CIVIL ENGINEERING

Course Structure and Syllabi for Pre Ph.D Programme

SUBJECT – 1

S.No	Course Code	Title of the Course
1	24CMGT01T	Research Methodology

SUBJECT - 2

S.No	Course Code	Title of the Course
1	24CMGT02T	Research and Publication Ethics

CORE SUBJECTS

Choose any **Two subjects** from the following list

S.No.	Course Code	Title of the Course
1	24CCIV01T	Advanced Concrete Technology
2	24CCIV02T	Environmental Impact Assessment
3	24CCIV03T	Water Resources Systems Planning and Management
4	24CCIV04T	Ground Improvement Techniques
5	24CCIV05T	Highway Infrastructure Design
6	24CCIV06T	Environmental Engineering
7	24CCIV07T	Advanced foundation engineering
8	24CCIV08T	Traffic Engineering and Transportation Planning
9	24CCIV09T	Advanced Structural Design
10	24CCIV0AT	Artificial Neural Networks and Fuzzy Logic
11	24CCIV0BT	Engineering Hydrology
12	24CCIV0CT	Geo-Environmental Engineering
13	24CCIV0DT	Ground Water Management & Modelling
14	24CCIV0ET	Sustainable Construction Materials and Techniques
15	24CCIV0FT	Rehabilitation And Retrofitting of Structures
16	24CCIV0GT	Finite Element Methods
17	24CCIV0HT	Fracture Mechanics
18	24CCIV0IT	Structural Dynamics

19	24CCIV0JT	Expansive Soils
20	24CCIV0KT	Environmental Systems Engineering
21	24CCIV0LT	Pavement Analysis and Design

[24CCIV01T] ADVANCED CONCRETE TECHNOLOGY

UNIT – I

Cements And Admixtures: Portland Cement – Chemical Composition - Hydration, Setting and Fineness of Cement – Structures of Hydrated Cement – Mechanical Strength of Cement Gel - Water Held in Hydrate Cement Paste – Heat of Hydration of Cement – Influence of Compound Composition on Properties of Cement – Tests on Physical Properties of Cement – I.S. Specifications – Different Types of Cements – Admixtures.

UNIT – II

Aggregates: Classification Of Aggregate – Particle Shape and Texture – Bond Strength and Other Mechanical Properties of Aggregate Specific Gravity, Bulk Density, Porosity, Absorption and Moisture in Aggregate – Soundness of Aggregate – Alkali – Aggregate Reaction, Thermal Properties – Sieve Analysis – Fineness Modulus – Grading Curves – Grading Requirements – Practical Grading – Road Note No.4 Grading of Fine and Coarse Aggregates Gap Graded Aggregate – Maximum Aggregate Size.

UNIT – III

Fresh Concrete: Workability – Factors Affecting Workability – Measurement of Workability by Different Tests – Effect of Time and Temperature on Workability – Segregation and Bleeding – Mixing and Vibration of Concrete – Quality of Mixing Water.

Hardened Concrete: Water/Cement Ratio-Abram's Law – Gel Space Ratio – Effective Water in Mix – Nature of Strength of Concrete – Strength in Tension and Compression- Griffith's Hypothesis – Factors Affecting Strength – Autogenous Healing –Relation Between Compression and Tensile Strength – Curing and Maturity of Concrete Influence of Temperature on Strength – Steam Curing – Testing of Hardened Concrete – Compression Tests – Tension Tests – Factors Affecting Strength – Flexure Tests – Splitting Tests – Non-Destructive Testing Methods.

UNIT – IV

Elasticity, Shrinkage and Creep: Modulus of Elasticity – Dynamic Modulus of Elasticity – Poisson's Ratio – Early Volume Changes – Swelling – Draying Shrinkage - Mechanism of Shrinkage – Factors Affecting Shrinkage – Differential Shrinkage – Moisture Movement Carbonation Shrinkage-Creep of Concrete – Factors Influencing Creep – Relation Between Creep and Time – Nature of Creep – Effect of Creep.

UNIT – V

Mix Design: Proportioning Of Concrete Mixes by Various Methods – Fineness Modulus, Trial and Error, Mix Density, Road Note. No. 4, ACI And ISI Code Methods – Factors in The Choice of Mix Proportions – Durability of Concrete – Quality Control of Concrete – Statistical Methods – High Strength Concrete Mix Design. Special Concrete's: Light Weight Concretes – Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete – High Density Concrete – Fiber Reinforced Concrete – Different Types of Fibers - Factories Affecting

Properties of FRC – Applications Polymer Concrete – Types of Polymer Concrete Properties of Polymer Concrete and Applications

TEXT/ REFERENCE BOOKS:

1. Properties Of Concrete by A.M. Neville – Pearson Publication – 4th Edition
2. Concrete Technology by M.S. Shetty. – S. Chand & Co. ; 2004
3. Design Of Concrete Mix by Krishna Raju, CBS Publishers.
4. Concrete: Micro Structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers
5. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi
6. Concrete Technology by A.M. Neville – Pearson Publication
7. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
8. Non-Destructive Test and Evaluation of Materials by J. Prasad & C.G.K. Nair , Tata McGraw Hill Publishers, New Delhi

[24CCIV02T] ENVIRONMENTAL IMPACT ASSESSMENT

UNIT – I

Introduction:

Basic concept of EIA: Initial environmental Examination, Elements of EIA, - factors affecting E-I-A, Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT – II

EIA Methodologies: -

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad- hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT – III

Impact of developmental activities and land use: -

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT – IV

Assessment of impact on vegetation and wildlife:

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

Environmental audit:

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-V

Environmental acts (protection and prevention)

Post Audit activities, The Environmental protection Act, The water prevention Act, The Air (Prevention & Control of pollution Act.), Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCES:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K. Katari & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

[24CCIV03T] WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT

UNIT – I

Introduction: General Principles of Systems Analysis to Problems in Water Resources Engineering, Objectives of Water Resources Planning and Development, Nature of Water Resources Systems, Socio-Economic Characteristics.

Economic Analysis of Water Resources Systems: Principles of Engineering Economy, Capital, Interest and Interest Rates, Time Value of Money, Depreciation, Benefit Cost Evaluation, Discounting Techniques, Economic and Financial Evaluation, Socio-Economic Analysis.

UNIT – II

Methods of Systems Analysis: Linear Programming Models, Simplex Method, Sensitivity Analysis, Dual Programming, Dynamic Programming Models, Classical Optimization Techniques, Non-Linear Programming, Gradient Techniques, Genetic Algorithm, Stochastic Programming, Simulation, Search Techniques, Multi Objective Optimization.

UNIT – III

Water Quantity Management: Surface Water Storage Requirements, Storage Capacity and Yield, Reservoir Design, Water Allocations for Water Supply, Irrigation.

Water Quality Management: Water Quality Objectives and Standards, Water Quality control Models, Flow Augmentation, Wastewater Transport Systems, River Water Quality Models and Lake Quality Models.

UNIT – IV

Hydropower and Flood Control, Reservoir Operations, Planning of an Irrigation System, Irrigation Scheduling, Groundwater Management, Conjunctive Use of Surface and Subsurface Water Resources, Design of Water Conveyance and Distribution Systems.

UNIT – V

Environmental Impact Assessment – Preparation of EIA and EIS, Impact Assessment Methodologies, Impact mitigation, EMP.

Legal Aspects of Water & Environment Systems: Principles of Law Applied to Water Rights and Water Allocation, Water Laws, Environmental Protection Law, Environmental Constraints on Water Resources Development.

REFERENCES

1. "Water Resources Systems Planning and Analysis", Loucks, D.P., Stedinger, J.R. and Haith, D.A.(1982)Prentice Hall Inc. N York
2. "Water Resources Systems Planning and Management", Chaturvedi, M.C. (1987), Tata McGraw Hill Pub. Co., N Delhi
3. "Water Resources Systems", Hall. W.A. and Dracup, J.A. (1975), Tata Mc Graw Hill Pub. N Delhi.
4. "Economics of Water Resources Planning", James, L.D. and Lee (1975), M c Graw Hill Inc. N. York
5. Biswas, A.K. (1976) "Systems Approach to Water Management", Mc Graw Hill Inc. N York
6. "Applied Water Resources System Planning", Major, D.C. and Lenton, R.L., (1979), Prentice-Hall Inc., N. Jersey
7. "Operations Research", Taha H A (1996), Prentice Hall of India, N Delhi, EIA, Canter, McGraw Hill Publication

[24CCIV04T] GROUND IMPROVEMENT TECHNIQUES

UNIT – I

Introduction to Ground Modification: Need and objectives of Ground Improvement, Classification of Ground Modification Techniques – suitability and feasibility, Emerging Trends in ground improvement.

UNIT –II

Mechanical Modification: Methods of compaction, Shallow compaction, Deep compaction techniques – Vibro-floatation, Blasting, Dynamic consolidation, pre-compression and compaction piles, Field compaction control.

UNIT –III

Hydraulic Modification: Methods of dewatering – open sumps and ditches, Well-point system, Electro-osmosis, Vacuum dewatering wells; pre-loading without and with sand drains, strip drains and rope drains.

Physical and Chemical Modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen, Grouting: categories of grouting, Art of grouting, Gout materials, Grouting techniques and control.

UNIT –IV

Reinforced Earth Technology: Concept of soil reinforcement, reinforcing materials, Backfill criteria, Art of reinforced earth technology, Design and construction of reinforced earth structures.

Soil Confinement Systems: Concept of confinement, Gabion walls, CRB walls, Sand bags, Evergreen systems and fabric formwork.

UNIT –V

Miscellaneous Techniques: Design, Construction and applications of stone columns lime columns and cofferdams

Types of Geo-textiles and their applications in various constructions.

REFERENCES:

1. Engineering, principles of ground modification – Manfred R. Hansmann Mc Graw-Hill pub. Co., New York.
2. Construction and Geotechnical methods in Foundation Engineering – Robert M. Koerner McGraw-Hill Pub. Co., New York.
3. Foundation Engineering Hand book – Winterkorn and Fang Van Nostrand Reinhold Co., New York.
4. Aris C. Stamatopoulos & Panaghiotis C. Kotzios – Soil Improvement by Preloading – John Wiley & Sons Inc. Canada.
5. Ground Improvement Techniques – P. Purushothama Raj Laxmi Publications (P) Limited.

[24CCIV05T] HIGHWAY INFRASTRUCTURE DESIGN

UNIT-I:

Highway Classification and Cross Section Elements: Functional Classification of Highway System; Carriageway, Shoulders, Formation, Right of Way; Kerbs, Foot Paths, Medians- Design Specifications.

Pavement Surface Characteristics – Skid Resistance, Factors Affecting Skid Resistance, Measurement of Skid Resistance; Road Roughness, Measurement of Road Roughness; Camber, Objectives of Camber, Design Standards.

UNIT-II:

Sight Distances and Geometric Design: Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance. Importance Of Sight Distances in Horizontal and Vertical Curves.

Horizontal And Vertical Alignment: Objectives of Horizontal Curves; Super Elevation – Need for Super Elevation; Method of Computing Super Elevation; Minimum Radius of Curve; Methods of Attainment of Super Elevation; Extra Widening on Curves; Transition Curves – Objectives and Design. Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design Criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation.

UNIT-III:

Intersection Design: Types Of Intersections; Design Principles for Intersections; Design of At-Grade Intersections – Channelization, Objectives; Traffic Islands and Design Standards; Rotary Intersection – Concept and Design, Advantages and Disadvantages; Grade Separated Interchanges – Types, Warrants and Design Standards.

UNIT-IV:

Traffic Signs and Road Markings: Types of Road Signs; Guidelines for The Provision of Road Signs; Cautionary Signs, Regulatory Signs, Information Signs – Design Standards; Road Markings: Objectives of Road Markings; Types of Road Markings; Role of Road Markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances – Delineators, Traffic Impact Attenuators, Safety Barriers.

UNIT-V:

Miscellaneous Elements: Requirements Of Pedestrians; Pedestrian Facilities on Urban Roads; Cycle Tracks – Guidelines and Design Standards; Bus Bays – Types and Guide Lines; Design of On-Street and Off-Street Parking Facilities – Guidelines for Lay Out of On-Street and Off-Street Parking.

REFERENCES:

1. Principles and Practice of Highway Engineering, L.R. Kadiyali and N.B. Lal, Khanna Publications
2. Traffic Engineering and Transportation Planning, L.R. Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G. Justo and S.K. Khanna, Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

[24CCIV06T] ENVIRONMENTAL ENGINEERING

UNIT – I
Environmental Chemistry and Microbiology
Basic Principles, stoichiometric calculations. Acid-Base equilibria, carbonate system in water, buffering in water system, titration curve. Solubility in water. Analysis and importance of common water/wastewater quality parameters
Microorganisms - classification, prokaryotic and eukaryotic cells, structure, characteristics, metabolism of microorganisms: Environmental factors, nutrition and metabolism, growth phases, Microbiology of drinking water: Distribution of microorganisms, indicator organisms, MPN index, M.F. technique, standards. Microbiology of wastewater treatment.

UNIT – II
Water Treatment
Important water treatment processes: Principles, working, design and maintenance of Sedimentation, Coagulation, filtration, Adsorption, gas transfer, chemical precipitation, water softening and disinfection processes. Household water treatment, Removal of specific pollutants such as arsenic, fluoride, iron, and nitrate.

UNIT – III
Wastewater Treatment
Principles, working, design and maintenance of the following wastewater treatment processes: aerobic/anaerobic, attached/suspended, activated sludge, tricking filter, SBR. Anaerobic processes – microbiology, process, design, Sludge treatment. Natural treatment processes. Tertiary treatment of wastewater and wastewater reuse.

UNIT – IV
Air and Noise Pollution
Air quality and standards, emission standards, important air pollutants - carbon monoxide, nitrogen dioxide, photochemical smog, ozone, particulate pollutants, oxides of sulphur, lead, hydrocarbon – their sources, effects. Application of Gaussian Plume model.
Control of suspended particulate matter, design criteria of settling chambers, cyclones, bag filters, scrubbers and electrostatic precipitators, control of gaseous pollutants.
Noise Pollution: Fundamentals and terminologies, health impacts, mitigation / control measures.

UNIT – V
Solid Waste Management
Generation and composition of MSW, Characterisation of MSW. Materials recovery and treatment – composting, Concepts of waste-to-energy methods, Energy recovery - Incinerators. Landfills: Site selection, design and operation, drainage and leachate collection systems.

REFERENCES

1. Metcalf & Eddy, "Waste water engineering: treatment and reuse", 4th edition, McGraw Hill Education, 2017.
2. Sawyer, McCarty and Parkin, “Chemistry for environmental engineering and science”, 5th edition, McGraw Hill Education, 2017.
3. Masters and Ella, “Introduction to environmental engineering and science”, 3rd edition, Pearson Education, 2015.
4. Peavy, Rowe and Tchobanoglous, “Introduction to environmental engineering ", 6th edition, McGraw Hill Education, 2016.
5. Tchobanoglous, “Integrated solid waste management: Engineering principles and management issues”, McGraw Hill Education, 2014.
6. Rao and Rao, “Air pollution”, 5th edition, McGraw Hill Education, 2017.

[24CCIV07T] ADVANCED FOUNDATION ENGINEERING

UNIT - I

Shallow foundations:

General requirements of foundations. Types of shallow foundations and the factors governing the selection of a type of shallow foundation. Bearing capacity of shallow foundations by Terzaghi's theory and Meyerhof's theory (derivation of expressions and solution to problems based on these theories). Local shear and general shear failure and their identification.

Bearing capacity of isolated footing subjected to eccentric and inclined loads. Bearing capacity of isolated footing resting on stratified soils-Button's theory and Siva Reddy analysis.

UNIT - II

Analysis and structural design of RCC footings:

Analysis and structural design of R.C.C. isolated, combined and strap footings.

UNIT - III

Deep foundations:

Pile foundations-types of pile foundations. Estimation of bearing capacity of pile foundation by dynamic and static formulae. Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests. Well foundations – elements of well foundation. Forces acting a on a well foundation. Depth and bearing capacity of well foundation. Design of individual components of well foundation (only forces acting and principles of design). Problems associated with well sinking.

UNIT - IV

Sheet pile walls:

Cantilever sheet piles and anchored bulkheads, Earth Pressure diagram, Determination of depth of embedment in sands and clays-Timbering of Trenches – Earth Pressure Diagrams – Forces in struts.

Design of under reamed piles foundations:

Under reamed piles-principle of functioning of under reamed pile-Analysis and structural design of under reamed pile.

UNIT - V

Foundations in problematic soils:

Foundations in black cotton soils- basic foundation problems associated with black cotton soils. Lime column techniques – Principles and execution. Use of Cohesive Non Swelling (CNS) layer below shallow foundations.

TEXT BOOKS:

1. Analysis and Design of Foundations and Retaining Structures- Shamsher Prakash, Gopal Ranjan and Swami Saran.
2. Soil Mechanics and Foundation Engineering by Purushottam Raj, Pearson Publications
3. Geotechnical Engg. – C. Venkat Ramaiah. New age International Pvt . Ltd, (2002).

REFERENCES:-

1. Analysis and Design of Foundations – E.W. Bowles.
2. Foundation engineering by Brije. M. Das, Cengage Publications, New Delhi.
3. Foundations Design and Construction – Tomlinson.
4. Foundation Design-Teng.

[24CCIV08T] TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

UNIT -I

Concept of Travel Demand; Travel Characteristics - origin, Destination, Houte mode, purpose; travel Demand as a function of independent variables; Assumptions in Demand Estimation Relation between land use and Travel; Four step process of Transportation planning.

UNIT - II

Transportation planning process; General concept of Trip; trip Generation; Trip Distribution, Traffic assignment and mode split, Aggregate and disaggregate Models. Date collection and Sequential and sequential Recursive models. Date collection and Inventories; Definition of study area; Zoning Principles; Types and sources of Date, Home Interview surveys; Road side interview surveys; Goods. Taxi, IPT surveys; sampling techniques; Expansion factors and accuracy check; Desire line diagram and use.

UNIT - III

Trip Generation Models; Factors governing Trip Generation and Attraction; multiple linear Regression Models, Category Analysis, Trip Distribution Models Methods of Trip Distribution; Growth Factor Models Uniform Growth Factor Method; Average Growth Factor Method; Factor Method; Furnes Method; limitation of Growth Factor Models concept of Gravity Model.

UNIT -IV

Traffic assignment and Mode Split; Purpose of Assignment and General Principles; Assignment Techniques - All - or- nothing. Assignment; Multiple route assignment, Capacity restraint method. Minimum path trees; diversion curves. Factors affecting mode split; probit, logit and discriminant Analysis.

UNIT - V

Transportation and Environment Detrimental effect of Traffic on Environment; Noise pollution; Air Pollution; Vibrations; Visual Intrusion - Effects and remedial measures. Economic Evaluation of Transportation plans; Costs and benefits of transportation projects; vehicle operating cost; timesaving Accident costs. Methods of Economic Evaluation - Benefit cost Ratio Method; Net present value method; Internal Rate of Return method.

REFERENCES:

1. L.R. Kadiyalli; Traffic Engineering and transportation Planning Khanna Publishers, Delhi.
2. Papa Costas C.S.; Fundamentals of Transportation Engineering, Prentice Hall, India.
3. Khistry C.J. Transportation Engineering -An Introduction Prentice Hall

[24CCIV09T] ADVANCED STRUCTURAL DESIGN

UNIT -I

Deflection Of Reinforced Concrete Beams and Slabs:

Introduction -Short-Term Deflection of Beams and Slabs -Deflection Due To -Imposed Loads - Short- Term Deflection of Beams Due to Applied Loads- Calculation of Deflection By IS 456 - Calculation Of Deflection by BS 8110 - Deflection Calculation by Eurocode – ACI Simplified Method - Deflection of Continuous Beams by IS 456 - Deflection of Cantilevers - Deflection of Slabs

UNIT - II

Estimation Of Crack Width in Reinforced Concrete Members and Design of Deep Beams: Introduction - Factors Affecting Crack Width in Beams - Mechanism of Flexural Cracking Calculation of Crack Widths - Simple Empirical Method - Estimation of Crack width In - Beams by IS 456 Of BS 8110 - Shrinkage and Thermal Cracking.

Deep Beams: Introduction - Minimum Thickness - Steps of Designing Deep Beams - Design by IS 456 - Design According to British Practice - ACI Procedure for Design of Deep Beams – Checking for Local Failures - Detailing of Deep Beams.

UNIT - III

Shear In Flat Slabs and Flat Plates:

Introduction - Checking for One-Way (Wide Beam) Shear - Two-Way (Punching) Shear Permissible Punching Shear - Shear Due to Unbalanced Moment (Torsional Moments) Calculation of J Values - Strengthening of Column Areas for Moment Transfer by Torsion Which Produces Shear - Shear Reinforcement Design - Effect of Openings in Flat Slabs - Recent Revisions in ACI 318 - Shear in Two – Way Slabs with Beams.

UNIT - IV

Design Of Plain Concrete Walls and Shear Walls:

Introduction - Braced and Unbraced Walls - Slenderness of Walls- Eccentricities of Vertical Loads At Right Angles to Wall - Empirical Design Method for Plane Concrete Walls Carrying Axial Load - Design of Walls for In-Plane Horizontal Forces - Rules for Detailing of Steel in Concrete Walls

Design Of Shear Walls:

Introduction - Classification of Shear Walls - Classification According to Behavior - Loads In Shear Walls - Design of Rectangular and Flanged Shear Walls - Derivation of Formula For Moment Of Resistance of Rectangular Shear Walls

UNIT - V

Design Of Reinforced Concrete Members for Fire Resistance : Introduction - ISO 834 Standard Heating Conditions- Grading or Classification - Effect of High Temperature on Steel and Concrete - Effect of High Temperatures on Different Types of Structural Members - Fire Resistance by Structural Detailing from Tabulated Data - Analytical Determination of The

Ultimate Bending Moment Capacity of Reinforced Concrete Beams Under Fire - Other Considerations.

TEXT/REFERENCE BOOKS:

1. P. Purushothaman, Reinforced Concrete Structural Elements: Behavior, Analysis And Design, Tata McGraw Hill
2. C.E. Reynolds and J.C. Steedman, Reinforced Concrete Designers Hand Bood, A View Point Publication.
3. Limit State Design of Reinforced Concrete Structures by P. Dayaratnam, Oxford & IBH Publishers.
4. Advanced RCC By N. Krishna Raju, CBS Publishers & Distributors.
5. Reinforced Cement Concrete Structures – Devdas Menon & Unnikrishnan Pillai, Tata Mc Graw Hill

[24CCIV0AT] ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC

UNIT – I

Introduction: A New Breed of Processor: The Brain; The Engineering of the Brain; A world of Fuzzy Thinking; Crisp versus Fuzzy Logics; Fuzzy and Neural Networks; Where Are Fuzzy Neural Networks Headings; Objectives;

Biological Neural Networks: The Axon: A Transmission Line; The Synapse; The Synapse; A Bio-computer Types of Synapses; The Developing Neuron: Forming Networks; Neuronal Specialization; The Cell's Biological Memory; Weighting Factor; Factors Affecting Potassium-ion Flow; Firing, in a Nutshell; Neuronal; Diversity; Specifications of the Brain; The Eye's Neural Network; Retina Structure; Rods and Cones; From photons to Electrons; A Photochemical Chain Reaction Organization and Communication of the Retina Neural Network; Image Processing in the Retina; Visual Pathways;

UNIT –II

Artificial Neural Networks: Concepts: Neural Attributes; Artificial Neural Networks; Same Mathematics Again; Modeling; Basic Model of a Neuron; Learning in Artificial Neural Networks; Supervised Learning; Unsupervised Learning; Reinforced Learning; Competitive Learning; The Delta Rule; Gradient Descend Rule; Hebbian Learning Characteristics of ANNs; Important ANN Parameters; Artificial Neural Network Topologies; Modeling ANNs; ANN Learning and Program; Learning Algorithms; Discrimination Ability; Linearly Separable ANNs; Multilinear ANNs; Nonlinear Separable ANNs; ANN Adaptability; The Stability- Plasticity Dilemma;

UNIT – III

Neural Network Paradigms: Mc Culloch- Perception; The Perception; ADALINE and MADALINE Models; Winner- Takes- All Learning Algorithm; Back – Propagation Learning Algorithm; Learning with the Back- Propagation Algorithm; Mathematical Analysis; Application; Criticism ; Cerebellum Model Articulation Controller (CMAC); Adaptive Resonance theory (ART) Paradigm; The ART Algorithm; Hopfield Model; Mathematical Analysis; The Hopfield Learning Algorithm Discrete-Time Hopfield Net; Competitive Learning Model ; .

Memory Type Paradigms; Random Access Memory (RAM); Content Addressable Memory (CAM); Bidirectional Associative Memory (BAM); Content Addressable Memory (TAM); Linear Associative Memory (LAM); Real –Time Models; Linear Vector Quantization (LVQ); self-Organizing Map (SOM); Probabilistic Neural Network (PNN); Radial Basis Function (RBF); Time-Deal Neural Net (TDNN); Cognition and Neocognitron Models; Simulated Annealing; Boltzmann Machine; Other Paradigms; Restricted Coulomb energy (RCE); Culbertson's Model; Encephalon Project; Cellular Neural Networks; Logic on Projection Networks (LPN); Probabilistic RAM (Pram-256); Neural Acceleration Chip (NAC);

UNIT – IV

Fuzzy Logic: Propositional Logic; The Membership Function; Fuzzy Logic; Fuzzy Rule

Generation; De-fuzzification of Fuzzy Logic; Time – Dependent Fuzzy Logic; Crisp Logics; Fuzzy Logics; Temporial Fuzzy Logic (TFL); Time – Invariant Membership Function; Time – Variant Membership Function;
Intervals; Semi large Intervals; Interval Operators; Temporial Fuzzy Logic Syntax; Applying Temporial Fuzzy; Operators; Defuzzification of temporal Fuzzy Logic Example;

Applicability of TFL IN Communications Systems; Temporal Fuzzification; Rules and Temporal Defuzzification.

UNIT – V
Fuzzy Neural Networks: Fuzzy Artificial Neural Network (FANN); Neural – fuzzy Control; Traditional Control; Neural Control; Fuzzy control; Fuzzy- Neural;

TEXT BOOKS:

1. Neural Networks by Hawkins, Mc Graw Hill publishers
2. Neural Networks and Fuzzy systems by Bart Kosko
3. Neural Network Design by Martin Hagan, Howard B Demuth and Mark Beale

REFERENCES

1. B. Yegnanarayana ”Artificial Neural Networks ” PHI, New Delhi, 2005.
2. S. Rajasekaran and G.A. Vijayalakshmi Pai “ Neural Networks. Fuzzy Logic And Genetic Algorithms ”, 2007.
3. James A Freeman and Davis Skapura” Neural Networks Algorithm, Applications And Programming Techniques ”, Pearson Education, 2002.

[24CCIV0BT] ENGINEERING HYDROLOGY

UNIT – I

Introduction to hydrology: Engineering hydrology and its applications; Hydrologic cycle; precipitation- types and forms, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, presentation and interpretation of rainfall data.

Descriptive hydrology: Evaporation- factors affecting evaporation, measurement of evaporation; Infiltration- factors affecting infiltration, measurement of infiltration, infiltration indices; Run off- Factors affecting run- off, Computation of run-off; Design Flood; Estimation of maximum rate of run-off; separation of base flow.

UNIT – II

Hydrograph analysis: Hydrograph; Unit Hydrograph- construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S-hydrograph.

Ground water: Introduction; Aquifer; Aquiclude; Aquifuge; aquifer parameters- porosity, Specific yield, Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility; well hydraulics- Darcy's law; Steady radial flow to a well –Dupuit's theory for confined and unconfined aquifers; Tube well; Open well; Yield of an open well–Constant level pumping test, Recuperation test.

UNIT – III

Irrigation: Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

Water requirement of crops: Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; vertical distribution of soil moisture; soil moisture tension; soil moisture stress; various soil moisture constants; Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Assessment of Irrigation water. Consumptive use of water-factors affecting consumptive use, direct measurement and determination by use of equations (theory only)

UNIT – IV

Channels – silt theories: Classification; Canal alignment; Inundation canals; Cross–section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories–Kennedy's theory, Kennedy's method of channel design; Drawbacks in Kennedy's theory; Lacey's regime theory- Lacey's theory applied to channel design; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

Water logging and canal lining: Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal;

Lining of irrigation channels – necessity, advantages and disadvantages; Types of lining; Design of lined canal.

UNIT – V

Diversion head works: Types of Diversion Head Works; Diversion and Storage Head Works; Weirs and Barrages; Layouts of Diversion Head Works; Components; Causes and Failure of Hydraulic Structures on Permeable Foundations; Bligh's Creep Theory; Khosla's theory; Determination of Uplift Pressure, Impervious Floors Using Bligh's and Khosla's Theory; Exit Gradient.

Canal outlets: Introduction; Types of Outlets; Flexibility, Proportionality, Setting ,Hyper Proportional Outlet, Sub-Proportional Outlet, Sensitivity, Efficiency of An Outlet, Drowning Ratio, Modular Limit; Pipe Outlet; Kennedy's Gauge Outlet; Gibb's Module; Canal Escape.

TEXT BOOKS:

1. Irrigation And Water Power Engineering by Punmia & Lal, Laxmi Publications Pvt. Ltd., New Delhi
2. Irrigation Engineering and Hydraulic Structures by S. K. Garg; Khanna Publishers, Delhi.

REFERENCES:

1. Engineering Hydrology by K. Subramanya, The Tata McGraw Hill Company, Delhi
2. Engineering Hydrology by Jayarami Reddy, Laxmi Publications Pvt. Ltd., New Delhi
3. Irrigation And Water Resources & Water Power by P.N. Modi, Standard Publications.

[24CCIV0CT] GEO-ENVIRONMENTAL ENGINEERING

UNIT - I

Introduction to Ground water contamination, pollutant transport and ground water remediation. Sources and Types of ground water contamination – introduction – underground storage tanks, Landfills, surface impoundment's, waste disposal injection wells, Septic system, Agricultural wastes, and application, radioactive contamination, other sources of contamination.

UNIT - II

Data Collection methods: Introduction, Geological data acquisition – Drilling methods – Solid flight auger drilling – Hollow stem auger drilling – Wet rotating drilling – Hand auger soil boring – Sample collection – Soil core logging – Cone penetration testing – Geophysical methods; Hydrologic data acquisition – monitoring well construction – well material – Screen interval selection – Installation procedure – Survey specification – Protective casing requirements – Well development procedures; Acquisition loft soil and Ground water quality data.

UNIT - III

Contaminant Transport Mechanisms: Introduction – Advection process – Diffusion – Dispersion process – Diffusion – Mass transport Equations: Derivation of advection dispersion equation for solute transport; One Dimensional Models – Continuous source in one dimension – Instantaneous source in one dimension – Adsorption effects – Transport in one dimensional with first order decay

Sorption: The concept of sorption, Factors influencing sorption – Contaminant characteristics, Soil characteristics, Fluid media characteristics. Sorption Isotherms: Linear sorption Isotherm – Freundlich Sorption isotherm – Langmuir Sorption Isotherm Sorption effects on fate and transport of pollutants.

UNIT - IV

Flow and Transport of Pollutants in Unsaturated zone: Capillarity, soil-water characteristic curves, Unsaturated Hydraulic conductivity, Governing equation for unsaturated flow, measurement of soil properties.

Non – Aqueous Phase Liquids (NAPLs): Introduction – Comparison of fate of dissolved mass versus NAPL mass- Types of NAPLs – LNAPL – DNAPL;

UNIT - V

NAPL Transport – general process – NAPL transport at the pore level p- Downward Migration of DNAPLs – in saturated zone – NAPL movement through Vadose zone – LNAPL behavior at the water table – NAPL Transport at the site level – LNAPL conceptual models – DNAPL conceptual models. NAPL transport

REFERENCES:

1. Groundwater Contamination (Transport and Remediation) By Philip. B. Bedient, Hanadi, S. Rifai and Charles. J. Newell, Prentice Hall Publishers.
2. Geoenvironmental Engineering by Sharma & Krishna Reddy, John Wiley and Sons
3. Introduction to Environmental geotechnology by Hsai-Yang Fang, CRC Press

[24CCIV0DT] GROUND WATER MANAGEMENT & MODELLING

UNIT – I

Fundamental concepts: Types of aquifers, Vertical distribution of soil water below the ground, Porosity specific yield, hydraulic conductivity and storage coefficient, their practical significance

Darcy's law and its validity. Derivation of basic differential equation and its solutions, Ground Water flow contour and their applications. Tracer techniques in ground water flow studies.

UNIT – II

Ground Water resources evaluation: Steady and unsteady radial flow of ground water towards a well in confined and unconfined aquifers, Analysis of pumping test data – Theis type curve method, Jacob's method for Time and Distance draw down tests, Theis recovery method

Estimation of well losses, Yield of open wells – methods of evaluation. Image wells. Geo-hydrologic boundaries

UNIT –III

Ground water Management-1: Water Balance Studies, Perennial Yield, Necessity of artificial recharge techniques. Conjunctive use of surface and ground water. Management of coastal aquifers – Ghyben Herzberg relation ,upcoming of Saline Water- Methods of control of salt water intrusion.

UNIT – IV

Ground water Management-2: Ground water Quality, Ground Water pollution, elements and source of pollution their effects and remedial measures.

UNIT – V

Aquifer Modeling– Electrical analog models – RC Network techniques. Principles of digital Modeling of aquifers, Numerical Modeling – Flow Modeling Using Finite Difference Methods

Flow Modeling Using Finite Element Methods- Advection Process – Diffusion and Dispersion Process – Solute Transport Modeling.

REFERENCES:

1. Ground Water Hydrology by D.K. Todd.
2. Ground Water Hydrology by Raghunath.
3. Geohydrology by Davis and Dewiest
4. Geohydrology by K. R. Karanth
5. Development Evaluation and Monitoring of Ground Water by K.R. Karanth.
6. Domenice(1972) "Concepts and Models in Groundwater Hydrology" McGraw Hill Inc. N. York

[24CCIV0ET] SUSTAINABLE CONSTRUCTION MATERIALS AND TECHNIQUES

UNIT – I

Housing Scenario Introduction - Status of Urban Housing - Status of Rural Housing - Housing Finance: Introducing - Existing Finance System in India - Government Role as Facilitator – Status at Rural Housing Finance - Impedimently in Housing Finance and Related Issues

Land Use and Physical Planning for Housing Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities

Housing The Urban Poor - Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor

UNIT – II

Development And Adoption of Low-Cost Housing Technology

Introduction - Adoption of Innovative Cost-Effective Construction Techniques - Adoption Of Precast Elements in Partial Prefatroices - Adopting of Total Prefactcation of Mass Housing in India- General Remarks on Pre-Cast Rooting/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonry Walls - Half Brick Thick Load Bearing Wall – Fly ash, Gypsum Thick for Masonry - Stone Block Masonry - Adoption of Precast R.C. Plank and Join System for Roof/Floor in The Building

UNIT – III

Alternative Building Materials for Low-Cost Housing

Introduction - Substitute for Scarce Materials – Ferro cement - Gypsum Boards - Timber Substitutions - Industrial Wastes - Agricultural Wastes

Low-Cost Infrastructure Services:

Introduction - Present Status - Technological Options - Low-Cost Sanitation - Domestic Wall - Water Supply, Energy

UNIT – IV

Rural Housing:

Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology

Mud Roofs - Characteristics of Mud - Fire Treatment for Thatch Roof - Soil Stabilization - Rural Housing Programs

UNIT – V

Housing In Disaster Prone Areas:

Introduction – Earthquake - Damages to Houses - Traditional Prone Areas - Type of Damages and Railways of Non-Engineered Buildings - Repair and Restore Action of Earthquake Damaged Non-Engineered Buildings Recommendations for Future Constructions. Requirements of Structural Safety of Thin Precast Roofing Units against Earthquake Forces status of R& D in Earthquake Strengthening Measures - Floods, Cyclone, Future Safety

TEXT BOOKS

1. Building Materials for Low –Income Houses – International Council for Building Research Studies and Documentation.
2. Hand Book Of Low-Cost Housing by A.K. Lal – Newage International Publishers.
3. Properties Of Concrete – Neville A.M. Pitman Publishing Limited, London.
4. Light Weight Concrete, Academic Kiado, Rudhai. G – Publishing Home of Hungarian Academy Of Sciences 1963.
5. Low-Cost Housing – G.C. Mathur.
6. Modern Trends in Housing in Developing Countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G. Annamalai.

[24CCIV0FT] REHABILITATION AND RETROFITTING OF STRUCTURES

UNIT – I

Influence On Serviceability and Durability:- General : Quality Assurance for Concrete Construction, As Built Concrete Properties, Strength, Permeability, Volume Changes, Thermal Properties, Cracking. Effects Due to Climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking Methods of Corrosion Protection, Inhibitors, Resistant Steels, Coatings Cathodic Protection.

UNIT – II

Maintenance And Repair Strategies:- Inspection, Structural Appraisal, Economic Appraisal, Components of Equality Assurance, Conceptual Bases for Quality Assurance Schemes.

UNIT – III

Materials For Repair :- Special Concretes and Mortar, Concrete Chemicals, Special Elements for Accelerated Strength Gain, Expansive Cement, Polymer Concrete, Sulphur Infiltrated Concrete, Ferro Cement, Fiber Reinforced Concrete.

UNIT – IV

Techniques For Repair :- Rust Eliminators and Polymers Coating for Rebars During Repair, Foamed Concrete, Mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

UNIT – V

Case Studies:- Repairs To Overcome Low Member Strength, Deflection, Cracking, Chemical Disruption, Weathering, Wear, Fire, Leakage, Marine Exposure.

TEXT/REFERENCE BOOKS:

1. Dension Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical, U.K. 1991.
2. RT. Allen and S.C. Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987.
3. MS. Shetty, Concrete Technology – Theory and Practice, S. Chand and Company, New Delhi, 1992.
4. Santhakumar, A.R. Training Course Notes on Damage Assessment and Repair in Low Cost Housing RHDC-NBO Anna University, Madras, July, 1992.
5. Raikar, R.N. Learning from Failures – Deficiencies in Design, Construction and Service – R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
6. N. Palaniappan, Estate Management, Anna Institute of Management, Madras Sep. 1992.
7. F.K. Garas, J.L. Clarke, GST Armer, Structural Assessment, Butterworths, UK Aporil 1987.

[24CCIV0GT] FINITE ELEMENT METHODS

UNIT – I

Introduction-Concepts of FEM –Steps Involved –Merits &Demerits –Energy Principles – Discretization –Rayleigh –Ritz Method of Functional Approximation.

Elastic Formulations: Stress Equations-Strain Displacement Relationships in Matrix Form-Plane Stress, Plane Strain and Axi-Symmetric Bodies of Revolution with Axi Symmetric Loading

UNIT – II

One Dimensional FEM-Stiffness Matrix for Beam and Bar Elements Shape Functions for ID Elements –Static Condensation of Global Stiffness Matrix-Solution –Initial Strain and Temperature Effects.

UNIT – III

Two-Dimensional FEM-Different Types of Elements for Plane Stress and Plane Strain Analysis –Displacement Models –Generalized Coordinates-Shape Functions-Convergent and Compatibility Requirements –Geometric Invariance –Natural Coordinate System-Area and Volume Coordinates- Generation of Element Stiffness and Nodal Load Matrices –Static Condensation.

UNIT – IV.

Isoparametric Formulation-Concept, Different Isoparametric Elements For 2D Analysis-Formulation Of 4-Noded And 8-Noded Isoparametric Quadrilateral Elements –Lagrangian Elements-Serendipity Elements.

Axi Symmetric Analysis –Bodies of Revolution-Axi Symmetric Modelling –Strain Displacement Relationship-Formulation of Axi Symmetric Elements.

UNIT – V

Three-Dimensional FEM-Different 3-D Elements, 3D Strain –Displacement Relationship-Formulation of Hexahedral and Isoparametric Solid Element.

REFERENCES:

1. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla and Ashok D. Belegundu – Pearson Education Publications.
2. Finite Element Analysis – Theory & Programming by C.S. Krishna Murthy- Tata Mc. Graw Hill Publishers
3. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla, Universities Press India Ltd. Hyderabad.
4. Finite Element Method and Its Application by Desai ,2012, Pearson Publications.
5. Finite Element Methods by Darrel W. Pepper, Vikas Publishers
6. Finite Element Analysis and Procedures in Engineering by H.V. Lakshminaryana, 3rd Edition, Universities Press, Hyderabad.
7. Finite Element Analysis in Engineering Design by S. Rajasekharan, S. Chand Publications, New Delhi.
8. Finite Element Analysis by S.S. Bhavakatti-New Age International Publishers

[24CCIV0HT] FRACTURE MECHANICS

UNIT – I
Summary Of Basic Problems and Concepts:
Introduction - A Crack in A Structure - The Stress at A Crack Tip - The Griffith Criterion The Crack Opening Displacement Criterion - Crack Propagation - Closure

UNIT – II
The Elastic Crack – Tip Stress Field:
The Airy Stress Function - Complex Stress Functions - Solution to Crack Problems - The Effect Of Finite Size - Special Cases - Elliptical Cracks - Some Useful Expressions

UNIT – III
The Crack Tip Plastic Zone:
The Irwin Plastic Zone Correction - The Dugdale Approach - The Shape of The Plastic Zone - Plane Stress Versus Plane Strain - Plastic Constraint Factor - The Thickness Effect

UNIT – IV
The Energy Principle:
The Energy Release Rate - The Criterion for Crack Growth - The Crack Resistance (R Curve) - Compliance , The J Integral (Definitions Only)
Plane Strain Fracture Toughness:
The Standard Test - Size Requirements - Non-Linearity – Applicability
Plane Stress and Transitional Behavior:
Introduction - An Engineering Concept of Plane Stress - The R Curve Concept

UNIT – V
The Crack Opening Displacement Criterion:
Fracture Beyond General Yield - The Crack Tip Opening Displacement - The Possible Use Of The CTOD Criterion
Determination Of Stress Intensity Factors:
Introduction - Analytical and Numerical Methods - Finite Element Methods, Experimental Methods (An Ariel Views Only)

REFERENCES:
1. Elementary Engineering Fracture Mechanics - David Broek, Battelle, Columbus Laboratories, Columbus, Ohieo, USA
2. Fracture and Fatigue Control in Structures - John M. Barsom, Senior Consultant United States Steel Corporation & Stanley T. Rolfe, Ross H. Forney Professor of Engineering University of Kansas.

[24CCIV0IT] STRUCTURAL DYNAMICS

UNIT – I

Theory Of Vibrations: Introduction –Elements of A Vibratory System – Degrees of Freedom-Continuous Systems –Lumped Mass Idealization –Oscillatory Motion –Simple Harmonic Motion – Pictorial Representation Of S.H.M - Free Vibrations of Single Degree of Freedom (SDOF) Systems –Undamped and Damped –Critical Damping –Logarithmic Decrement –Forced Vibrations of SDOF Systems-Harmonic Excitation –Dynamic Magnification Factor- Bandwidth. Fundamental Objective of Dynamic Analysis-Types of Prescribed Loading- Methods of Discretization- Formulation of The Equations of Motion.

UNIT – II

Single Degree of Freedom System: Formulation and Solutions of The Equation of Motion - Free Vibration Response –Response to Harmonic, Periodic, Impulsive and General Dynamic Loading –Duhamel Integral

UNIT – III

Multi Degree Of Freedom System: Selection of The Degree of Freedom –Evaluation of Structural Property Matrices-Formulation of The MDOF Equations of Motion –Undamped Free Vibrations-Solution of Eigen Value Problem for Natural Frequencies and Mode Shapes- Analysis of Dynamic Response –Normal Coordinates –Uncoupled Equations of Motion –Orthogonal Properties of Normal Modes-Mode Superposition Procedure

UNIT – IV

Practical Vibration Analysis: Stodola Method- Fundamental Mode Analysis –Analysis of Second and Higher Modes –Holzer's Method –Basic Procedure –Transfer Matrix Procedure

UNIT – V

Introduction To Earthquake Analysis: Introduction –Excitation by Rigid Base Translation – Lumped Mass Approach -SDOF And MDOF System- I.S Code Methods of Analysis.

Continuous System: Introduction –Flexural Vibrations of Beams- Elementary Case-Equation of Motion – Analysis of Undamped Free Shapes of Simple Beams with Different End Conditions-Principles of Application to Continuous Beams.

REFERENCES:

1. A.K. Chopra, "Structural Dynamics for Earthquake Engineering", Pearson Publications
2. Dynamics Of Structures by Clough & Penziem
3. Structural Dynamics by Mario Paz
4. I.S:1893 (Latest)" Code of Practice for Earthquakes Resistant Design of Structures"
5. Anderson R.A Fundamentals of Vibration, Amerind Publishing Co.,1972.

[24CCIV0JT] EXPANSIVE SOILS

Unit-I:
Origin and occurrence of expansive soils-problems associated with expansive clays-identification and classification based on mineralogical composition
X-Ray diffraction, differential thermal analysis and electron microscopy-identification by index properties

Unit-II
Clay-water system – Ion distribution in clay –water systems-diffuse double layer-Gouy Chapman theory-cation exchange.
Mechanisms of swelling-osmotic pressure concept-Importance of mineralogical details in swelling-soil suction-measurement in laboratory and field

Unit-III
Swell potential-swelling pressure-factors affecting-direct measurement from laboratory testing-stresses in an in-situ soil mass-factors affecting heave-methods of heave prediction
Shear strength of expansive clays-Katti's concept of bilinear stress- state variables-Fredlund's three-dimensional approach to shear strength and swelling behavior of expansive clays

Unit-IV
Foundation practices in expansive clays-sand cushion-belled piers-under reamed piles-CNS layer technique

Unit-V
Expansive soil stabilization with lime-lime soil columns and lime slurry pressure injection-stabilization with admixtures

REFERENCES:

1. Foundations on expansive soils – F.H. Chen, Elsevier Publishing Co.
2. Search for solutions to problems in black cotton soils – R.K. Katti, Indian Geo. Tech. Journal, Volume 1, 1971
3. Fundamentals of soil behavior – J.K. Mitchell, John Wiley & Sons

[24CCIV0KT] ENVIRONMENTAL SYSTEMS ENGINEERING

UNIT – I

Water and wastewater Treatment Processes: Introduction – characteristics of water and wastewater - Treatment of Water and wastewater for different requirements – Water and wastewater Treatment Processes - Layout of Treatment Plant.

UNIT – II

Plain Sedimentation: Principles of Sedimentation – Settling velocities – Design consideration - Types of Sedimentation Tanks – problems.

Coagulation And Flocculation: Chemical Coagulation – Alum, Iron Salts and other coagulants for use as Coagulants Coagulant aids – secondary sedimentation tanks – design.

UNIT – III

Filtration: Gravity Sand Filters - types of sand filters – slow sand filter – construction and theory of operation of Slow Sand Filters – maintenance – efficiency - Rapid Sand Filter – construction and operation of filter – back wash - The Under Drainage System – efficiency of Rapid Gravity Sand Filters - Comparison between Slow and Rapid Gravity Filters – Pressure Filter - Designs of Filters, Examples.

UNIT – IV

Sanitation: Definition of environmental sanitation by W H O Communicable disease, epidemic-endemic-pandemic - sporadic diseases. Methods of infection transmission - Diseases of intestinal origin, vector-borne/arthropod-borne diseases. Domestic waste disposal - without water carriage and with water carriage systems. General liquid waste treatment system- household and community waste disposals. Insect vectors - flies and mosquitoes - life histories - Diseases transmitted by vectors - Eradication methods - biological control versus chemical control - rural and urban remedial measures - rats and rodent control - fumigation - disinfection - Insecticides - use and abuse.

UNIT –V

Solid Waste Management – Sources, Systems of collection-transportation - methods of solid waste disposal – Reuse, recycle, energy recovery, Hazardous waste management.

Air Pollution - Sources, effects, control of Air Pollution, Plume dispersion, plume rise, Pollutant dispersion models, Automobile Pollution and Control.

Environmental Law: Environmental protection and laws-Environmental (Protection) Act, 1986 - The Water (Prevention and Control) Act, 1974, The Air (Prevention and Control) Act, 1981, Laws relating to Hazardous Substances and Factories Act, 1948 - Hazardous Waste (Management and Handling) Rules 1989, EIA.

REFERENCES:

1. Environmental Engineering Design – Sincero and Sincero, Mc Graw Hill Publication.
2. Water Supply and Sanitary Engineering, Peavy and Rowe, Mc Graw Hill Publications
3. Air Pollution Control – Martin Crawford, Mc Graw Hill Publication
4. Municipal and Rural Sanitation - Ehlers, V.M. and Steel, E.W. Mc. GRAW-HILL Book Company, Inc. V. edition. 1987.
5. Environmental Sanitation, Ehlers, V.M., add Steel, E.W., McGraw-Hill Book Co., Inc.
6. Environmental Protection and Laws, Jadhav and Bhosale, V.M. Himalaya publishing House.

[24CCIV0LT] PAVEMENT ANALYSIS AND DESIGN

Unit I:
Factors affecting Pavement Design: Variables Considered In Pavement Design, Types Of Pavements, Functions Of Individual Layers, Classification Of Axle Types Of Rigid Chassis And Articulated Commercial Vehicles, Legal Axle And Gross Weights On Single And Multiple Units, Tire Pressure, Contact Pressure, EAL And ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect Of Transient & Moving Loads.

Unit II:
Stresses In flexible and Rigid Pavements:
Stress Inducing Factors in Flexible and Rigid Pavements; Stress in Flexible Pavements: Visco- Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two - and Three-Layered Systems, Fundamental Design Concepts;
Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses Due to Curling, Stresses and Deflections Due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

Unit III:
Materials and Characteristics:
CBR And Modulus of Subgrade Reaction of Soil, Mineral Aggregates – Blending of Aggregates, Binders, Polymer and Rubber Modified Bitumen, Fiber Reinforced Concrete,
Permanent Deformation Parameters and Other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics, Non-Destructing Testing.

Unit IV:
Design Of Flexible and Rigid Pavements: Development of Design Methods, Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA And Other Base Combinations, AASHTO, IRC Methods For Highways and Low Volume Roads, Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Rigid Pavement Design for Low Volume Rural Roads and Highways. Design Of Overlays: Types & Design of Overlays: IRC Methods Of Overlay Design, Importance of Profile Correction Course.

Unit V:
Airfield Pavement Design:
Aircraft Configurations, Flexible Airport Pavements - IS Specifications and Design, Corps of Engineers, FAA Methods, AI Methods.
Rigid Airport Pavements – IS Specifications, PCA Method, Corps of Engineers Method, FAA Method.

REFERENCES:

1. Design Of Functional Pavements, Nai C. Yang, Mc Graw Hill Publications
2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
3. Principles Of Pavement Design, Yoder. J. & Witzorac Mathew, W. John Wiley & Sons Inc
4. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
5. Pavement And Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
6. IRC Codes for Flexible and Rigid Pavements Design