

**CE 701 – Design of Hydraulic Structure**

**Unit - I**

**Gravity dams:** Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

**Unit - II**

Earth and Rock fill dams :

**Earth Dams:** Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

**Rock fill dams:** Types, merits and demerits, conditions favourable for their adoption.

**Unit - III**

**Spillways :** Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.

**Unit - IV**

**Energy dissipations and gates :** Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles and details. Design of canal regulating structures, Detailed design of Sarda Falls, design of cross drainage works, sphyon aquaduct.

**Unit - V**

**Hydropower Plants:** Introduction of Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

**Reference Books: -**

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey
5. Water Power Engineering by Dandekar

**CE 702 – Advanced Structural Design – II (RCC)**

**Unit - I**

**Design of Multistory Buildings** - Sway and nonsway buildings, Shear walls and other bracing elements.

**Unit II**

**Earth Retaining Structures:** Cantilever and counter fort types retaining walls.

**Unit - III**

**Water Tanks:** Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

**Unit - IV**

**Silos and Bunkers**

**Unit - V**

T-beam & Slab bridges- for highway loading (IRC Loads).

Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

**Suggested Books: -**

1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge engineering – D.J. Victor
4. Bridge Engineering - Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.
7. Pre stresses concrete – T.Y. Lin

**CE 703 – Environmental Engg. - II**

**Unit - I**

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

**Unit -II**

Characteristics and analysis of waste water, cycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

**Unit -III**

Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.

**Unit - IV**

Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

**Unit - V**

Advanced Waste Water treatment - Diatomaceous earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

**Laboratory work** shall be based on the topics of environmental engineering I & II and consist of experiments of water and waste water quality as per facility available in the institution.

**List of Experiment**

1. To study the various standards for waste water
2. To study the sampling techniques for waste water
3. To determine the alkalinity in water sample
4. To determine the acidity in water sample
5. Determination of Dissolved Oxygen in the water and waste water sample
6. Determination of Biological Oxygen demand of a waste water sample
7. Determination of Chemical Oxygen demand of a waste water sample
8. Determination of various types of solids in the waste water sample
9. Determination of bacterial number by membrane filter Technique
10. Determination of bacterial colonies by standard plat count method

**Reference Books :-**

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company, (P) Ltd. New Delhi
2. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
3. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
4. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi
5. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
6. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi
- 7.

**CE 704 – Quantity surveying & Costing**

**Unit – I**

**Introduction:** Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

**Unit – II**

**Rate Analysis:** Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

**Unit – III**

**Detailed Estimates:** Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

**Unit – IV**

**Cost of Works:** Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

**Unit – V**

**Valuation:** Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

**Suggested Books:**

1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala

**Practical & Sessional Works:**

1. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project.

**CE- 705 Elective- I (CE- 7101 Computational Methods in Structural Engineering)**

**Unit - I.**

Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations.

Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beamcolumn, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. nonprismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

**Unit - II.**

Basics of the Direct Stiffness method - Analysis of pinjointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Nonsway)

**Unit - III.**

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

**Unit - IV.**

Analysis of continuum structures - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalised element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

**Unit - V.**

Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipity family elements in natural coordinates, computation of stiffness matrix for isoparametric elements, degrading of elements, plate bending elements.

**Reference Books :-**

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

**CE- 705 Elective- I (CE- 7102 Traffic Engineering)**

**Unit -I.**

Traffic Characteristics : (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

**Unit -II.**

Traffic Studies : (i) Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies ( O & D ) : Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

**Unit -III.**

Traffic Operations and Control : (i) Traffic regulations and various means of control. (ii) One way streets- advantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

**Unit -IV.**

Street Lighting : (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

**Unit -V.**

Accident Studies & Mass Transportation : (i) Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

**Reference Books :-**

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S. Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R. Drew, Traffic Flow Theory
5. W.R. Mcshane and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

**CE- 705 Elective- I (CE- 7103 Industrial Waste Treatment)**

**Unit - I.**

Problem of Water Pollution: Effects of wastes on streams and sewage treatment plant. Natural purification of streams. oxygen sag curve. allowable organic load on streams classification of stream, stream standards and effluent standards. requirement of water for different purposes.

**Unit - II.**

Measurement of Waste Water Volume: Sampling of waste waters, grab and composite samples. analysis of waste water. biochemical oxygen demand. chemical oxygen demand and pH value of waste, toxicity of waste by bioassay method. Pretreatment of Wastes: Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

**Unit - III.**

Conventional Methods of Treatment of Waste Water: Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, advance methods of treatment, such as reverse osmosis, ion exchange, electrodialysis, algal harvesting etc. low cost treatment plants. common effluent treatment plant, design and operation.

**Unit - IV.**

Combined Treatment of Waste Water Sewage: Energy requirement optimization and budget, municipal regulation, sewer rental charge, instrumentation in waste water treatment plants, collection of data, operation and maintenance of plants, water pollution control board.

**Unit - V.**

Brief study of industrial processes and treatment methods of waste water from common industries, such as textile, dairy, paper and pulp, tannery, distillery. Hazardous wastes- Impact handling and disposal.

**Reference Books :-**

1. "Liquid Waste of Industries - Theories, Practice and Treatment" - N.L. Nemerow, Wesley Publishing Co.
2. Treatment of Industrial Waste - E.B. Besselièvre & Max Schwartz - Mc Graw Hill Book Company
3. "Waste Water Engg. - Treatment Disposal & Reuse" - Metcalf & Eddy - Tata Mc Graw Will, New Delhi
4. Waste Water Treatment - Arceivala - Tata Mc Graw Will, New Delhi
5. Industrial Pollution Control, hand book - Lund H.F. Tata Mc Graw Will, New Delhi



**CE- 705 Elective- I (CE- 7104 Cost Effective & ECO-Friendly Construction)**

**UNIT-I**

**Concepts of energy efficient & environment friendly materials and techniques.**

**Cost effective materials :-** Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

**Energy Efficient & Environment friendly building material products :-**

Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions.

Roofs - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

**UNIT-II**

**Cost effective construction techniques and equipments :-**

(a) Techniques :- Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology.

(b) Equipments :- Brick moulding machine, Stabilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

**UNIT-III**

**Cost effective sanitation :-**

- (a) Waste water disposal system
- (b) Cost effective sanitation for rural and urban areas
- (c) Ferrocement Drains

**UNIT-IV**

**Low Cost Road Construction :-**

Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

**UNIT-V**

**Cost analysis and comparison :-**

- (a) All experimental materials
- (b) All experimental techniques

**CE- 705 Elective- I (CE- 7105 Environmental Impact Assessment)**

**UNIT-I**

**Concept of EIA :** Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

**UNIT-II**

**Methods of Impact Identification :** Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

**UNIT-III**

**Impact analysis :** Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

**UNIT-IV**

**Preparation of written documentation :** Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

**UNIT-V**

**Public Participation in Environmental Decision making :** Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

**CE 706 – Minor Project**

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

**OR**

Shall submit a detailed report of experimental work/ software package on any specific problem of importance.