrete Design –By S.N. Sinha, Tata-Mgraw Hill, 2nd Edition.
2. Plain reinforced concrete –By Jain and Jai Krishna.
3. Reinforced concrete design –By S. Unnikrishna Pillai and D. Menon, Tata Mgraw Hill
4. Reinforced concrete design –By Malik and Gupta.
5. Design of R.C. Structures –By D.S. Prakashrao.

Transportation Engineering II

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Unit 1: Airport Engineering

Aircraft component part and its function, Aircraft Characteristics and their influence on airport planning airport planning – topographical and geographical features, existing airport in vicinity, air traffic characteristics, sight selection, development of new airport, airport obstruction – zoning laws, classification of obstruction, imaginary surface, approach zones, turning zones.

04 hrs

Unit 2 : Airport Design

- a) Airport Layout:- Run way orientation, wind rose diagram, basic runway length, airport classification , geometric design, airport capacity, run way configuration, taxi way design, geometric standards, exist taxi way, holding aprons, location of terminal building, aircraft hanger and park.
- b) Airport Marking and light marking, lightening of run way, taxiway and approach & other areas, terminal area and airport layout - terminal area, planning of terminal building apron, size of gate position, no. of gate position, aircraft parking system, general planning and blast consideration.

08 hrs

Unit 3 : Air traffic control

Airtraffic control aids, enroute aids, landing aids.

Airport drainage – requirement , design data, surface drainage design, airport airside capacity and delay, run way capacity and delay, practical hourly capacity, practical annual capacity, computation of run way system, run way gate cap, taxiway capacity, air traffic forecasting in variation, forecasting methods, forecasting applications and requirements.

08 hrs.

Unit 4 : Bridge Engineering

Basic definition, Importance, investigations, site selection, collection of data, determination of flood discharge, water way afflux, economic spam, scour depth, pier, abutments & bearing, foundation – pile, well, uses of cofferdam.

05hrs.

Unit 5 : Design of Bridge

- a) Loading : IRC-Recommendation for loading on road, bridges loading on railway bridge and load distribution.
- b) Maintenance of Bridges : Methods of erecting girder, truss, reinforced concrete , prestressed concrete and suspension bridges.

05hrs.

Unit 6 : Tunnelling

Detail Classification , open cut Vs. Tunnels, method of transfer of alignment, problems in tunneling, tunneling in hard rock, tunneling in soft rock, linings – necessity and types, lightening – necessity and types, ventilation – necessity , explosives- types, classification of drills, TBM, mucking, rock bolting.

10 hrs.

Recomanded books :

- 1] Airport planning and design By Khanna and Arora
- 2] Airport Engineering Rao G.V. , TMH.
- 3] I.R.C. Code for bridge I and III .

- 4] Bridge Engineering By S.P. Bindra
- 5] Bridge Engineering By D.R. Pathak
- 6] Tunnel Engineering By S.C. Saxena
- 7] Tunnel Engineering By R. Shrinivasan

CONSTRUCTION MANAGEMENT

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

UNIT 1: CONSTRUCTION

INTRODUCTION:

Unique terms of construction, construction projects, types and features, phases of a projects, Agencies involved and their methods of section. (02 hrs)

PLANNING:

Need for project planning and management Engineer's role in Construction economy, Value engineering, Time value of money. Stages of project planning Pre-tendering planning pre-construction planning, Details or pre-construction planning, Development of plan and schedule work break down structure. Activity lists, assessment of work content, Estimating Duration.

(04 hrs)

PROJECT PLANNING:

Construction schedule activity and events Bar Chart, Milestone Chart, Uses and Drawbacks - evolution of networks (02 hrs)

UNIT 2: NETWORK TECHNIQUES:

PERT PROGRAMME (EVOLUTION AND REVIEW TECHNIQUE) :

Brief History of Evolution of PERT Salient features, construction of PERT network, multiple time estimates and network analysis, earlier events time, latest even time, forward pass and backward pass, event slack, concept of critical path and its identification, data reduction, Application of statistics to probability of achieving a target data, suitability of PERT for research projects.

(04 hrs)

CPM (CRITICAL PATH METHOD)

Definitions, network construction. Fundamental rules, assignment of duration of activities, determination of project schedule, activity time estimates earliest start and earliest finish, latest start and latest finish time-float types-free float, independent float, Interfering float -0 their significance in project control, identification of critical path. (04 hrs)

UNIT 3. : PROJECT COST ANALYSIS

Planning, scheduling and controlling, updating an arrow diagram, time grid diagram. Types of project costs direct and indirect cost-time relationships, cost slopes straight-line and segmented approximations, optimum cost and optimum duration, conducting a crash programme, determining the minimum total cost of a project (04 hrs)

UNIT 4. MANAGEMENT TECHNIQUES :

Work Study : Introduction & its application to civil Engineering objects.

Motion study - Def. Aim, Procedure for motion study.

Time study - Def. Uses of time study, (work measurements) procedure for time study. (06 hrs)

UNIT 5: MATERIAL AND PERSONAL MANAGEMENT:

Introduction economic aspects, objectives functions of material management. Manager selective control techniques. A.B.C. Control policy.

Functions, duties of personal officer, Employment Recruitment, Recruitment Procedure (Employment) Selection, Training-Needs, objectives, Advantages, Welfare services. (08 hrs)

UNIT 6. INDUSTRIAL LAWS :

1. The Indian factories Act 1948.
2. Industrial Dispute Act. 1947.
3. The Payment of Wages Act. 1936.
4. Workmen's Compensation Act. 1923.
5. Minimum Wages Act. 1948. (06 hrs)

REFERENCE BOOKS:

1. Industrial Engineering : Organization - O.P. Khanna.
2. Project Planning & Control with PERT & CPM- Dr.B.C. Purmia.
3. PERT AND CPM(Principal and Applications) 2nd Edition –L.S. Srinath.
4. Industrial Organization and Engg, Economics-By T.R. Banga and S.C. Sharma.
5. Motion and Time study - Narvb and Nybdek.
6. Workstudy- O.P. Khanna.
7. Principles of Cost Management - Roy plchery,

SURVEYING – III

Teaching Scheme:

Lectures: 4 hours per week

Examination Scheme:

Theory Paper: 80 marks

Class Test: 20 marks

Objective

This is an advanced course based on SURVEYING-I&II. It introduces various basic concepts in Surveying through theory and series of practical's based on theory.

Unit 01:

[8 hrs]

Geodetic Surveying

Objects, Methods in Geodetic surveying, Triangulation, Classification of triangulation systems, Triangulation figures, Strength of figure & derivation for well conditioned triangle, Selection of stations, intervisibility & height of stations, Towers signals & their classifications, Phase of signals & their corrections. Satellite stations, Reduction to center. Base line measurement, Reduction to mean sea level and extension of base.

Unit 02:

[7 hrs]

Triangulation Adjustment

Kinds of errors, Laws of weights, Determination of Most probable values [MPV] of conditioned and independent quantities, Method of least squares, probable error and its determination, Distribution of error to the field measurement. Normal equation, Method of correlates, station adjustment and figure adjustment of Geodetic triangle [without central station] and Geodetic Quadrilateral [without central station], Spherical triangle, calculations of spherical excess and sides of spherical triangle.

Unit 03:

[05 hrs]

Field Astronomy

Terms, Coordinate systems, Determination of Latitude and True bearing by observation on the sun and Pole Star

Unit 04:

[6 hrs]

Trigonometrical Leveling

Terrestrial refraction, Angular corrections for curvature and refraction, Axis signal correction, Determination of Difference in elevation by single observation and reciprocal observations.

Unit 05:

[8 hrs]

Aerial Photogrammetry

Objects, Applications to various fields, Aerial camera, Comparison of map & vertical photograph, Vertical tilted and oblique photographs, scale of vertical photograph, computation of length and height from the photograph, Relief displacement on vertical photograph. Mirror Stereoscope, Flight planning, Ground control, Radial line method, parallax equation, Mosaics, Photo interpretation.

Unit 06:

[6 hrs]

Remote Sensing

Basic principles, Electromagnetic spectrum, Interaction mechanism and image formation, Classification of remote sensing systems, platforms for sensing different types of data products, Applications to Civil Engineering, concept of global positioning systems [GPS] and Global information system [GIS] and different GPS and GIS.

Text Books

- Surveying and Leveling Vol. II , T.P.Kanetkar & S.V.Kulkarni,
- Surveying Vol. II & III, Dr. B.C.Punmia
- Text book in Surveying Vol. II & II, Dr. K.R.Arora

Reference Books

- Surveying for Engineer, J. Uren and W.F.Price, McMillan Publication
- Introduction to Surveying, By Anderson, McGraw Hill Publication

- Elements of Photogrammetry, Paul R Wolf, McGraw Hill Publication
- Remote Sensing in Civil Engineering, J.M.Kennie and M.C.Matthews.

GEOTECHNICAL ENGINEERING – II Laboratory

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

TERM WORK:

Term work shall consist of solution of following (by analytical & graphical methods)

1. Graphical solution of earth pressure using.
 - a) Rankine's method
 - b) Coulomb's method
 - c) Culmann's method
 - d) Rebhann's method
2. Graphical solution of seepage flow through earth dam.
 - e) Construction of Flow Net
 - f) Experimental method
 - g) Construction of Phreatic line
3. Checking stability of earth dam for sudden draw dam and steady seepage cases using.
 - a) Coulomb's methods
 - b) Modified method of slice
 - c) Friction circle method.
4. Case Study on above syllabus, from available literature.

PRACTICAL / ORAL EXAMINATION

The Practical / Order examination is based of the term work mentioned above.

DESIGN OF STRUCTURE-II (WSM RCC) (LABORATORY)

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

It shall consist of design and drawing for various structural elements as detailed below.

1. Design and drawing of singly reinforced / doubly reinforced / flanged beams.
2. Design and drawing of one way / two way /continuous slab.
3. Design and drawing of column / footing.
4. Design and drawing of staircase / retaining wall.
5. Design of above structural element by any suitable design software.(For e.g. Staad, SPP, STRL)
Oral examination will be based on above Term Work and Syllabus.

SURVEYING – III LABORATORY

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Oral Examination: 25 marks

Term Work: 25 marks

List of Practicals (any Six)

1. Satellite station and reduction to center
2. Measurement of base line base by substance bar method
3. Determination of true bearing of survey line
4. Study of model of celestial sphere
5. Determination of latitude of place of observation
6. Study and use of Mirror Stereoscope and finding out Air base distance.
7. To find out scale of photograph.
8. Setting out works for buildings/culverts/bridges
9. Topography survey reports

Project work (compulsory)

Project work shall be conducted in the field outside the institute premises and shall be based on the Adjustment of a **Geodetic Quadrilateral / Geodetic Triangle** without central station.

A Laboratory Journal based on the practical work would be submitted for the term-work. Practical Examination would be based on the term work. Course Teacher for the Laboratory would decide the breakup of marks for the Oral Examination. An Objective Multiple Choice Test based on the theory as well as laboratory experiments will be conducted as a part of the practical examination.

T.E.CIVIL SEMINAR

Term work : 50 Marks

Each student should select a topic related to Civil Engineering from current literature(i.e. Journal of institution of engineers, India . ASCE ,Applied Mechanics, Indian water works Association ,Etc) And collect the draft pertaining to that write a detailed report thereon. He should also deliver a seminar talk before the departmental staff and class students. An examiner appointed by the Head of the Department and his guide will assess seminar contents and seminar presentation .A detailed seminar report and and presentation of talk on the subject will be treated as term work.