Course structure
B. Tech. (Civil Engineering)
Year IV, Semester - VII

S. No.	Course Code	NAME OF THE SUBJECT	PERIODS			Credit
			L	T	P	C
1	-------	Open Elective-I	3	1	-	4
2	TCE-701	Steel Structures	3	1	-	4
3	TCE-702	Environmental Engineering- II	3	1	-	4
4	TCE-703	Geotechnical Engineering – II	3	1	-	4
5	-------	Elective I	3	1	-	4
6	TCE-751	Environmental Engineering Lab – II	-	-	3	1
7	TCE-752	Structural Detailing Lab - II	-	-	3	1
8	TCE-753	Tour/Training	-	-	3	1
9	TCE-754	Project	-	-	-	2
10	GP-701	General Proficiency	-	-	-	0
		Total	15	5	9	25

Year IV, Semester - VIII

S. No.	Course Code	NAME OF THE SUBJECT	PERIODS			Credit
			L	T	P	C
1	-----	Open Elective-II	3	1	-	4
2	TCE-801	Earthquake Resistant Design of Building	3	1	-	4
3	-----	Elective-II	3	1	-	4
4	-----	Elective-III	3	1	-	4
5	TCE-851	Project	-	-	12	12
6	TCE-852	Comprehensive	-	-	-	0
7	GP-801	General Proficiency	-	-	-	0
		Total	12	4	12	28

OPEN ELECTIVE-I

TCE – 013: Design of waste water system
TCE – 015 Plastic designs of steel structures
TCE – 021 Finite element and finite difference methods

OPEN ELECTIVE-II

TCE-011 Matrix analysis of structres
TCE-012 Seismic analysis of structures
TCE-014: Transportation system planning
TCE – 024 Computer aided design

ELECTIVE-I

TCE- 023 : Traffic engineering
TCE – 022 Advanced foundation design
TCE – 025 Theory of elasticity and plasticity

ELECTIVE-II

TCE--034 : Fundamentals of remote sensing and gis
TCE--035 : Open channel flow
TCE- 016 : Fluvial hydraulics and ground water modelling

ELECTIVE-III

TCE – 031 Advanced concrete design
TCE – 032 Reliability based design
TCE – 033 Environmental pollution control

TCE - 701
STEEL STRUCTURES

UNIT – 1

Introduction to rolled steel sections, loads, factor of safety, permissible and working stresses. Riveted and welded connections, strength, efficiency and design of joints.

.

UNIT – 2

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

.

UNIT – 3

Tension members – Net and Gross sectional areas,Strength of members and their design. Design of slab and Gusset bases, Design of Grillage footing

.

UNIT – 4

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

UNIT – 5

Design of Industrial Buildings – Detailed design of roof trusses.

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

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

.

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

.

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.

.

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.

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

.

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
GEOTECHNICAL ENGINEERING – II

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.

UNIT – 2

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

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.

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
.

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.
.

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. GopalRanjan and A.S.R. Rao – Basic and Applied Soil Mechanics
3. C. Venkataramaiah – Geotechnical Engineering
4. M.J. Tomilson – Foundation Design
5. PurshothamRaju – Ground Improvement

ENVIRONMENTAL ENGINEERING LAB. II

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

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
EARTHQUAKE RESISTANT DESIGN OF BUILDING

Unit-1

Introduction - Origin of Earthquakes, magnitude, intensity, ground motions, sensors,

Strong motion characteristics.

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

.

Unit – 2

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

Unit – 3

M.D.O.F Systems.-

Two degree and multi-degree freedom systems

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)

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

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 byL.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

IS: 13920 – 1993

ELECTIVE – I

TCE-011 MATRIX ANALYSIS OF STRUCTRES

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

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

UNIT-1

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

UNIT-2

Wastewater treatment: Basic design

consideration, principles of reactor design and process flow sheets.

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3

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

UNIT-4

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

.

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

.

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).

TCE – 014 : Transportation System Planning

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems incities, 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), PublicTransport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

UNIT-3

Travel demand: Estimation and fore casting, 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 andterminal 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

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 loweryield stress, Effect of normal force, Effect of shear force.

UNIT-4

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

UNIT-5

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

Reference:

1. S.K. Duggal, Design of Steel Structures, Tata McGraw Hill Publishing Co., India.
2. AryaAjmani, 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, Champman& 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

UNIT-1

Fluvial Hydraulics: Origin, Properties of sediments, size, shape, fall velocity and itseffects, 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 streasms, 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 linearprogramming : Classical optimization techniques, constrained and unconstrained non linear algorithms, lagrange multiplicand KuhuTucher conditions.

UNIT – 4

Numerical Modeling of Ground Water Flow: Review of differential equations, finitedifference 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 luvial stream problems, Wiley Eastern Ltd.
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Change, 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, Wley 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

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

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. GopalRanjan 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

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 andmarking, street lighting, Traffic Safety: Barricades, delineators.

UNIT – 5

Design of Intersections: Canalizing islands, Design of Rotaries, Intersection andterminal 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

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. Lerine& / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.

TCE – 025 THEORY OF ELASTICITY AND PLASTICITY

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

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

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 Derivaives, 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.

Applicati9ons: Element of Force Systems, Cancrolds, 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

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

Unit – I

Remote Sensing: Introduction, sources of energy for remote sensing, active and passivesources, 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, andcharacterization, 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 ofGIS, Rastor 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. AnjiRedds, RS & GIS, R S Publication, Hyedrabad
4. Swain, P.H. & S.M. Davis, r S – The Quantitative Approach, McGraw Hill Publication.
5. Lyan, J.G. and Mc. Larthy, J., Wetland and Environmental Application GIS, Lavis Publication,
   M , A.M.J. etal: Introduction to the use GIS for practical Hydrology,
6. ITC, Methertends

TCE- 035 : Open Channel Flow

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 hydraulicjump, 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, Freeoverfall.
Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of thegravity wave, deep and shallow water waves, open channel positive and negative surge,

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations forincreasing 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. RangaRaju, K.G., Flow through open channels, T.M.H.
5. M. HanifChaudhry, Open Channel Flow, PHI

French, R.H., Open channel Hydraulics, McGraw Hill Internation