

LIST OF ELECTIVES

Elective-I

<u>S.No.</u>	<u>PAPER CODE</u>	<u>PAPER NAME</u>
1.	TCE 011	Matrix Analysis of Structures
2.	TCE 012	Seismic Analysis of Structures
3.	TCE 013	Design of Waste Water System
4.	TCE 014	Transportation System & Planning
5.	TCE 015	Plastic Design of Steel Structures
6.	TCE 016	Fluvial Hydraulics and Ground Water Modelling

Elective-II

<u>S.No.</u>	<u>PAPER CODE</u>	<u>PAPER NAME</u>
1.	TCE 021	Finite Element & Finite Difference Methods
2.	TCE 022	Advanced Foundation Design
3.	TCE 023	Traffic Engineering
4.	TCE 024	Computer Aided Design
5.	TCE 025	Theory of Elasticity & Plasticity

Elective-III

<u>S.No.</u>	<u>PAPER CODE</u>	<u>PAPER NAME</u>
1.	TCE 031	Advanced Concrete Design
2.	TCE 032	Reliability Based Design
3.	TCE 033	Environmental Pollution control
4.	TCE 034	Fundamentals of Remote Sensing and GIS
5.	TCE 035	Open Channel Flow

THU 501

INDUSTRIAL ECONOMICS AND PRINCIPLES OF MANAGEMENT

Industrial Economics:

Unit –1.Introduction: Nature and significance of Economics. Meaning of Science, Engineering and Technology and their relationship with economic development. 4

Unit –2. Basic Concept: The concept of demand and supply. Elasticity of Demand and Supply. Indifference Curve Analysis, Price Effect, Income Effect and Substitution Effect. 6

Unit –3. Money and Banking: Functions of Money, Value of Money, Inflation and measures to control it. Brief idea of functions of banking system, viz., Commercial and central banking, Business fluctuations. 8

Management:

Unit –4. Introduction: Definition, Nature and Significance of Management,. Evaluation of Management thought, Contributions of Max Weber, Taylor and Fayol. 10

Unit –5. Human Behaviour: Factors of Individual Behaviour, Perception, Learning and Personality Development, Interpersonal Relationship and Group Behaviour. 10

References:

1. Dewett, K.K. / Modern Economic Theory/S.Chand & Co.
2. Luthers Fred/ Organizational Behaviour.
3. Prasad L.M./ Principles of Management.
4. A.W. Stonier & D.C. Horgne / A TextBook of Economic Theory/ Oxford Publishing House Pvt. Ltd.

TCE - 501

STRUCTURAL ANALYSIS II

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method. 8

UNIT – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust. 8

UNIT – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. 8

UNIT – 4

Basics of Force and Displacement Matrix methods for beams and trusses. 8

UNIT – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames. 8

Text Books

1. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.
2. Structural Analysis by C. S. Reddy, Tata Mc Graw Hill Publishing Company Limited, New Delhi.

References

1. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee.
2. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
3. Analysis of Statically Indeterminate Structures by P. Dayaratnam, Affiliated East-West Press.
4. Indeterminate Structural Analysis by C. K. Wang.
5. Introduction to Matrix Methods of Structural Analysis by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.
6. Matrix Analysis of Framed Structures by Weaver and Gere.
7. Theory of Structures Vol. II by Vazirani & Ratwani.
8. Influence Line Diagrams by Dhavilkar.

TCE - 502**CONCRETE STRUCTURE I**

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. 8

UNIT – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method. 8

UNIT – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. 8

UNIT – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations. 8

UNIT – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. 8

Note : All designs shall be conforming to IS : 456 – 2000.

Text Books

1. IS : 456 – 2000.
2. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.
3. Reinforced Concrete Design by P. Dayaratnam.

References

1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. Reinforced Concrete Structures by R. Park and Pauley.
3. Reinforced Concrete Design by S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.

TCE - 503 TRANSPORTATION ENGINEERING I

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction : Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern.

Geometric Design : Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. 8

UNIT – 2

Traffic Engineering : Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection. 8

UNIT – 3

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC : 58 – 2002). 8

UNIT – 4

Road Construction Methods : WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction. 8

UNIT – 5

Airport Engineering : Air craft characteristics, types of airports, layout of airports, airport planning & design, runway orientation, wind-rose diagram, estimation of runway length & correction. 8

Text Books

1. Highway Engineering by S. K. Khanna & C.E.G. Justo.
2. Airport Planning & Design by S. K. Khanna, M. G. Arora & S. S. Jain.

References

1. Transportation Engineering by L. R. Kadiyali.
2. Highway Engineering by S. K. Sharma
3. Principles of Transportation Engineering by P. Chakraborty & A. Das.

TCE – 504

GEOTECHNICAL ENGINEERING – I

L – 3, T – 1

CT – 30, TA – 20, ESE - 100

UNIT – 1

Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Clay minerals, Index properties, Particle size analysis, Soil classification. 8

UNIT – 2

Soil-water systems, capillarity-flow, Darcy's law, permeability, field and lab tests, piping, quick sand condition, seepage, flow nets, flow through dams, filters. Soil compaction, water content – dry unit weight relationships, OMC, field compaction control, Proctor needle method. 8

UNIT – 3

Effective stress principle, Stresses due to applied loads, Boussinesq and Westergaard equations.

Compressibility and consolidation characteristics, Rate of consolidation, Terzaghi's one dimensional theory of consolidation and its applications, Over Consolidation Ratio, determination of coefficient of consolidation and secondary consolidation (creep), consolidation under construction loading. 8

UNIT – 4

Shear strength - direct & triaxial shear tests, Mohr – Coulomb strength criterion, drained, consolidated, undrained and unconsolidated tests, strength of loose and dense sands, Normally Consolidated and Over Consolidated soils, dilation, pore pressure, Skempton's coefficient. 8

UNIT – 5

Stability of slopes with or without pore pressure, limit equilibrium methods, methods of slices and simplified Bishop method, factor of safety.
Soil stabilization, Introduction to geosynthetics, classification, functions and its field application. 8

Text Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering

References

1. Alam Singh – Modern Geotechnical Engineering
2. Brij Mohan Das – Geotechnical Engineering
3. I.H. Khan – Text Book of Geotechnical Engineering
4. C. Venkataramaiah – geotechnical Engineering
5. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
6. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics

TCE – 551

Structural Analysis Lab.

P – 3

TA – 25, ESE – 25

1. To determine the Flexural Rigidity (EI) of a given beam.
2. To verify Maxwell's Reciprocal Theorem.
3. To find horizontal thrust in a three – hinged arch and to draw influence line diagrams for horizontal thrust and bending moment.
4. To find horizontal thrust in a two – hinged arch and to draw influence line diagrams for horizontal thrust and bending moment.
5. To find carry over factor for the beam with far end fixed.
6. To find deflection of curved member.
7. To find bar forces in a three member structural frames with pin jointed bar.
8. To find critical load in struts with different end conditions.
9. To find forced in elastically coupled beams.
10. To find deflections in beam having unsymmetrical bending.

TCE – 552
Concrete Lab.

P – 3

TA – 25, ESE – 25

1. Compressive Strength of Concrete.
2. Workability by Compaction Factor, Slump Test.
3. Determination of Constituents of Hardened Mortar.
4. Mix Design by IS Code Method.

TCE – 553
TRANSPORTATION ENGINEERING LAB.

P – 3

TA – 25, ESE – 25

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer or Enoscope)

References

1. Highway Material Testing by S. K. Khanna & C. E. G. Justo
2. Highway Material Testing by A. K. Duggal

TCE – 601
ENVIRONMENTAL ENGINEERING – I

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

Sources of water: Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir. 8

UNIT-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures. 6

UNIT-3

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system.

Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply. 8

UNIT-4

Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.

Storm water: Collection and estimation of storm water by different formulae.

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines; small bore sewer systems. Planning of sewerage systems. Institutional and industrial wastewater management. 9

UNIT-5

Air pollution: Composition and structure of atmosphere; units of measurement, sources of pollutants, classification of pollutants and their effects, air quality monitoring and standards.

Brief introduction to Control devices for particulate contaminants – gravitational settling chambers, centrifugal collectors, wet collectors, fabric filters and electrostatic precipitators; control devices for gaseous contaminants; automotive emission control, concept of clean and biofuels.

Noise pollution: Definition of decibel, sound power level, sound intensity level and sound pressure level; measurement of noise level; basic concept of community noise, transportation noise and industrial noise; acceptable outdoor and indoor noise levels; effects of noise and control measures.

Introduction to Solid waste management and environmental impact assessment. 9

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology
7. Raju: Water Supply and Wastewater Engineering
8. Sincero and Sincero: Environmental Engineering: A Design Approach
9. Pandey and Carney: Environmental Engineering
10. Rao: Textbook of Environmental Engineering
11. Davis and Cornwell: Introduction to Environmental Engineering
12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. Nevers: Air Pollution Control Engineering
18. Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and Technology
19. Suess and Craxford: W. H. O. Manual on Urban air Quality Management
20. W. H. O.: Selected Methods of Measuring Air Pollutants
21. Cunniff: Environmental Noise Pollution

22. Kreith: Handbook of Solid Waste Management
23. Vesilind, Worrell and Reinhart: Solid Waste Engineering
24. Canter: Environmental Impact Assessment
25. Cheremisinoff and Morresi: Environmental Assessment and Impact Assessment Handbook.

TCE - 602
CONCRETE STRUCTURE II

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method). 8

UNIT – 2

Analysis and design of beam curved in plan. 2
Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing. 6

UNIT – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. 6

Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert. 4

UNIT – 4

Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground / underground, design of overhead tanks. 8

UNIT – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section. 8

Text Books

1. IS : 456 – 2000.
2. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.

References

1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. Reinforced Concrete Structures by R. Park and Pauley.
3. Reinforced Concrete Design by P. dayaratnam.

TCE – 603
GEOTECHNICAL ENGINEERING – II

L – 3, T – 1

CT – 30, TA – 20, ESE - 100

UNIT – 1

Review of principles of soil mechanics.

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ test, SPT, CPT, DCPT, pressure meter test, geophysical exploration-brief description, resistivity, reflection and refraction methods, Sub-soil investigation report. 8

UNIT – 2

Earth pressure theories, Coulomb and Rankine approaches for $c-\phi$ soils, smooth and rough walls, inclined backfill, depth of tension crack, graphical solutions, types of retaining structures. 8

UNIT – 3

Types of foundations – shallow / deep, isolated, combined, mat, etc., Definitions, Bearing capacity of shallow foundations (Terzaghi analysis), general, local and punching shear failures, corrections for size, shape, depth, water table, Bearing capacity by consolidation method, insitu bearing capacity determination, Provisions of IS code of practice, selection of depth of footing, eccentrically loaded footings. 8

UNIT – 4

Classifications of piles, loading capacity of single pile in clay, silt and sand by static methods. Pile groups, under-reamed piles – their design and construction, negative skin friction, pile load test, well foundations – various parts, forces acting on well. 8

UNIT – 5

Machine foundations, classification, definitions, vibration analysis by mathematical model, design principles in brief.

Ground improvement techniques, methods for difficult and problematic ground conditions-soft soils, loose sands, expansive soils, etc., preloading, vertical drains, stone columns, grouting methods. 8

Text Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering

References

1. J.E. Bowles – Foundation Analysis and Design
2. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
3. C. Venkataramaiah – Geotechnical Engineering
4. M.J. Tomilson – Foundation Design
5. Purshotham Raju – Ground Improvement

TCE - 604

ESTIMATION & CONSTRUCTION MANAGEMENT

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Importance of estimation, different types of estimates, specifications : general and detailed. Methods of estimation, Estimates of RC works, Estimates of Buildings. 8

UNIT – 2

Analysis of rates, Prime cost, Work charge establishment, Quantity of materials per unit of work for major Civil Engineering items, Resource planning through analysis of rates, market rates, P.W.D. schedule of rates and cost indices for building material and labour. Introduction to Valuation. 8

UNIT – 3

Project cycle, Organisation, Planning, Scheduling, Monitoring, Updating and Management System in Construction. Bar Chart, Milestone charts, Work down structure and preparation of networks. Application of network, Techniques like PERT, GERT, CPM, AON and AOA techniques. 8

UNIT – 4

Project monitoring, cost planning, resources allocation through network techniques. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method, equivalent annual cost method, discounted cash flow method, Depreciation and break even cost analysis. 8

UNIT – 5

Legal aspects of contracts, their relative advantages and disadvantages, Different types of contracts, their relative advantages and disadvantages, Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tender preparation, process of tendering, Evaluation of tender, Contract negotiation and award of work. 8

Text Books

1. Estimating and Costing by B. N. Dutta.
2. PERT and CPM Principles and Application by L. S. Shrinath.

References

1. Estimating, Costing and Valuation in Civil Engineering by M. Chakraborty.
2. Construction, Planning, Equipment and Methods by R. L. Peurify
3. Network Analysis Techniques by S. K. Bhatnagar.
4. Construction Planning and Management by U. K. Srivastava.

TCE 605
EARTHQUAKE RESISTANT DESIGN OF BUILDING

L-3, T-1

CT-30, TA-20, ESE-100

Unit-1

Introduction - Origin of Earthquakes, magnitude, intensity, ground motions, sensors, Strong motion characteristics. 3

Concepts of Earthquake Resistant Design of Reinforced Concrete Buildings – Earthquake and vibration effects on structure, identification of seismic damages in R.C. buildings, Effect of structural irregularities on the performance of R.C. buildings during earthquakes and seismoresistant building architecture. 5

Unit – 2

S.D.O.F. Systems- Equation of motion, free and forced vibrations, damping, Response spectrum 8

Unit – 3

M.D.O.F Systems.-
Two degree and multi-degree freedom systems 8

Unit – 4

Seismic Analysis and Modeling of R.C. Buildings- Codal procedure for determination of design lateral loads, in-fill walls, seismic analysis of R.C. building as per IS: 1893 (Part 1) 8

Unit – 5

Earthquake Resistant Design of Buildings-
Ductility considerations, E.R.D. of R.C. building, Design of load bearing buildings, Design of shear wall 8

Text Books

1. Earthquake Resistant Design of Structures by P. Agarwal & M. Shrikhande
2. Structural Dynamics – Theory & Computation by Mario Paz
3. Dynamics of Structures Theory and Applications to Earthquake Engineering by Anil K. Chopra

References

1. Introduction to Structural Dynamics by J.M. Biggs
2. Elements of Earthquake Engineering by Jai Krishna and A.R. Chandrasekharan
3. Fundamental of Earthquake Engineering by N.M. Neumarks and E. Rosenblueth
4. Engineering Vibrations by L.S. Jacobsen & R.S. Ayre
5. Structural Dynamics by R. Roy Craig Jr.
6. Dynamics of Structures by R.W. Clough & J. Penjien

I.S. Codes

1. IS: 1893 (Part -1) – 2002
2. IS: 1893 (Part -4) – 2005
3. IS: 13920 - 1993

TCE-651

ENVIRONMENTAL ENGINEERING LAB. – I

P – 3

TA – 25, ESE – 25

1. Determination of turbidity, colour, and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine and chlorine demand.
5. Determination of dissolved oxygen.
6. Determination of most probable number of coliforms.
7. Measurement of air pollutants with high volume sampler.
8. Measurement of sound level with sound level meter.

Text Books

1. Sawyer, McCarty and Parkin: Chemistry for Environmental Engineering
2. Mathur: Water and Wastewater Testing.

References

1. Standard Methods for the Examination of Water and Wastewater, A. P. H. A., New York
2. W. H. O.: Selected Methods of Measuring Air Pollutants
3. Cunniff: Environmental Noise Pollution.

TCE – 652
Structural Detailing Lab. I

P – 3

TA – 25, ESE – 25

Preparation of working drawings for the following _

1. RC Beams- Simply supported, Continuous, Cantilever
2. T – beam / L-beam floor
3. Slabs – Simply supported, Continuous, One way and two way slabs.
4. Columns – Tied Columns and Spirally reinforced columns.
5. Isolated footings for RC Columns.
6. Combined rectangular and trapezoidal footings.
7. Detailing of Buildings with respect to Earthquake Resistant Design.

TCE – 653
Geotechnical Engineering Lab.

P – 3

TA – 25, ESE – 25

Preparation of working drawings for the following _

1. Sieve Analysis
2. Hydrometer Analysis
3. Liquid & Plastic Limit Tests
4. Shrinkage Limit Test
5. Proctor Compaction Test
6. Relative Density
7. In Situ Density – Core cutter & Sand Replacement
8. Permeability Test
9. Direct Shear Test
10. Auger Boring
11. Static Cone Penetration Test
12. Standard / Dynamic Cone Penetration Test

TCE - 701
STEEL STRUCTURES

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction to rolled steel sections, loads, factor of safety, permissible and working stresses. 3

Riveted and welded connections, strength, efficiency and design of joints. 5

UNIT – 2

Compression members- Effective length, Slenderness ratio, Strength of Compression members, Design of Struts, Columns, Built-up Columns, Design of eccentrically loaded columns. 8

UNIT – 3

Tension members – Net and Gross sectional areas, Strength of members and their design. 4

Design of slab and Gusset bases, Design of Grillage footing. 4

UNIT – 4

Beams – web crippling and web buckling, design of laterally supported beam, design of laterally unsupported beam, Purlins. 8

UNIT – 5

Design of Industrial Buildings – Detailed design of roof trusses. 8

Text Books

1. IS : 800 – 1984.
2. Design of Steel Structures by A. S. Arya & J. L. Ajmani, Nem Chand & Bros., Roorkee.

References

1. Design of Steel Structures by S. K. Duggal, Tata Mc-Graw-Hill Publishing Company.
2. Design of Steel Structures by Gaylord & Gaylord.

TCE-702**ENVIRONMENTAL ENGINEERING – II**

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT-1

Introduction: Beneficial uses of water and quality requirements, standards.

Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater.

Water borne diseases and their control.

Wastewater characteristics: Temperature, p^H , colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc.

Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets. 8

UNIT-2

Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. 8

UNIT-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination.

Water softening and ion exchange: calculation of dose of chemicals. Adsorption. 8

UNIT-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes.

Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc. 8

UNIT-5

Anaerobic digestion of sludge: Design of low and high rate anaerobic digesters and septic tank.

Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Disposal of wastewater on land and in water bodies.

Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies for wastewater treatment. 8

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering

2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology
7. Raju: Water Supply and Wastewater Engineering
8. Sincero and Sincero: Environmental Engineering: A Design Approach
9. Pandey and Carney: Environmental Engineering
10. Rao: Textbook of Environmental Engineering
11. Davis and Cornwell: Introduction to Environmental Engineering
12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. Mara: Sewage Treatment in Hot climates.

TCE - 703
WATER RESOURCES ENGINEERING I

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – I

Water Resources planning and management: Objectives, constraints and criteria based on technical, economical, social and political factors. Assessment of surface water resources of India, Intra and inter basin development concepts. Single and multipurpose projects.

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system,

Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabac maximum Precipitation (PMP) curves.

Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships

Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.

Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation

Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programmes for design of channels

Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining.

Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects

Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.

References

5. Water Resources Engg. By Larry W. Mays, John Wiley India
6. Water resources Engg. By Wurbs and James, John wiley India
7. Water Resources Engg. By R. K. Linsley, McGraw Hill
8. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
9. Irrigation Theory and practices by A.M. Michel.

TCE-751 ENVIRONMENTAL ENGINEERING LAB. II

P – 3

TA – 25, ESE – 25

1. Determination of total, suspended and dissolved solids.
2. Determination of BOD of sample.
3. Determination of COD of sample.
4. Determination of Kjeldahl nitrogen.
5. Determination of fluorides.
6. Determination of rate kinetics constant of aerobic reactions.
7. Field visit of water / wastewater treatment plant.

Text books

1. Sawyer, McCarty and Parkin: Chemistry for Environmental Engineering
2. Mathur: Water and Wastewater Testing.

References

1. Standard Methods for the Examination of Water and Wastewater, A. P. H. A., New York.

TCE – 752 Structural Detailing Lab. II

P – 3

TA – 25, ESE – 25

Preparation of working drawings for the following _

1. Rolled sections and connections (welded and riveted).
2. Built-up columns and beams.
3. Gusset bases
4. Grillage footing
5. Roof trusses
6. RC retaining walls
7. RC water tanks.

TCE - 801 TRANSPORTATION ENGINEERING II

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Indian railways: Development and organization of Indian Railways.

Permanent way : Sub-grade, formation, embankment and cutting, track drainage.

Rails : Rail gauges, types of rails, defects in rails, rail failure, creep of rail.

Rail Fastenings : Fish plates, spikes, chairs, keys, bearing plates.

Sleepers : Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density.

Ballast : Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast. 10

UNIT – 2

Railway Track Geometry : Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, compensation for curvature on gradients, track resistance and tractive power.

Points & Crossings : Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out. 8

UNIT – 3

Stations & Yards : Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards.

Signalling & Interlocking : Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station. 7

UNIT – 4

Introduction to Steel Bridges, Types of Steel Bridges, Economical Span, Loads, Permissible Stresses, Fluctuation of Stresses, Secondary stresses in trusses, Design of Plate Girder Bridges. 8

UNIT – 5

Design of Truss Bridges, General arrangement, Economic proportions, Types of Bridge trusses, Wind Forces on Lattice Girder Bridge, Top lateral bracing, Bottom lateral bracing, Brief introduction to Bearing. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. IS : 800 – 1984.
3. Design of Steel Structures by A. S. Arya & J. L. Ajmani, Nem Chand & Bros., Roorkee.

References

1. Railway Engineering by M. M. Aggrawal.
2. Railway Engineering by Vasvani
3. Bridge Engineering by Algia
4. Railway Engineering by B. L. Gupta & Amit Gupta
5. Roads, Railway, Bridge & Tunnel Engineering by B. L. Gupta
6. Essentials of Bridge Engineering by D. J. Victor
7. Design of Steel Structures by S. K. Duggal, Tata Mc-Graw-Hill Publishing Company.
8. Design of Steel Structures by Gaylord & Gaylord.

TCE - 802 WATER RESOURCES ENGINEERING II

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis fall.

Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir.

Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Pheratic line, and its determination
Introduction to statisilty analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and Practices by A M Michel
6. Irrigation Engineering,

References

1. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
2. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal Laxmi Publications
3. Engineering Hydrology by K Subramanya, TMH
4. Irrigation, Water Power and Wate Resources Engg. By K. R. Arora

ELECTIVE – I

TCE-011 MATRIX ANALYSIS OF STRUCTRES

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2

Hand computation of problems on trusses, frames and grids.

UNIT – 3

Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Reference:

1. Weaver & Gere , Matrix Analysis of Framed structures.
2. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York.

TCE-012 SEISMIC ANALYSIS OF STRUCTURES

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction to Earthquake Resistant Design

UNIT – 2

Seismic response of buildings, calculation of time period, base shear and distribution of forces by using conventional approaches i.e. seismic coefficient method and response spectrum method.

UNIT – 3

Effects of torsion on the buildings.

UNIT – 4

An introduction to seismic analysis of special structures; water tower, dam, chimney, bridge, nuclear power plant, etc.

UNIT – 5

An introduction to soil-structure interaction, under dynamic loads.

Reference:

1. Introduction to Structural Dynamics – J.M. Biggs
2. Elements of Earthquake Engineering – Jai Krishna and A.R. Chandrasekaran
3. IS: 1893 -1984 Criterion for Earthquake Resistant Design
4. Fundamental of Earthquake Engineering – N.M. Neumarks and E. Rosenblueth
5. Engineering vibrations – L.S. Jacobsen & r.S. Ayre
6. Structural Dynamics – Theory & Computation – Mario Paz
7. Dynamics of Structures Theory and Applications to Earthquake Engineering – Anil K. Chopra.
8. Structural dynamics – R. Roy Craig Jr.
9. Dynamics of structure – R.W. clough and J. Penjien

TCE – 013
DESIGN OF WASTE WATER SYSTEM

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT-1

Wastewater characteristics: composition and microbiology of wastewater, BOD kinetics. 8

UNIT-2

Wastewater treatment: Basic design consideration, principles of reactor design and process flow sheets.

8 **UNIT-3**

Theory and design of biological treatment processes and units. Design of aerobic suspended growth systems including activated sludge process and aerated lagoon.

8

UNIT-4

Theory and design of aerobic attached growth systems including trickling filter and rotating biological contactor.

8

UNIT-1

Theory and design of waste stabilization ponds and oxidation ditches.

Design considerations of anaerobic treatment systems.

Sewage treatment plant layout, concept of sustainable wastewater treatment.

8

Text books:

1. Manual on Sewerage and Sewage Treatment, C.P. H.E. E. O., Ministry of Urban

Development, Government of India, New Delhi

2. Peavy, Rowe and Techobanoglous: Environmental Engineering

3. Metcalf and Eddy Inc.: Wastewater Engineering

4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering

Vol. – II).

Reference:

1. Arceivala: Wastewater Treatment for Pollution Control

2. Qasim: Design of Wastewater Treatment

3. Parker: Wastewater Systems Engineering

4. Steel and McGhee: Water Supply and Sewerage

5. Fair and Geyer: Water Supply and Wastewater Disposal

6. Hammer and hammer Jt.: Water and Wastewater Technology

7. Raju: Water Supply and Wastewater Engineering

8. Sincero and Sincero: Environmental Engineering: A Design Approach

9. Rao: Textbook of Environmental Engineering

10. Davis and Cornwell: Introduction to Environmental Engineering
11. Ramalho: Introduction to Wastewater Treatment Processes
12. Mara: Sewage Treatment in Hot climates.

TCE – 014 : Transportation System Planning

L – 3 T – 1 P
- 0

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning,

UNIT-2

Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

UNIT-3

Travel demand: Estimation and forecasting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

UNIT-5

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

Reference:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning – E.K. Mortak.
3. Metropolitan transportation planning – J.W. Dickey.
4. Traffic Engineering, L.R. Kadiyali

TCE – 015 PLASTIC DESIGN OF STEEL STRUCTURES

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT-1

General: Introduction, Basic hypothesis, Stress – strain relation for mild steel, scope of plastic analysis, redistribution of moments, concept of shape factor, scope of plastic collapse – Basic theorems.

UNIT-2

General Methods for plastic Design: Introduction, Trial and error method, method of combining mechanisms, plastic moment distribution method.

UNIT-3

Factors Affecting Fully Plastic Moments: Introduction, variations of lower yield stress, Effect of normal force, Effect of shear force.

UNIT-4

Plastic Design: Design of simple, fixed and continuous beams, Analysis and Design of portal and Gable Frames, Design of Two bay and two storey Frames.

UNIT-5

Minimum Weight Design: Assumptions, Geometrical analogue and minimum weight theorem, Applications, Methods of Solution.

Reference:

1. S.K. Duggal, Design of Steel Structures, Tata McGraw Hill Publishing Co., India.
2. Arya Ajmani, Design of Steel Structures, Wiley Eastern, New York
3. Bresler Line Scalze, Design of Steel Structures, Wiley Eastern, New York
4. Crawley Dillon, Steel Building Analysis and Design, John Willey & sons, New York
5. Vazirani & Ratwant, steel Structures, Khanna Publishers, Delhi.
6. B.G. Neal, Plastic method of Structural Analysis, Chapman & Hall Ltd., Great Britan
7. Beddle, L.S., Plastic Design of Steel Frames, John Wiley, New York.
8. J. Heyman, Plastic Design of Portal Frames, Cambridge University Press.

TCE 016 : Fluvial Hydraulics and Ground Water Modelling

L T P
3 1 0

UNIT-1

Fluvial Hydraulics: Origin, Properties of sediments, size, shape, fall velocity and its effects, orientation, grain size distribution, Difference between rigid and alluvial channels, Incipient motion of sediment particles, Different approaches to study sediment motion, lift force approach, tractive force approach, theoretical and sub theoretical analysis of Shield, White and others. Types of bed forms or regimes of flow.

UNIT-2

Alluvial channel design: Resistance to flow in alluvial streams, Basic equations, characteristics and types of sediment load, Theories of bed load and suspended load and total load, design of stable channels, Lane's theory, Kennedy's theory, Lacey's theory, Critical Tractive force method of design of stable channels, design of stable channels in cohesive soils

UNIT- 3

Ground Water Modelling:

Background: Ground water occurrence and movement, general introduction

System concepts and optimization: System component and constraints

Linear Programming: Graphical, Duality and Simplex Methods

Dynamic Programming: Principle of optimality, recursive equation representation, tabular method.

Non linear programming : Classical optimization techniques, constrained and unconstrained non linear algorithms, lagrange multiplicand Kuhn Tucker conditions.

UNIT – 4

Numerical Modeling of Ground Water Flow: Review of differential equations, finite difference solution, direct problem, inverse problem, Introduction to finite element method, stream-aquifer interflows

UNIT – 5

Planning of Ground water Development: Water balance, Assessment of recharge, utilizable recharge, Indian practice, Constraints on ground water development Feasibility check by ground water modeling, optimal ground water developments, simple cases of planning and development in canal commands areas.

Reference:

1. Graf, W.H., Hydraulics of Sediment Transport, McGraw Hill International
2. R.J. Garde and K.G. Rangaraju, Mechanics of sediment transportation and alluvial stream problems, Wiley Eastern Ltd.
3. Subramanya, K., Flow in Open Channels, Tata Mc Graw Hill
4. Chanson, H.H., Fluvial processes in river engineering, John Wiley and sons.
5. Todd, D.K., Ground Water Hydrology, John Wiley
6. Remson, I. Homberger, G.M, and Molz. F.J., Numerical Methods in subsurface Hydrology, Wiley Inter Science, Newyork
7. Ruhston, K.R. and Redshaw, S.C., Numerical analysis by analog and digital methods, John Wiley

8. Huakom, P.S. and Pindar, G.G., computational methods in subsurface flow, Academic Press
9. R.A. wurbs and W.P. James, Water Resources Engineering, PHI

ELECTIVE – II

TCE – 021 FINITE ELEMENT AND FINITE DIFFERENCE METHODS

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Derivation of Backward, Forward and Central Difference, Relations and estimate of error in use of these Relations.

UNIT – 2

Extension of Central Difference Relations in solution of Partial Differential Equations. Application to Laplace equation and torsion problems.

UNIT – 3

Introduction to Finite Element Method and its uses in analysis of Civil Engineering Structures. Derivation of the element characteristics and condensation technique.

UNIT – 4

Application of the Method in treatment of Plane stress and Plane strain problems using triangular, 4- noded & 8 noded quadrilateral elements. Organisation of the Finite Element program and data preparation.

UNIT – 5

Efficient solution techniques for simultaneous linear algebraic equations obtained in finite Element formulation.

Reference:

1. Introduction to Finite Element Method – Desai and Abel.
2. finite Element Method in Engineering – S.S. Rao.

TCE – 022 Advanced Foundation Design

L T
P
3 1 0

UNIT – 1

Bearing capacity and settlement analysis of shallow foundation, design of shallow foundation, allowable, total & differential settlement, soil pressure under unsymmetric foundation.

UNIT – 2

Various factors affecting load carrying capacity of piles, pile load test, static & kinematic analysis of pile groups in sand & clays, Cast in situ pile construction, Machine foundations.

UNIT – 3

Settlement & safe load Carrying capacity of pile foundations, laterally loaded and battered piles, group action of piles, pile cum raft foundation; Foundations on expansive soils.

UNIT – 4

Drilled piers and caissons, Elements of well foundations, shapes, depth of scour, well sinking, tilts, shift and their prevention.

UNIT – 5

Types of coffer dams, design of cellular coffer dams.

Text books:

1. K.R. Arora – Soil Mechanics & Foundation Engineering
2. Alam Singh – Modern Geotechnical Engineering
3. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics

Reference:

1. J.E. Bowles – Analysis & Design of Foundation (Fourth Edition)
2. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
3. C. Venkataramaiah – Geotechnical Engineering
4. Brij Mohan Das – geotechnical Engineering

TCE 023 : Traffic Engineering

L-3

T-1 P-0

UNIT – 1

Introduction: Role of traffic Engineer, Vehicle, highway and traffic factors. Traffic characteristics, Vehicular Road users, Introduction to Traffic Noise and Air Pollution and remedial measures.

UNIT – 2

Traffic flow: Interrupted and Un-interrupted Traffic Flow, Highway capacity: Urban, rural and intersection, Capacity of transit system, Traffic flow theory: Car Following and Queuing Theory.

UNIT – 3

Traffic Studies: Traffic volume studies, speeds studies, Speed and Delay Studies, Origin and Destination studies, Accident studies, capacity studies, parking studies.

UNIT – 4

Traffic Control: regulations and other operational controls, Traffic Signal and marking, street lighting, Traffic Safety: Barricades, delineators.

UNIT – 5

Design of Intersections: Canalizing islands, Design of Rotaries, Intersection and terminal Design, Parking facilities.

Reference:

1. Introduction to Transportation Engineering: William w. Hay.
2. Introduction to Transportation Engineering planning =- E.K. Mortak
3. Metropolitan Transportation planning – J.w. Dickey.
4. Traffic Engineering, L.R. Kadiyali
5. Transportation Engineering, Khisty & Lall

TCE – 024 COMPUTER AIDED DESIGN

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design.
Hardware required for CAD works.

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing.

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems.

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields.

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks.

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lertner & / Lane E. Drang, McGraw Hill
3. “Neural Computing: Wasserman, vonnostrand.

TCE – 025 THEORY OF ELASTICITY AND PLASTICITY

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

The requirements for a solution, solution procedures, The St. Venant's Principle, Stress functions.

UNIT – 2

Some exact solutions for the bending of beams, Beams under torsion, Beams of irregular cross-section,

UNIT – 3

Membrane theory of shells of revolution and cylindrical shells.

UNIT - 4

Stress Distributions due to cracks & Fracture. Variation and Energy Methods, Numerical Methods.

UNIT – 5

Yield surfaces, Prandtl – Reuse. Theory and Deformation Theory, Generalized stress-strain relations, Bending and torsion of prismatic bars, Axisymmetric problems, Metal forming processes.

Reference:

1. Theory of Elasticity by Timoshenko and Young.

ELECTIVE - III
TCE – 031 ADVANCED CONCRETE DESIGN

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects.

UNIT – 2

Design of staging: Braces, Columns and Raft Foundation.

UNIT – 3

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

UNIT - 4

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab, and R.C. T-beam types.

UNIT – 5

High performance concrete, Production and no-conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Reference:

1. Reinforced Concrete: Limit State Design by A.K. Jain
2. Essentials of Bridge Engineering by D.J. Victor

TCE – 032 RELIABILITY BASED DESIGN

L – 3, T – 1

CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction: Safety factors, Fallacies in Designing by Safety Factors, Reliability, Probabilistic Reliability, reasons for Probabilistic Approach, Mathematical Considerations: Basic Probability concepts, Random Variables, Expected Values and Moments, Moments of Random Variables Distribution of functions, Moments of Functions, Moments of function of Random Variables.

UNIT – 2

Algebra of Normal Functions: Independent Binary Operations, Moment Generating Functions, Methods of partial Derivatives, Special correlated combinations.

UNIT – 3

Determination of Reliability: Generally distributed Allowable and Applied Stress, Determination of reliability when Strength and stress Distribution are Normal, Non-normal distributions.

UNIT - 4

Reliability Methods: Introduction, Monte Carlo Method, First Order Second Moment Method, and Determination of partial Safety Factors.

Applications: Element of Force Systems, Centroids, Moment of Inertia, and Radius of gyration, Estimating Variance.

UNIT – 5

Reliability Based Design: Analysis & Design to Tension members, Short columns Long Columns, Beam – Column, simple and Cantilever Beams.

Reference:

1. Ranganathan, R., Reliability based design of structures, Tata McGraw Hill Comp. Ltd., New Delhi.
2. Molton E. Harry, Reliability based design in Civil Engineering, Mc-Graw Hill Comp. Ltd., New York.
3. S.J. Rao, "Reliability Based Design" Mc, Graw Hill Inc. New York, 1992.

TCE – 033
ENVIRONMENTAL POLLUTION CONTROL

L – 3, T – 1

CT – 30, TA – 20, ESE - 100

UNIT – 1

Impact of man on environment: The biosphere, hydrological cycle, nutrient cycles, consequence of population growth, energy problem, pollution of air, water and land. Global environmental issues.

UNIT – 2

Air pollution: Sources and effects, meteorological aspects, air pollution sampling and measurement, control methods and equipments, control of specific air pollutants.

UNIT – 3

Water pollution: Sources and classification of water pollutants, wastewater sampling and analysis, control strategies, Eutrophication of lakes, self purification capacity of streams.

UNIT – 4

Land pollution: Types of land pollution, solid waste management-generation, storage, collection, transport, processing and disposal.

UNIT – 5

Noise pollution: Sources, effects, preventive and control measures.
Thermal pollution: Sources, effects and control measures.

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Mctcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Volo. – II).
4. Cunniff: Environmental Noise Pollution

Reference:

1. Davis and Cornwell: Introduction to Environmental Engineering
2. Pandey and Carney: Environmental Engineering
3. Rao: Textbook of Environmental Engineering
4. Garg, Garg and Garg: Ecological and Environmental Studies
5. Meenakshi: Elements of Environmental Science and Engineering
6. Anjaneyulu: Introduction to Environmental Science
7. Joseph and Nagendran: Essentials of Environmental Studies.

TCE 034 : Fundamentals of Remote Sensing and GIS

L	T	P
3	1	0

Unit – I

Remote Sensing: Introduction, sources of energy for remote sensing, active and passive sources, electromagnetic radiation, and their characteristics, thermal emission, Interaction of EMR with atmosphere, atmospheric windows, interaction of EMR with earth surface – spectral reflection curves.

Unit – II

Multi concept of remote sensing, idealisms and real sequence of remote sensing, sensors and orbital characteristics, various sensing platforms for remote sensing, characteristics of various satellite, remote sensing data products and their uses.

Unit – III

Digital image processing: Introduction, digital image representation, and characterization, histograms and scatter plot, image enhancement, contrast stretching, pattern recognition, and feature extraction, image classification: unsupervised and supervised techniques

Unit – IV

Geographic Information system: Introduction, concept and terminology, components of GIS, Raster and Vector formats, scanners and digitisers, methods of digitization, data preprocessing, form conversion, data reduction, and generalization

Unit – V

Data merging, edge matching, registration and re-sampling, data manipulation and analysis representation of real world problems, problem solving and spatial modeling, classification, aggregation, overlay, buffers and intervisibility and its applications in planning of utility lines, flood studies, ground water recharge, erosion modeling, environment impact assessment

References:

1. Lillerand, T.M. and Keifer, r.W., remote Sensing and image John Wiley & Sons.
2. A.M. Chandra and S.K. Ghosh, R S & GIS, Marosa Publication Delhi
3. M. Anji Redds, RS & GIS, R S Publication, Hyderabad
4. Swain, P.H. & S.M. Davis, r S – The Quantitative Approach, McGraw Hill Publication.
5. Lyan, J.G. and Mc. Larchy, J., Wetland and Environmental Application GIS, Lavis Publication,
6. M , A.M.J. etal: Introduction to the use GIS for practical Hydrology, ITC, Methertends

TCE- 035 : Open Channel Flow

L	T	P
3	1	0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections, Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater,

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge,

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack.

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International

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**Syllabus
of
CIVIL ENGINEERING**

**THIRD YEAR (V & VI SEMESTERS)
&
FOURTH YEAR (VII & VIII SEMESTERS)**