T.E. Civil Engineering Syllabus

Water Resources Engineering -I

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work: 50 marks

Course objectives:

1. To impart the basic knowledge of importance of Hydrology & irrigation in water resources development
2. To know various hydrometeorological parameters and their estimation
3. To create awareness about floods, their estimation using various methods
4. To understand the importance of irrigation in Indian agricultural industry considering cropping patterns
5. To understand the principles of watershed management and water harvesting

Course Outcomes:

1. Apply the knowledge of estimation of hydrometeorological parameters
2. Design of efficient hydraulic structures
3. To develop different methods of efficient irrigation and water conservation
4. To develop the methods of consumptive use of surface water and groundwater

SECTION I

UNIT No 1 – (08)

Introduction of Hydrology: Definition, Importance and scope of hydrology, the hydrologic cycle,
Precipitation: Forms and types of precipitation, Methods of measurement, Graphical representation of rainfall - Mass rainfall curves, Hyetograph, Determination of average precipitation over the catchment. **Evaporation:** Proccess, factors affecting, measurement, and control of evaporation, **Infiltration:** Process, Factors affecting and measurement of Infiltration

UNIT No 2 – (06)

Runoff: Factors affecting runoff, Determination of annual runoff, Rainfall runoff relationship
Hydrograph: Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph – theory – assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

UNIT No 3 : (06)

Stream gauging: Selection of site, discharge measurement by Area velocity method, slope Area method
Floods: Estimation of peak flow-- empirical equations, rational method, Importance of --Design flood, standard project flood, maximum probable flood, Introduction to flood frequency analysis.

SECTION II

UNIT No 4 : (06)

Ground water hydrology: Occurrence, distribution and classification of ground water, Darcy's law, Acquifer parameters— Permeability, specific yield, specific retention, porosity, storage coefficient, Transmissibility,

Hydraulics of well under steady flow conditions in confined and unconfined aquifers, Specific capacity of well, Recuperation Test, constructional features of Tube wells and Open wells .

UNIT No 5 : **(08)**

Introduction to irrigation: Definition and necessity of irrigation, ill-effects of irrigation, surface, sub-surface, sprinkler irrigation, Water logging and land drainage,

Water requirement of crops:

Principal crops and crop seasons, cropping pattern and crop rotation, Classes and availability of soil water, depth and frequency of irrigation,

Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Assessment and efficiency of irrigation water. Gross command area, culturable command area and command area calculations based on crop water requirement.

Estimation of evapo-transpiration by blaney-criddle method and penman method,

UNIT No 6 : **(06)**

Minor Irrigation works : General layout, main components and functioning of –

1. Percolation tanks, 2. K.T.Weir, 3. Bandhara irrigation 4. Lift irrigation

Watershed Management: Need and importance of watershed management, Soil conservation measures, Techniques of Rainwater and groundwater harvesting.

TERM WORK:

Numerical Problems of the following' topics

1. Determination of average annual rainfall using Thiessens polygon & Isohyetal method
2. Determination of infiltration losses – phi index calculation, Hortons infiltration curve, effective rainfall hyetograph
3. To develop a unit hydrograph from a total runoff hydrograph resulting from isolated storms
4. Alteration of base period of given unit hydrograph using method of superposition and s-curve technique
5. Stream flow measurements – Area velocity and slope-area method
6. Flood frequency analysis using Gumbel's method.
7. Determination of well discharge in a confined/unconfined aquifer
8. Estimating depth and frequency of irrigation on the basis on soil moisture regime concept
9. Schematic layout of percolation tank & K.T.weir
10. A case study/report of lift irrigation scheme.
11. A Case study / report of a watershed management
12. Site visit & report on meteorological station.

RECOMMENDED TEXT BOOKS:

1. Irrigation Engineering – S. K. Garg – Khanna Publishers, Delhi.
2. Irrigation, Water Resources and Water power Engineering – Dr P.N. Modi
3. Irrigation and Water power Engineering – Dr Punmia and Dr. Pande – Laxmi Publications, Delhi
4. 'Engineering Hydrology' – Dr. K. Subramanya., -Tata McGraw Hill, New Delhi.
5. Hydrology – Dr. P Jayarami Reddy, Laxmi Publications, New Delhi
6. 'Engineering Hydrology' – Dr. Raghunath H.M. - New Age International Publishers.

7. Watershed Management in India – J.V.S.Murthy – Wiley Eastern Publications, Delhi.
8. Irrrigation Engineering – Dahigaonkar Asian Book Pvt Ltd
9. Irrigation Engineering, Raghunath, WILEY,

REFERENCE BOOKS:

1. R.K.Sharma, 'Hydrology and water resources', Dhanpatrai and sons, New Delhi.
2. Varshney, Gupta and Gupta, 'Theory and design of irrigation structures vol. I and II and III, Newchand and Brothers.
3. Michael, 'Irrigation Theory and practice', Vikas Publications House.
4. Jaspal Sing, M.S.Acharya, Arun Sharma, 'Water management', Himanshu Publications.
5. Design of M.I. and Canal Structure – Satyanarayan and R. Murthy.
6. Water and Soil Conservation – Ghanshyam Das.

Design of Steel Structures

Teaching Scheme:
Lecture: 4 hours per week

Examination scheme:
Theory paper: 100 marks

Course Objectives:

1. To understand the behavior of elements of steel structure.
2. To understand the design concept of steel structure.
3. To have sense of professional ethics

Course Outcomes:

After successul completion of course, the students will be able to

1. List the essential elements necessary to analyze steel structures.
2. Analyze and design different types of bolted & welded connections
3. Demonstrate the knowledge of common sections subjected tension & its design, tension & its design, concept of net area & gross area.
4. Analyze and design compression members (struts).
5. Analyze and design of steel column, column bases & its elements.
6. Analyze and design laterally supported & unsupported beams.
7. Calculate forces acting on the gantry girder & its design.

SECTION I

Unit No.	Contents	Period (Hrs)
1	**a)** Introduction to Design of steel structures, Design Philosophy, comparison of LSM & WSM, advantages and disadvantages of steel structures, types of steel structures, grades of structural steel, various rolled steel sections, loads and load combinations partial safety factors for load and materials, load calculation for roof trusses. **b)**Types of bolts & welds, analysis and Design of axially and eccentrically loaded bolted and welded connections (subjected to bending and torsion).	09
2	**Tension Members:** Common sections, Net area, modes of failure, load carrying capacity, Design of axially loaded tension members, Design of end connections (Bolted and welded).	08
3	**Compression Members as Struts** Common sections, economical sections, effective length, slenderness ratio, modes of failure, classification of cross section, behavior of compression member, load carrying	07

capacity, Design of compression members.

SECTION II

Unit No.	Contents	Period (Hrs)
4	**a) Columns :** Design of column subjected to axial and eccentric loading, design of lacing, battening system, column splices. **b) Column Bases** Design of slab bases & gusseted base subjected to axial and eccentric load and design of concrete pedestal	09
5	**Beams:** Types of sections, behavior of beam in flexure, design of laterally supported, unsupported beams and built up beam using flange plates, curtailment of flange plates, check for deflection, shear, web buckling & web crippling. Secondary and main beam arrangement, beam to beam connections.	08
6	**Gantry girder:** Forces acting on gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details.	07

Note:

1. Use of IS: 800-2007, IS: 875 part III and steel table is permitted for theory examinations.
2. The Design shall be as per IS: 800 – 2007 by limit state method.

RECOMMENDED BOOKS:

1. Design of Steel Structures, by Dr. N. Subramanian, Oxford University Press, New Delhi.
2. Limit State Design of Steel Structures: *V. L. Shah and* Veena Gore, Stuctures Publication, Pune.
3. Limit State Design of Steel Structures: S.K. Duggal, Tata Mc-Graw Hill India Publishing House
4. Design of Steel Structures: K.S. Sairam, Pearson
5. Design of steel structure by Limit State Method as per IS: 800- 2007: Bhavikatti S. S., I K International Publishing House, New Delhi
6. Limit state design in structural steel: Dr. M. R. Shiyekar, PHI publications.

REFERENCE BOOKS:

1. IS: 800 – 2007, IS: 875 (part I, II and III), SP6 (1) & SP 6 (6), IS: 816, IS: 808.
2. LRFD Steel Design: William T. Segui, PWS Publishing

3. Design of Steel Structures: Edwin H. Gaylord, Charles N. Gaylord James, Stallmeyer, Mc-Graw-Hill
4. Design of Steel Structures: Mac. Ginely T.
5. Design of Steel Structures: Dayaratnam, Wheeler Publications, New Delhi.
6. Design of Steel Structures: Punmia, A. K. Jain and Arun Kumar Jain, Laxmi Publication
7. Design of Steel Structures: Kazimi S. M. and Jindal R. S., Prentice Hall India.
8. Design of Steel Structures: Breslar, Lin Scalzi, John Willey, New York.
9. Steel Structure: Controlling Behaviour Through Design, Englekirk, WILEY.

Environmental Engineering – I

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work: 50 marks

Course Objectives:

1. To understand various sources of water with respect to quality and quantity of water.
2. To describe and design the various water treatment units.
3. To learn the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. To design the various components related to transmission and distribution of water.
5. To understand various water supply appurtenances.
6. To outline the principles of green building.

Course Outcome:

After successful completion of this course, the students will be able to

1. Describe the various sources of water with respect to quality and quantity of water.
2. Describe and design the various water treatment units.
3. Illustrate the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. Design the various components related to transmission and distribution of water.
5. Summarize the different water supply appurtenances.
6. Explain the principles of green building.

SECTION I

UNIT 1: **(06)**

Water: Sources of water, quantity & quality of sources, demand of water, factors affecting demand, fluctuations in demand, rate of water consumption, design period & population forecast.

Water quality parameters: Characteristics & significance in water treatment, drinking water quality standards- BIS, WHO.

Intake Works : Concepts of Intake well, Jack well and Rising main. Design of Intake well.

UNIT 2: **(06)**

Concept of water treatment process.

Aeration- Types of aerators, design of cascade aerator

Coagulation & Flocculation: Theory of coagulation and flocculation, destabilization of colloidal particles, factors affecting coagulation, types of coagulants, methods of dosing of coagulants, Jar tests, design of rapid mixer & flocculator.

Sedimentation- Theory, types of settling, types of sedimentation tanks. Design of vertical flow sedimentation tank. Concept of clariflocculator. Concept of tube & plate settler.

UNIT 3:

(06)

Filtration- Mechanism, head loss development, negative head loss.
Types of filters- Slow sand, Rapid sand, Multimedia & Pressure filters. Operation & design of rapid sand filter.
Disinfection- Mechanism, factors affecting disinfection, methods of disinfection, chemistry of chlorination, Forms of chlorination and practices.
Water softening processes - lime-soda process, ion exchange
Demineralization - Reverse osmosis, electro dialysis.Layout of water treatment units as per source.

SECTION II

UNIT 4:

(06)

Reservoirs: necessity, types, capacity determination by analytical & graphical method.
Transmission of water: pumping & gravity mains, choice of pipe materials,
forces acting on pressure pipes, concept of thrust block, corrosion types & control measures. Leakage & pressure testing of pipes.

UNIT 5 **(06)**

Water Distribution System: basic requirements, methods of distribution, layout patterns, methods of network analysis:Equivalent pipe, Hardy-Cross method,design problems.Use of software in network analysis.

UNIT 6 **(06)**

Water supply appurtenances: sluice valve, air relief valve, gate valve, non-return valve, scour valve, fire hydrants water meter, service connections, maintenance & leak detection of water distribution system.
Green building: Concept and materials, Energy and water budgeting

TERM WORK:

A. Analysis of any 08 of the following test parameters for water

1. pH
2. Acidity
3. Alkalinity
4. Chlorides content
5. Hardness – Total, temporary and permanent
6. Turbidity
7. Residual Chlorine
8. Total dissolved solids through measurement of electrical conductivity
9. Dissolved Oxygen
10. Most Probable Number
11. Optimum dose of alum by jar test.

B. Design/ Analysis problems on water treatment unit

C. Analysis of distribution system using software
D . Visit to a water treatment plant

RECOMMENDED BOOKS:

1. Manual of water supply and treatment by Government of India publication.
2. Water and Waste water Technology by Mark J. Hammer,John Wiely and Sons.
3. Introduction to Environmental Engineering by M. L. Davis and Davis A. Cornwell, Mc Graw Hill.
4. Environmental Engineering: A design approach by A.P. Sincero and G.A. Sincero. Prentice Hall of India.
5. Environmental Engineering by H.S. Peavy, D.R. Rowe. McGraw Hill
6. Water Supply Engineering by Dr. P. N. Modi, Standard Book House, New Delhi.
7. Water Supply Engineering by S. K. Garg, Khanna Publishers, New Delhi
8. Water Supply Engineering by Dr. B. C. Punmia, Laxmi Publishers, New Delhi

Geotechnical Engineering - I

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper:100 marks
Term Work: 25 marks
Practical & Oral: 50 marks

Course Outcome:

At the end of course student will be able to

1) Understand the index properties of soil.
2) Characterize the soil based on size, shape, index properties plasticity.
3) Understand the concept of total stress, effective stress pore water pressure in soil.
4) Understand the process of compaction and consolidation.
5) Understand the shear strength of soil.
6) Determine the earth pressure on retaining structures.
7) Perform different laboratory tests to determine index and engineering properties of soil.

SECTION-I

Unit 1 **Soil, its properties and basic relationships:** soil & soil structure, soil phase system, weight volume relationships, index properties of soil - unit weight, water content, specific gravity, void ratio, porosity, air content, degree of saturation and their relationships and its significance, particle size analysis (introduction to mechanical analysis and wet mechanical analysis), I. S. classification of soil, Cassagrande's Plasticity chart, soil consistency and indices. **6 hr**

Unit 2 **Permeability and Seepage**:
Darcy's law, Factors affecting permeability, introduction to Determination of coefficient of permeability by constant head, falling head method pumping in test and pumping out test. Permeability of layered soils
Seepage forces, Laplace equation, Flow net construction and applications for determination of seepage, Concept of effective neutral & total stress in soil mass., quick sand condition. **6 hr**

Unit 3 **Compaction:** phenomenon. Factors 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. Field compaction equipment and methods, Field control of compaction
Consolidation: Spring analogy, Terzaghi's theory of one dimensional consolidation, Lab consolidation test; cc, cv, mv and av
Determination of coefficient of consolidation-square root of time fitting method and logarithm of time fitting method. normally consolidated and over consolidated soils, Determination of pre consolidation pressure **6 hr**

SECTION – II

Unit 4	**Stress Distribution in Soil**: Boussinesq theory- point load, strip load, pressure distribution diagram on a horizontal, , pressure bulb, introduction to Newmark chart, Westergaard's theory- uniformly loaded rectangular area, contact pressure, approximate stress distribution method- equivalent point load method and 2:1 method.	**6 hr**
Unit 5	**Shear Strength:** Concept of shear stress and shear strength, Coulomb's theory and failure envelope, Total stress approach and effective stress approach, representation of stresses on Mohr's circle, Mohr-Coulomb's envelope for different types of soil such as c soil, phi soil and c-phi soil, Determination of Shear Strength: type of test - box shear test (UU, CU, CD), triaxial compression test (UU, CU, CD) unconfined compression test, vane shear test.	**6 hr**
Unit 6	**Earth Pressure**: Concept, Area of application, earth pressure at rest, active and passive condition. Rankines theory of earth pressure - dry/moist, submerged (partially and full), horizontal backfill with surcharge, backfill with inclined surcharge and Coulomb's theory of earth pressure	**6 hr**

Laboratory Experiments To Be Conducted

A) Experiments (Any 8)

1. Determination of water content by oven drying.
2. Specific gravity determination by pycnometer / density bottle.
3. Particle size distribution-Dry Mechanical sieve analysis
4. Particle size distribution-hydrometer analysis
5. Determination of consistency limits (minimum 2- LL, PL, SL) and its use in soil classification.
6. Field density test by core cutter
7. Field density test by sand replacement method
8. Determination of co-efficient of permeability by variable head method.
9. Standard proctor test/ Modified proctor test.
10. Direct shear test - CD

B) Demonstration (Any 2)

1) Particle size distribution-Sedimentation analysis (hydrometer)
2) Determination of co-efficient of permeability by constant head
3) Unconfined Compression Test
4) Triaxial shear test.
5) Vane shear test
6) One dimensional consolidation test.

Text Books & Reference Books

1) "Soil Mechanics and Foundation Engineering" by K. R. Arora, (Standard Publication)
2) "Text book of soil mechanics in theory and practice" by Dr. Alam Singh(Asian Publishing House, Bombay)
3) "Soil mechanics and Foundation engineering" by V. N. S. Murthy. (U. B. S. Publishers and distributors New Delhi)
4) "Soil mechanics and Foundation engineering" by B. C. Punmia.(A Saurabh and Company Pvt. Ltd., Madras)
5) "Geotechnical Engineering" by P. Purushottam Raj. (Tata Mcgraw Hill Company Ltd. New Delhi)
6) "Soil mechanics" by Terzaghi and Peak.(John Willey and Sons, New- York)
7) "Soil Testing" by T.W. Lambe.(Willey Eastern Ltd., New Delhi)
8) Geotechnical Engineering" by B. J. Kasamalkar.(Pune Vidyarthi Griha)

Transportation Engineering-I

Teaching Scheme	Examination Scheme:
Lecture : 3 hrs / week	Theory Paper: 100 marks
Practical :2 hrs / week	Term Work : 25 marks
	Oral Exam : 25 marks

Course outcome:

After completion of this course student should be able to……

1. Design features such as super-elevation sight distance section of road in cutting and filling
2. Design flexible and rigid pavement as per IRC.
3. Carryout quality control for WBM, BBM, and concrete pavements.
4. Design and plan airport, runways terminals buildings, hangers and aprons.
5. Plan different methods of tunnelling in soft and hard rocks
6. Plan and layout for docks and ports.

SECTION –I

Unit -I — **06**

Highway planning-Classification of roads, brief history of road development in India, present status of roads in India. NHAI, NHDP, PMGSY, MSRDC .

Geometric design of highways-Terrain classification, design speed, vehicular characteristics, highway cross-section elements Sight distance: introduction to sight distance, reaction time, analysis of safe sight distance, analysis of overtaking sight distance, intersection sight distance. Design of horizontal alignment: horizontal curves, design of super elevation and its provision, radius at horizontal curves, widening of pavements at horizontal curves, analysis of transition curves. Design of vertical alignment: different types of gradients, grade compensation on curves, analysis of vertical curves, summit curves, valley curves.

Unit-II — **06**

Pavement materials- Stone aggregates: desirable properties, tests, requirements of aggregates for different types of pavements. Bituminous materials: types, tests on bitumen, desirable properties, selection of grade of bitumen. Bituminous mix design: principle, methods, modified binders.

Design of pavements-Types of pavements, functions of pavement components, pavement design factors, design wheel load, equivalent single wheel load, repetition of loads, equivalent wheel load factors, strength characteristics of pavement materials, climatic variation; design steps of flexible highway pavement as per IRC 37-2001 and problems based on CBR method, Design of rigid pavement as per IRC 58-2002, Stresses in rigid highway pavements, , Joints in rigid pavements: transverse joints, longitudinal joints, fillers and sealers.

Unit-III	Traffic engineering- traffic characteristics, traffic studies. Highway construction- Types of roads: WBM, BBM, SDBC, DLC & PQC. Highway drainage- Necessity, surface draining, sub surface drainag	**06**

SECTION-II

Unit-IV	Airport Engineering- introduction, terminology, components of Aircraft, aircraft characteristics. Airport planning: airport surveys, site selection, obstructions. Runways: orientation, wind rose, basic runway length, geometric design, airport capacity, runway patterns. Taxiways, terminal buildings.	**08**
Unit-V	Docks and Harbour Engineering : introduction, planning and layout of ports, classification of ports and harbours,, site selection, break water, jetties,	**05**
Unit-VI	Tunnel Engineering: Introduction to tunnelling Tunneling in hard rock, and soft material, shield method, tunnel lining, safety measures, ventilation, lighting and drainage tunnelling.	**05**

Term work:

List of experiments

- Aggregate Impact Value
- Los Angles Abrasion Test
- Crushing test of aggregate
- Bitumen Penetration
- Softening Point
- Flash Point and Fire Point Test
- Ductility test
- Viscosity of bitumen
- Stripping value

At least two assignments on each unit including design problems

Reference Books

Khanna and Justo, 'Highway Engineering', Nemchand & Bros., Roorkee.

- Khistry, C.J., 'Transportation Engineering – An Introduction', Prentice Hall of India Ltd., New Delhi.
- S.K. Sharma, Highway Engineering
- Partha Chakraborty and Animesh das, Principles of Transportation Engineering, Prentice Hall, India
- Khanna and Arora, Airport Planning & Design, Nemchand Bros, Roorkee
- Rao G.V., Airport Engineering, Tata McGraw Hill
- Bindra S.P., Docks & Harbor Engineering, Dhanpat Rai, New Delhi
- R Shrinivasan, Harbor Dock and Tunnel Engineering
- S. C. Saxena , Tunnel engineering
- Wright, Highway Engineering, 7th Edition WILEY,
- Relevant IRC codes
- MORTH specification

Building Planning & Design

Teaching Scheme:
Lecture: 2 hours per week
Drawing:4 hours per week

Examination Scheme:
Term Work: 50 marks
Practical Oral Exam: 25 Marks

Course Learning Outcomes:

After successful completion of the course the student will be able to:

(i) Specify dimensions and space requirements for various elements of the building in relation to human body measurements.
(ii) Explain various principles of planning of buildings and architectural compositions
(iii) Plan and design various public buildings using principles planning
(iv) Illustrate the procedures for preparing perspective drawings of various objects as well as buildings.
(v) Prepare the submission and working drawings of various public buildings.
(vi) Design furniture, utilities and services of a building
(vii) Write a report on planning and design of a building under consideration.

Unit 1 (02)

Dimensions & space requirement in relation to body measurements space design for passage between walls, service access, stair, ramps, and elevators

Unit 2 (16)

Planning and Design, site selection, site layout for various types of building such as:

a) Educational buildings: Younger age range, middle age range

b) Building for health - health centers, hospitals

c) Assembly buildings- recreational halls, cinema theatres, restaurants, hotels, clubs

d) Business and mercantile buildings- shops, banks, markets and malls

e) Industrial buildings- factories, workshops, cold storages

f) Office buildings- administrative buildings, corporate office

g) Buildings for transportation- Bus stations, railway / metro stations

Unit 3 (05)

Elements of perspective drawings, parallel perspective and angular perspectives of different objects and small buildings

Unit 4 **(02)**

The nature of architecture- definition and scope of study, the aesthetic component of building terms such as mass, space, proportion, symmetry, balance, contrast, pattern.

TERMWORK

1. Sheet for human body dimensions for space design.
2. Planning and designing of a public building project for which drawings shall be prepared covering scope of:
   i) Municipal drawing
   ii) Layout plan
   iii) Plan giving details of water supply, drainage, electrification, furniture layout etc.
   iv) Elevation treatment.
3. Perspective view of the buildings planned above.
4. Two alternative line plans of buildings on graph paper of at least five remaining types of buildings not covered in 2.
5. Two exercises on parallel and angular perspective of simple objects on half imperial sheets.
6. Report for the building project stated in 2, including necessary sketches and design details.
7. Visit to a building complex and a report based on that.
8. One exercise of preparing a plan and elevation on CAD.

REFERENCES

Text Books:

i) Building Drawing with an integrated approach to Built-Environment - Shah, Kale and Patki Tata Mcgraw Hill co. 5th edition.
ii) Principles of Building Drawing – M.G.Shah and C.M.Kale
iii) Planning and Designing Building – Y.S.Sane, Modern Publication House, Pune
iv) Building Planning – Kumar Swami, Thorotar Publication
v) Civil Engineering Drawing – M.Chakaborty

T.E.Civil Sem.VI (Part-II)

THEORY OF STRUCTURES

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work: 25 Marks

Course outcome-
After successful completion of this course students should be able to-
1. Know the concept of determinacy and indeterminacy.
2. Apply appropriate solution techniques to the problem.
3. Analyze indeterminate structures by using different methods.
4. Interpret the output of different methods
5. Aware of the limitations of the methods of solution and their outcomes.

SECTION I

Unit 1 A) Concept of determinacy and indeterminacy, Degrees of freedom and structural redundancy, Methods of analysis. (No numerical). **08**
B) Consistent deformation method: propped cantilever with uniform section, fixed beam, portal frame.

Unit 2 **Force Method:** Energy Theorems- Betti's Law, Maxwell's reciprocal theorem, Castiglione's theorem and unit load method. Statically indeterminate beam, truss (lack of fit and temperature variation effect), two hinged parabolic arch with supports at same level.(Degree of S.I. ≤ 2). **08**

Unit 3 **Force method:** Clapeyron's theorem of three moments continuous beam, sinking of support, beam with different M.I. **08**

SECTION II

Unit 4 **Displacement Method:** **08**
Slope deflection equation method, Modified slope deflection equation application to beams, sinking of supports, portal frames without sway. (Degree of K.I. ≤2)

Unit 5 **Displacement Method:** **08**
Moment distribution method: application to beam, sinking of supports, portal frames without and with sway. (Degree of S.I. ≤2).

Unit 6 **Matrix Methods:** **08**
Flexibility coefficients, development of flexibility matrix, analysis of beams and portals, Stiffness coefficients, development of stiffness matrix, analysis of beams and portals (Degree of S.I. < 2)

TERM WORK-

Term work shall consist of minimum six assignments based on above syllabus with at least four problems from each unit.

RECOMMENDED BOOKS

1. Basic Structural Analysis: *C.S. Reddy*, Tata McGraw Hill Publishing House, New Delhi.

2. Mechanics of Structures (Vol-I and II) : *S. B. Junnarkar H.J. Shah*, Charotar Publishers.

3. Structural Analysis: *L.S. Negi and R.S. Jangid*, Tata Mc-Graw Hills Publishing House, New Delhi

4. Analysis of Structures: Vol. I II, *Vazirani and Ratwani,* Khanna Publishers

5. Structural Analysis: *Bhavikatti*, Vikas Publishing House Pvt, ltd.

6. Structural Analysis: *Devdas Menon*, Narosa Publishing House.

7. Basic Structural Analysis: K.*U. Muthu, Azmi Ibrahim, M. Vijyan, Maganti Janadharn. I.K.* International Publishing House Pvt. Ltd.

8. Structural Analysis- Matrix approach by Pandit & Gupta.

9. Matrix analysis of structures by Gere & Weaver.

10. Indeterminate structural analysis by C.K. Wang.

Geotechnical Engineering - II

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work: 50 marks

Course Outcome:

At the end of course student will be able to

1. Know different soil/rock strata and use of this data for interpretation of bearing capacity
2. Understand the importance and basics of foundation engineering in the civil engineering projects.
3. Understand the classical theories of load bearing capacity and settlement of foundations.
4. Understand the geotechnical aspects of shallow and deep foundations
5. Understand the concepts of the stability of slopes and study various methods of evaluating the stability of slopes.
6. Understand the various concepts of modern foundation techniques.

SECTION-I

Unit 1 — **Soil & Rock Exploration:** — **6 hr**

Necessity, Planning, No & depth of bore holes, Exploration Methods- auger boring (hand and continuous flight augers), and wash boring, rotary drilling. Soil sampling- disturbed and undisturbed, Rock drilling and sampling, Mechanical properties of rock, behaviour of rocks in uniaxial compression, tensile strength of rocks, Core barrels, Core boxes, core recovery, RQD.

Unit 2 — **Bearing Capacity Evaluation:** — **6 hr**

Definitions, Modes of failure, Terzaghi's bearing capacity theory, I.S. Code method of bearing capacity evaluation & computation (IS 6403), Effect of various factors on bearing capacity(Size & Shape, Depth, WT, Eccentricity), Bearing capacity evaluation from Plate load test, S.P.T. (By I.S. Code method) and pressure meter tests with detailed procedure

Unit 3 — **Shallow Foundation:** — **6 hr**

Types and their selection, minimum depth of footing, Assumptions & limitations of rigid design analysis. Design of Isolated, combined, strap footing (Rigid analysis), Raft foundation (elastic analysis), floating foundations (R.C.C. Design is not expected)

Foundation Settlement:

Immediate settlement- computations from I.S. 8009- 1976 (Part I) approach, consolidation

Settlement computations, Concept of total settlement, differential settlement and angular distortion.

SECTION - II

Unit 4 **Pile Foundation**:

Classification and their uses, single pile capacity evaluation bystatic and dynamic methods, pile load test. Negative skin friction, Group action piles, spacing of piles in a group, Group efficiency. Under reamed piles – equipment, construction and precautions **6 hr**

Unit 5 **Well foundations, , Caisson, , Sheet pile, coffer dam :**

Element of wells, types, methods of construction, tilt and shift, remedial measures.

Pneumatic caissons: sinking method- Sand island method, Caisson disease. **6 hr**

Types and material used for sheet piling

Common types of cofferdams, Soil pressure distribution, Braced cofferdam.

Unit 6 **Stability of Slope:**

Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil, Taylor's stability number, Swedish slip method and concept of Friction circle method, Landslides **6 hr**

Modern Foundation Techniques:

Stone columns, Vibroflotation, Preloading technique, Civil engineering application of geo synthetics,

geo textile & geo membrane.

TERM WORK:

1. Preparation of detailed bore log analysis at least for 3 different soil and rock strata.
2. Method of calculation of bearing capacity based on unconfined compressive strength of rock core samples.
3. Calculate bearing capacity by Terzaghi's method
4. Calculate bearing capacity by IS code method
5. Detailed description and calculation of bearing capacity and settlement using plate load test data with critical comment on load settlement curve
6. Design of shallow foundation – isolated, combined, raft foundation with settlement
7. Design of pile foundation – individual and group action
8. Calculation of factor of safety for infinite slope
9. Calculation of factor of safety for finite slopes by using Swedish circle method
10. Visit to foundation construction sites and preparation of the report.

RECOMMENDED BOOKS:

1. Foundation Engineering by B.J. Kasamalkar
2. Soil Mechanics and Foundation Engg. by V.N.S.Murthy
3. Soil Mechanics and Foundation Engg. By K.R.Arora
4. Soil Mechanics and Foundation Engg. by B.C. Punmia
5. Foundation design manual-Dr. N.V. Nayak. Dhanpat Rai and Sons
6. Foundation Engineering by S.P.Brahma

7. Principles of Geotechnical Engg. By Braja Das
8. Foundation analysis & design by J.E.Bowles
9. Foundation design by W.C.Teng

Engineering Management

Lectures – 4hrs per week Theory: **100 Marks**

SECTION-I

Unit 1: Introduction to Management **(5)**

a) Importance, Principles of Management (Henry Fayol)
b) Functions of Management:
Planning- Importance, Nature, Process
Organizing – Types
Staffing – Importance, Process
Directing – Supervision, Co-ordination, Communication, Motivation, Leading
Controlling – Importance, Techniques.
c) Decision Making: Process, decision Tree (Concept Only)

Unit 2: Quantitative Techniques **(7)**

a) Linear Programming – Simple LP model, Graphical Method, Simplex Method (Concept Only)
b) Transportation Problem, Assignment Model.
c) Sensitivity Analysis (Concept Only)

Unit 3: Material Management **(6)**

Objectives, Need for Inventory Control, EOQ Analysis, ABC analysis, Safety Stock, Purchase Procedure, Stores Record

SECTION-II

Unit 4: Economics **(10)**

a) Importance, Time Value of Money, Equivalence
b) Economic Comparison Methods: Present Worth Method, EUAC method, Capitalized Cost method, Net Present Value, Rate of Return, Benefit- Cost Ratio, Payback Period Method, and Linear Break Even Analysis.

Unit 5: **(4)**

a) Site Organization and Site layout
b) Legal Aspects: Workmen's Compensation Act, Minimum Wages Act, Child Labour Act, Building and other construction worker's act.

Unit 6: **(4)**

a) Value Engineering (Concept only)
b) Work Study (Introduction)
c) Quality Management: Quality Circle, ISO 9000, Sampling and Testing

Course Outcome:

On Completion of this course, Students will be able to

1) Understand the importance of management in Construction
2) Apply the Quantitative Techniques in practice
3) Understand and apply Techniques of Material Management
4) Use the concept of Engineering Economy
5) Understand the importance of legal aspects in construction
6) know the advance techniques used in Management

Term Work:

Minimum two assignments based on each unit.

References:

1. Engineering Management – Stoner
2. Principles of Management – Davar
3. A Text book of Management – A.S.Deshpande
4. Essentials of Management – Koontz, Dounell and Weigrick
5. Management and Organization by Kast and Rosinweig
6. Operation Research – S.H.Deshpande
7. Operation Research – Wagner Wikey Easter Ltd., new Delhi
8. Quantitative Techniques in Management – Vol. I, L.C.Zhamb
9. Material Management – Gopal Krishnan, Sdueshan
10. Executive Decisions & Operation Research by Miller and Stars, Prentice Hall of India, Publisher.
11. Principles of Construction Management by Roy Pilcher.
12. Project Cost Control in Construction by Roy Pilcher.
13. Projects by Prasanna Chandra
14. Management and Engineering Economics by G.A.Taylor.
15. Engineering Economics – Layland Blank and Torquin.
16. Engineering Economics by Pannerselvam
17. Work Study by O.P.Khanna
18. Industrial Engineering and Production management by Martand Telsang
19. John L.Ashford, " The Management of Quality in Construction ", E & F.N Spon, New York, 1989.
20. Juran Frank, J.M. and Gryna, F.M. " Quality planning and Analysis ", Tata McGraw Hill, 1982.
21. James, J.O Brian, " Construction Inspection Handbook - Quality Assurance and Quality Control ", Van Nostrand, New York, 1989.
22. Relevant Acts

Environmental Engineering – II

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week
Oral : 25Marks

Examination scheme:
Theory paper: 100 marks
Term Work: 25 marks

Course Objectives:

1. To describe wastewater, its sources, characteristics and collection systems.
2. To design the various treatment processes for wastewater treatment.
3. To describe and design various low cost treatment processes for wastewater treatment.
4. To interpret various methods of wastewater disposal.
5. To explain various aspects of solid waste management.
6. To outline the effects of air pollution and its control measures.
7. To understand legal aspects related environmental protection.

Course Outcomes:

At the end of this course students will be able to learn to,

1. Explain sources, characteristics and methods of wastewater collection.
2. Design the primary and secondary wastewater treatment units.
3. Design low cost wastewater treatment units.
4. Apply the knowhow of effluent standards for wastewater disposal as per norms.
5. Explain the necessity and importance of solid waste management.
6. Describe air pollution, its effect and controlling techniques.
7. Summarize different legal aspects related to environment protection for sustainable development.

SECTION I

UNIT 1: **(06)**

Wastewater: Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal waste water, Problems on B.O.D. calculations, Quantity of storm water, Ground water infiltration.

Sewerage system: Types, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems Sewage and Sludge pumping, Location, Capacity, Types of pumps, Pumping station design

UNIT 2: **(06)**

Primary Treatment: Screening, comminuting, Grit removal, Oil and Grease trap Primary settling tank.

Secondary Treatment: Activated sludge process, Process design and operating parameters, modification of ASP, Operational problems,
Concept of trickling filter, Secondary Settling Tank

UNIT 3: **(06)**

Sludge: Characteristics, Treatment and disposal, Concept of anaerobic digestion, types of reactors.

Low cost wastewater treatment methods-Principles of waste stabilization pond. Design and operation of oxidation pond, aerobic & anaerobic Lagoons, Aerated Lagoon, Oxidation ditch, Septic tank. Selection of alternative Treatment process flow sheets, Concept of recycling and reuse of sewage.

SECTION II

UNIT 4: **(06)**

Stream pollution: Classification, Concept of Self Purification and DO sag curve. Streeter Phelp's Equation.
Disposal of wastewater: methods, effluents standards for stream and land disposal as per MPCB and CPCB standards and legislation.
Concept of environmental impact assessment.

UNIT 5: **(06)**

Solid waste management: Definition, types, sources, characteristics. Functional outlines, Generation, storage, Collection, Processing techniques.
Methods of treatment of solid waste, Composting, Incineration, Pyrolysis and Sanitary land filling.
Concept of Hazardous waste management

UNIT 6: **(06)**

Air Pollution-Definition, Sources and classification of pollutants, Effects on man material and vegetation.
Introduction to Meteorological aspects such as atmospheric stability, mixing heights, and plume behavior.
Control of industrial air pollution-Settling Chamber, Bag Filters, Cyclone separators, Scrubbers, Electrostatic precipitators,
Introduction to global issues – Global warming, Acid rain, Ozone depletion, Photochemical Smog. Ambient air quality standards.

TERM WORK:

Term work shall consist of the following:

A. Characterization of Municipal Waste water (Any 5 of the following):
   1. pH
   2. Alkalinity
   3. Solids
   4. Chlorides
   5. DO
   6. BOD
   7. COD
   8. Sulphates
   9. Oil & grease
   10. Volatile acids

B. Demonstration of HVS and Auto exhaust analyzer.
C. Design of sewerage system and treatment system for a small urban area
D. Visit to sewage treatment plant.

RECOMMENDED BOOKS:

1. Peavey, H. S. Rowe, D.R., Environmental Engineering, McGraw-Hill Book Company.
2. Waste water Engineering, P. N. Modi.
3. Viessman W. and Hammer M.J. Water supply and pollution Control, Harper Collins College publishers.
4. Hammer M.J. Water and Waste water Technology, Prentice-Hall of India Private Limited.
5. Water Supply & Sanitary Engineering, G. S. Birdie, Dhanpat Rai & Sons, New Delhi.
6. Manual on sewerage and sewage Treatment-Government of India Publication.
7. Masters. G. M. Introduction to Environmental Engineering and Science.
8. Rao. M. N. and Rao H.V. Air pollution, Tata McGraw Hill, 1990.
9. Canter, Environmental Impact Assessment, TMH Publication.
10. Manual on Municipal Solid Waste Management, Ministry of Urban Development Govt. of India.

Structural Design and Drawing - I

Teaching Scheme:
Drawing: 4 hours per week

Examination scheme:
Term Work: 50 marks
Oral Exam: 25 marks

The term work shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

a) Design of industrial building including roof truss, purlin, bracings, gantry girder, column, column base and connections. Three full imperial size drawing sheets.

b) Design of any one of the following

1. Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and connections. One full imperial size drawing sheets.

2. Design of building including primary and secondary beams, column, column base and connections. One full imperial size drawing sheets.

3. Design of Foot Bridge: Influence lines, cross beam, main Truss, Raker, joint details, support details.

Note:

1. Analysis and design shall be compared with the results of any standard software package.
2. The Design shall be as per IS: 800 – 2007 by limit state method.

Engineering Geology

Teaching Scheme:
Theory : 3 hours per week
Practical: 2 hrs per week

Examination scheme:
Term Work: 50 marks

Unit: 1 Introduction and Physical Geology (8)

Definition, Scope and subdivisions, Application of Geology in civil engineering.
About the Earth. Interior of the Earth, Basic Seismology, Volcanos. Weathering, Types of weathering, mountains and mountain building. Geological work of River and Wind in the process of erosion, deposition and transportation

Unit: 2 Mineralogy and Petrology (6)

Definition of mineralogy, some rock forming mineral groups.
Definition of petrology, Rock cycle.
Igneous Rocks: Formation, classification, textures, structures.
Secondary Rocks: Formation, classification, textures, structures.
Metamorphic Rocks: Agents and Types of Metamorphism, Products of Metamorphism, structures of metamorphic Rocks.
Engineering properties of Rocks, characteristics of good building stone, and building stones in India.

Unit: 3 Structural Geology (4)

Outcrop, strike and dip, folds, faults, joints, unconformities, overlap, outliers and inliers, Civil Engineering considerations of Geological structures

Unit: 4 Groundwater and Landslides (6)

Sources of ground water, water table, zones, porosity and permeability, Types of aquifers, occurrence of groundwater in Deccan Traps.
Importance of groundwater investigation in civil engineering projects- Groundwater prospecting
Landslides:Types, causes, prevention.

Unit: 5 Geological Investigations and Geology of Dams (6)

Preliminary geological investigations, Core drilling, core logging. Influence of Geological conditions on location, alignment and type of dam, site improvement techniques, dams on various types of rocks and structures.

Unit: 6 Geology of tunnel and Remote Sensing (6)

Geology of Tunnel:Influence of geological conditions on tunnelling, difficulties during tunnelling, Tunnelling in Deccan traps. Geological Considerations for Roads and bridges

Remote Sensing: Introduction, Basic concepts of remote sensing, Airborne and space born sensors, Passive and active remote sensing. EMR Spectrum, Energy sources and radiation Principles, Energy interactions in the atmosphere. Energy interactions with earth surface features. Applications of Remote Sensing in Civil Engineering.

References:

1. Engineering and General Geology - Prabin Singh, S. K. Katariya and Sons, Delhi.1984, 1st Edition.
2. Engineering Geology for Civil Engineering - Dr. D. V. Reddy, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1995, 1st Edition.
3. Engineering Geology - B. S. SathyaNarayanswami, DhanpatRai and Co. (P). Ltd.Delhi.
4. Principles of Engineering Geology - K. M. Bangar Standard Publishers Distributors 1705-B NaiSarak, Delhi.
5. Textbook of Engineering Geology - N. ChennaKesavulu, Macmillian India Ltd. 2/10 Ansari Road Daryanganj, New Delhi.
6. Introduction to Remote Sensing - J.B.Cambell, Taylor and Francis, UK, 2002
7. Principles of Petrology - G. W. Tyrrell, B. I. Publication Pvt. Ltd., New Delhi.
8. Principles of Physical Geology - A. Holmes, ELBS Chapman and Hall, London.
9. Structural Geology - M. P. Billings, Prentice Hall of India Private Ltd., New Delhi.
10. A Text Book of Geology - P. K. Mukerjee, The World Press Pvt. Ltd., Calcutta.
11. Geology Hand book in Civil Engineering - R. F. Legget, McGraw-Hill, New York.Principles of Engineering Geology and Geotechnics - D. P. Krynine and W. R.Judd, CBS Publishers and Distributors, New Delhi.Engineering Properties of Rocks - L. W, Farmer, Chapman and Hall, London.Experiments in Engineering Geology - K. V. G. K. Gokhale and D. M. Rao, TMN, New Delhi.
12. A Text Book of Engineering Geology - R. B. Gupte, Pune VidyarthiGrihaPrakashan, Pune.
13. Groundwater Hydrology - Todd D. K., John Wiley and Son, New York.
14. Engineering Geology Laboratory Manual.
15. Rultey's Elements of Mineralogy - H. H. Read, CBS Publishers and Distributors, Delhi
16. Remote Sensing and Image Interpretation - T.M. Lillesand and R.W. Kiefer, John Wiley & Sons, Singapore, 2002.

TE Civil (Semester VII – Part II)
7.a) Seminar

Teaching Scheme:
Practical: 2 hours per week

Examination Scheme:
Term Work: 50 marks

The topic for the seminar may be related to Civil Engineering area and interdisciplinary area related to Civil Engineering such as-

1. Structural Engineering
2. Concrete Technology
3. Environmental Engineering
4. Geotechnical Engineering
5. Transportation Engineering
6. Infrastructural Engineering
7. Water resources Engineering
8. Town & Country Planning
9. Construction Engineering
10. Surveying & Remote Sensing Techniques
11. Project management
12. Legal aspects in Civil Engineering
13. Earthquake Engineering
14. Disaster management
15. Advanced Geology and Remote Sensing
16. Advanced Construction Technology
17. Advanced Engineering Construction Materials
18. Advanced Engineering Construction Methods
19. Planning and Design of Special Buildings
20. Finance Management
21. Engineering Geology

TE Civil (Semester VII – Part II)

7. b) Vacation Field Training

Examination scheme:
Term Work: 25 marks

ASSESSMENT ON VACATION FIELD TRAINING (20 DAYS)

The students are required to undergo rigorous field training in Civil Engineering for 20 days at the end of 6th & 7th semester and before the commencement of 8th semester. Students shall submit the report of the field training taken and necessary certificate from the organization where such training is undertaken.

The Report Should Consist:

1. Daily Material Consumption Report
2. Daily Work Progress Report
3. Daily Muster of Labours on Site
4. Site Layout
5. Site Details (Includes Plan)
6. Bar Chart of Work Done

Note: Evaluation of Report by External Examiner from other college should be done at the end of 8th semester