



# **DEPARTMENT OF CIVIL ENGINEERING**

**Scheme of Courses and Syllabus**

**B. Tech**

**Civil Engineering**

**Batch 2017 onwards**

**(Semester 3<sup>rd</sup> to 8<sup>th</sup>)**

Course Code	Title of Course	MARKS				CREDITS			
		Theory	Practical	Internal Assessment	Total Marks	L	T	P	Total
SEMESTER – III									
CE001	Civil Engineering Materials	60		40	100	4	0	0	4
CE003	Rock Mechanics & Engineering Geology	60		40	100	4	--	--	4
CE005	Surveying-I	60		40	100	3	1	--	4
ES104	Fluid Mechanics	60		40	100	3	1	--	4
ES105	Solid Mechanics	60		40	100	3	1	--	4
EN001	Environmental Studies	60		40	100	3	1	--	4
CE00P	Surveying-I Laboratory		20	30	50	0	--	1	1
ES104P	Fluid Mechanics Laboratory		20	30	50	0	--	1	1
ES105P	Solid Mechanics		20	30	50	0	--	1	1
ME143	Workshop Training (Viva)			50	50	0	--	--	2
	Student Centered Activity					0	--	--	0
						20	4	3	29

Course Code	Title of Course	MARKS				CREDITS			
		Theory	Practical	Internal Assessment	Total Marks	L	T	P	Total
SEMESTER – IV									
CE006	Building Planning, Drawing and Construction	60		40	100	3	--	--	3
CE007	Concrete Structure (RCC) Design- I	60		40	100	3	1	--	4
CE008	Construction Machinery &Project Planning	60		40	100	3	--	--	3
CE009	Structural Analysis	60		40	100	3	1	--	4
CE010	Surveying-II	60		40	100	3	1	--	4
BM104	Total Quality Management	60		40	100	3	--	--	3
CE006P	Building Planning, Drawing & Construction Laboratory		20	30	50	--	--	1	1
CE007P	Concrete Structure (RCC) design-I Laboratory		20	30	50	--	--	1	1
CE009P	Structure Analysis Laboratory		20	30	50	--	--	1	1
CE010P	Surveying-II Laboratory		20	30	50	--	--	1	1
	Student Centered Activity					--	--	--	0
						18	3	4	25

Course Code	Title of Course	MARKS				CREDITS			
		Theory	Practical	Internal Assessment	Total Marks	L	T	P	Total
SEMESTER – V									
CE011	Environmental Engineering -I	60		40	100	3	1	--	4
CE013	Geotechnical Engineering	60		40	100	3	1	--	4
CE015	Transportation Engineering-I	60		40	100	3	1	--	4
CE016	Concrete Structure (RCC) Design-II	60		40	100	3	1	--	4
CE039	Estimating & costing	60		40	100	3	1	--	4
CE011P	Environmental Engineering – Lab		20	30	50	--	--	1	1
CE013P	Geotechnical Engineering -Lab		20	30	50	--	--	1	1
CE015P	Transportation Engineering-I Lab		20	30	50	--	--	1	1
CE016P	Concrete Structure (RCC) Design-II Lab		20	30	50	--	--	1	1
CE039P	Estimating & Costing Lab		20	30	50	--	--	1	1
CE100	Survey Camp (Global Positioning System & its Application)		60	40	100	--	--	--	4
	Student Centered Activity					--	--	--	--
						15	5	5	29

Course Code	Title of Course	MARKS				CREDITS			
		Theory	Practical	Internal Assessment	Total Marks	L	T	P	Total
SEMESTER – VI									
CE012	Hydrology and Dams	60		40	100	3	1	--	4
CE014	Design of Steel Structure-I	60		40	100	3	1	--	4
CE018	Foundation Engineering and Soil Mechanics	60		40	100	3	1	--	4
CE019	Irrigation Engineering – I	60		40	100	3	1	--	4
CE020	Transportation Engineering –II	60		40	100	3	1	--	4
	Elective- I	60		40	100	3	--	--	3
	Open Elective	60		40	100	3	--	--	3
CE040P	Building Planning and Design		20	30	50	--	--	1	1
CE041P	Concrete Structure Drawing (computer Aided)		20	30	50	--	--	1	1
	Student Centered Activity					--	--	--	--
	TOTAL					21	5	2	28

#### **Elective- I**

- CE028 Architecture and Town Planning  
CE044 Prestressed Concrete  
CE045 Quantity Surveying and Valuation

#### **Open Elective**

- CE042 Construction Management Account  
CE043 Repair and Maintenance of buildings

Course Code	Title of Course	MARKS				CREDITS			
		Theory	Practical	Internal Assessment	Total Marks	L	T	P	Total
SEMESTER – VII / VIII									
CE021	Earthquake Resistant Design and Structural Dynamics	60		40	100	3	1	--	4
CE022	Irrigation Engineering –II	60		40	100	3	1	--	4
CE024	Design of Steel Structure-II	60		40	100	3	1	--	4
CE025	Hydro Power Engineering	60		40	100	3	1	--	4
	Elective II	60		40	100	3	1	--	4
	Elective III	60		40	100	3	1	--	4
CE022P	Irrigation Engineering -II Lab		20	30	50	--	--	1	1
CE103	Project Work		80	120	200	--	--	2	2
HU020	General Fitness			100	100	--	--	4	4
	Student Centered Activity					--	--	--	--
						18	6	7	31

### Elective II

CE046	Waste Management
CE047	Advanced Construction Material
CE050	Airport Engineering and Pavements

### Elective III

CE051	Open Channel Flow
CE052	Remote Sensing and Geographical Information System (GIS)
CE053	Design of RCC Culverts and Bridges

<b>Course Code</b>	<b>Title of Course</b>	<b>Credits</b>
<b>SEMESTER – VII / VIII</b>		
CE101	Industrial Training (Six Month Industrial Training)	20
	<b>Total</b>	20

## **CE001 CIVIL ENGINEERING MATERIALS**

### **UNIT-1**

Bricks:Composition of good brick earth, harmful ingredient, manufacture of bricks, characteristics of goodbricks, shapes, losis, classification of bricks as per IS 1077-1985.

### **UNIT-II**

Stones: Classification of rocks, test for stones, characteristics of a good building stone, deterioration of stones,common building stones of India, comparison of the brick comparison of the brick work and stone work.

### **UNIT-III**

Cement:Manufacture, basic properties of cement compounds, grades, packing storage, quality control and curing,supplementary cementatious materials such as fly ash, rice husk ash, silica fume.

### **UNIT-IV**

Aggregates: Classification, characteristics, soundness of aggregates, fineness modulus, maximum size ofaggregate and grading of aggregates.

### **UNIT-V**

Admixtures and Superplasticizers: Functions, classification, accelerating admixture, retarding admixture, air-containing admixtures, waterproofing and permeability reducing admixture, corrosion inhibiting admixtures and coloring admixture.

### **UNIT-VI**

Lime & Mortar:Classifications & Properties.

### **UNIT-VII**

Concrete:Introduction, properties of concrete, water cement ratio, workability, compressive strength, grades,Production of Concrete: Batching, mixing, transportation, placing, compaction and curing of concrete, quality control of concrete, concrete mix design. Special Concretes: RMC, Shortcrete.

### **UNIT-VIII**

Timber: Classification and identification of timber, defects in timber, characteristics of good timber, seasoningof timber and its methods, preservation of timber, varieties of industrial timber, famous Indian timber tress, Plywood.

### **UNIT-IX**

Metals:Manufacture of steel, market forms of steel e.g. mild steel and HYSD steel bars, rolled steel sections.Thermo Mechanically Treated (TMT) Bars, Brief discussion of properties and uses of aluminum.

### **UNIT-X**

Miscellaneous Materials: Epoxies, Asbestos, Asphalt, Bitumen, insulating materials, materials for doors andwindows, paints, varnishes, white washing, distempering, materials for structural repairs, cracks and joint fillers.

### **UNIT-XI**

Engineering Services:Water supply and electrical system, Sewerage and disposal of refuse, Acoustics andsound proofing, Ventilation and air-conditioning, Lift and escalators.



## UNIT-XII

Fire: Fire hazards, fire fighting system means of escape alarms system, Fire prevention measures.

### Text Books:

1. Gambhir, M.L., Concrete Technology, TMH
2. Rangwala, S.C., Engineering Materials, Charotar Publishing House
3. Kumar, Sushil, Engineering Materials, Metropolitan Press.
4. B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Building Construction, LPH

## **CE-003 ROCK MECHNAICS & ENGINEERING GEOLOGY**

### **UNIT I**

Earthquakes: Definition, terminology, causes, earthquake waves, intensity, recording of earthquakes, seismic zones in India, factors to be considered and methods in earthquake proof construction.

### **UNIT II**

Earth movements: Landslides and land subsidence, elementary idea about classification, factors causing landslides and land subsidence. Preventive measures for landslides viz retaining walls, slope treatment, chemical stabilization and drainage control.

### **UNIT III**

Engineering Properties of Rocks and their Laboratory Measurement: Uniaxial compression test, tensile test, permeability test, shear test, effect of size, shape of specimen, rate of testing and confining pressure; stress strain curves for typical rocks. Strength of intact and fissured rocks. Effect of anisotropy, influence of un-saturation and temperature on strength.

### **UNIT IV**

Engineering Properties of Rock Masses : Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear tests, pressure tunnel test.

### **UNIT V**

Simple methods of determining in-situ stresses: Bore hole over coring technique, Bore hole deformation gauges. Improvement in Properties of Rock masses by Pressure grouting for dams and tunnels, rock reinforcement and rock bolting.

**Text Books:** 1. Engineering and general geology by Parbin Singh . Katson Educational Series

## **CE005 SURVEYING-I**

### **UNIT I**

Introduction And Chain Surveying : Definition, Principles, Classification, Field and office work – Precision and Accuracy, Scales, Conventional signs, Survey instruments, Ranging and chaining, Reciprocal ranging, Setting perpendiculars, well , conditioned triangles, Traversing, Plotting, Enlarging and reducing figures.

### **UNIT II**

Compass Surveying And Plane Table Surveying: Prismatic compass, Surveyor's compass, Bearing, Systems and conversions – Local attraction , Magnetic declination, Dip, Traversing, Plotting , Adjustment of error , Plane table instruments and accessories , Merits and demerits , Methods , Radiation, Intersection, Resection , Traversing.

### **UNIT III**

Levelling : Level line , Horizontal line, Levels and Staves, Spirit level, Sensitiveness, Bench marks, Temporary and permanent adjustments, Fly and check levelling, Booking, Reduction, Curvature and refraction, Reciprocal levelling, Longitudinal and cross sections, Plotting, Calculation of areas and volumes , Contouring , Methods , Characteristics and uses of contours , Plotting , Earth work volume , Capacity of reservoirs.

### **UNIT IV**

Theodolite Surveying : Theodolite, Vernier and microptic, Description and uses, Temporary and permanent adjustments of vernier transit, Horizontal angles, Vertical angles, Heights and distances, Traversing, Closing error and distribution, Gale's tables, Omitted measurements

### **UNIT V**

Survey Applications : Reconnaissance, preliminary and location surveys for engineering projects, Lay out – Setting out works , Route Surveys for highways, railways and waterways , Curve ranging – Horizontal and vertical curves , Simple curves , Setting with chain and tapes, tangential angles by theodolite, double theodolite , compound and reverse curves , Transition curves – Functions and requirements , Setting out by offsets and angles , Vertical curves , Sight distances – Mine Surveying , instruments , Tunnels , Correlation of under ground and surface surveys , Shafts , Adits.

#### **Text Books:**

1. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation,
2. Punmia B.C. Surveying, Vols. I II and III, Laxmi Publications,

## **ES104 FLUID MECHANICS**

### **UNIT I**

Fluid statics: Basic equations, pressure and its relationship with height, pressure diagram, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.

### **UNIT II**

Fluid kinematics: Flow characteristics, continuity equation, acceleration of fluid particles, rotational and irrotational motion, circulation and vorticity, velocity potential and stream function, streamlines, equipotential lines, flow net - method, use and limitations.

### **UNIT III**

Fluid dynamics: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation orifice meter, venturimeter, pitot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved vanes, moment of momentum equation.

### **UNIT IV**

Flow through pipes: Reynolds' experiment, laws of fluid friction, Darcy Weisbach equation, energy losses, equivalent pipe, pipes in series and parallel, branched pipes, time of emptying a reservoir through pipe, pipe networks.

### **UNIT V**

Laminar flow: Laminar flow through circular pipes, parallel plates, open channel, Porous media, couette flow, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.

### **UNIT VI**

Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter,  $\Pi$  theorem, dimensional analysis choice of variables, Reyleigh methods, examples Rise in capillary tube, head characteristics of a pump, drag on a ship, Fall velocity of a sphere, velocity in an open channel, pipe orifice, discharge over a sharp edge weir, celerity of a gravity wave. Model analysis similitude, types of similarities, force ratios, similarity laws, model classification, scale effects.

### **UNIT VII**

Boundary layer theory: Types, boundary layer thickness and equations, momentum integral equation boundary layer on rough surfaces, total drag on flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control.

### **UNIT VIII**

Turbulent flow: Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non circular conduits.

### **UNIT IX**

Flow measurement: Measurement of pressure- static, dynamic and total pressure, Piezometric head, Measurement of velocity- Pitot tube and prandtl tube. Measure flow through orifice, mouth piece, weir and notches, measurement of discharge-orifice, mouthpiece weir and notches, orifice meter, Flow nozzle, Venturi flume.

**Text Books:**

1. Douglas JF, Gasiorek JM, Swaffield JP, Fluid Mechanics; Pitman
2. Streetes VL & Wylie EB; Fluid Mechanics : McGraw Hill book company.
3. Kumar D.S; “Fluid Mechanics and Fluid Power Engineering” S.K. Kataria
4. Garde R.J. and A.G. Mirajgaoker “Engineering Fluid Mechanics”, Nem Chand & Bros,
5. Garde R.J. “Fluid Mechanics through Problems” Wiley Eastern Ltd,

## **ES-105 SOLID MECHNICS**

### **UNIT I**

Axial Stress and Strain: Concept of stress and strain, Generalized Hooke's law, Stress-strain diagram of ductile and brittle materials, properties of engineering materials, Statically determinate and indeterminate problems, Compound and composite bars, Thermal stresses.

### **UNIT II**

Torsion of Circular shafts: Basic assumptions, Torsion formula, Power transmitted by shafts, Design of solid and hollow shafts based on strength and stiffness.

### **UNIT III**

Shear Force and Bending Moment Diagrams: Types of load on beam, Classification of beams, Shear force and bending moment diagrams: Simply supported, Overhung and Cantilever beams subjected to any combination of point loads, Uniformly distributed and varying load and moment, Relationship between load, shear force and bending moment.

### **UNIT IV**

Theory of Pure Bending: Derivation of flexural formula for straight beams, bending stress calculation for beams of simple and built up sections, Flitched beams.

### **UNIT V**

Shear Stresses in Beams: Shear stress formula for beams, Shear stress distribution in beams.

### **UNIT VI**

Stability of Columns: Crippling load of an axially loaded columns under different end conditions, Euler's and Rankine's formula.

### **UNIT VII**

Deflection of Beams: Governing differential equation for deflection of straight beams having constant flexural rigidity, double integration and Macaulay's methods for slopes and deflection, Moment area method, Conjugate beams method.

### **UNIT VIII**

Analysis of Plane Stress and Strains: Transformation equations for plane stress and plane strain, Mohr's stress circle, Relation between elastic constants, Strain measurements, Strain rosettes.

### **UNIT IX**

Theories of Failure: Theories of elastic failure, graphical comparison of theories of failure.

**Text Books:**

1. Popov, E.P. and Balan, T.A., Engineering Mechanics of Solids, PHI
2. Singh, D.K., Mechanics of Solids, Pearson Education
3. Shames, I. H. and Pitarresi, J. M., Solid Mechanics, PHI
4. Crandall, S.H., Dahl, N.C. and Lardner., An Introduction to Mechanics of Solids, MH

## **EN001 ENVIRONMENTAL STUDIES**

### **UNIT I**

Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness

### **UNIT II**

Renewable and non-renewable resources: Natural resources and associated problems- a) Forest resources : Use and over-exploitation, deforestation, case studies; Timber extraction, mining, dams and their effects on forest and tribal people; b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems; c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies; d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

### **UNIT III**

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers; Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a). Forest ecosystem; (b) Grassland ecosystem; (c) Desert ecosystem; (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

### **UNIT IV**

Biodiversity and its conservation: Introduction – Definition : genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity - In-situ and Ex-situ conservation of biodiversity.

### **UNIT V**

Environmental Pollution: Definition, Cause, effects and control measures of :- Air pollution; Water pollution; Soil pollution; Marine pollution; Noise pollution; Thermal pollution; Nuclear hazards and solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution..Pollution case studies. Disaster management : floods, earthquake, cyclone and landslides.



## **UNIT VI**

Social Issues and the Environment: From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies; Environmental ethics : Issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act; Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

## **UNIT VII**

Human Population and the Environment: Population growth, variation among nations; Population explosion – Family Welfare Programme., Environment and human health; Human Rights. Value Education; HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health.

## **UNIT VIII**

Field work : Visit to a local area to document environmental assets river/forest/ grassland/hill/ mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc.

## **UNIT IX**

Theories of Failure: Theories of elastic failure, graphical comparison of theories of failure.

### **Text Books:**

1. Mhaskar A.K., Matter Hazardous, Techno-Science Publication
2. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. Clark R.S., Marine Pollution, Clanderson Press Oxford
- 3 Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication
4. Agarwal, K.C. Environmental Biology, Nidi Publ. Ltd. Bikaner.

## **CE005P SURVEYING-1** **LABORATORY WORK**

### **List of experiments:-**

1. Chain And Compass Surveying :Ranging and Chaining – Offsets - Traversing.
2. Plane Table Surveying: Radiation – Intersection – Resection – Traversing
3. Levelling: Study of levels and levelling staff - Fly levelling using Dumpy level and Tilting level – Check Levelling.
4. Theodolite Surveying: Study of theodolites - Measurement of angles by reiteration and repetition - Measurement of vertical angles.

## **ES 104P FLUID MECHANICS LABORTORY**

### **LABORATORY WORK**

#### **List of Experiments**

1. To determine the meta-centric height of a ship model
2. Verification of Bernoulli's theorem
3. To calibrate a venturimeter and to determine its coefficient of discharge
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
5. To study the flow over v notch ( weir ) and to find the coefficient of discharge
6. To determine the hydraulic coefficient of discharge of a mouth piece.
7. To verify the momentum equation experimentally
8. To determine the coefficient of friction of pipes of different diameters.
9. To determine the form losses in a pipe line
10. To obtain the surface profile on the total heads distribution of a forced vortex
11. Viscous flow analogy (Hele-Shaw apparatus) for flow net.
12. Electrical analogy for flow net.

Study of flow measurement devices through rotameter apparatus

## **ES105P SOLID MECHNICS LABORTORY**

### **LABORATORY WORK**

Tests for Hardness, Bending, Impact, Tensile strength, Torsion and Compression tests.

#### **List Of Experiments:**

1. Rockwell/Brinell hardness number of given specimens.
2. Vicker's hardness number test.
3. Torsion test (destructive): to determine the torsional rigidity of the material.
4. Tensile test on strip/universal testing machine – to obtain the young's modulus of elasticity, tensile strength and percentage elongation of the material.
5. Impact strength of the given material – Izod's and Charpy tests.
6. Experimentally determine the value of E of the beam material using deflections formula for cantilever and simply supported beams.
7. Non-destructive torsion test to determine modulus of rigidity of the shaft material.
8. To study the behavior of the material on UTM.

## **CE006 BUILDING PLANNING, DRAWING AND CONSTRUCTION**

### **UNIT-I**

Brick & Stone Masonry: Terms used; types of bonds; their merits and demerits; Rubble and ashlar joints in stone masonry, introduction to cement concrete hollow blocks, advantages and disadvantages of concrete block masonry over brick masonry.

### **UNIT-II**

Walls and Foundation: Load bearing and non-load bearing walls, estimation of load on walls and footings, Thickness considerations, partition and cavity walls design of masonry walls, pillars and footings.

### **UNIT-III**

Damp Proofing: Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing.

### **UNIT-IV**

Arches and Lintels: Introduction to terms used in Arches; different types of arches; brick and stone arches, types and functions of lintels.

### **UNIT-V**

Roofs: Introduction, terms used, types of roof trusses and roof coverings, details of rain proofing, rain water pipes.

### **UNIT-VI**

Doors and Windows: Introduction, terms used, location of doors and windows, types of doors and windows, methods of fixing doors and window frames in walls. Ventilators.

### **UNIT-VII**

Plastering, Pointing and Painting: Introduction, objects and types, special materials for plastered surfaces, distempering, white washing and color washing of plastered surfaces.

### **UNIT-VIII**

Floors: Introduction, various types of floors commonly used and their suitability for different buildings, constructional details of concrete and Terrazzo floorings, marble flooring, anti-termite treatment.

\*\* Site Selection criteria. Principles of Building planning. Significance Sun diagram. Wind Diagram. H-Orientation, Factors affecting, criteria under Indian condition. Building Planning Byelaws & regulations as per SP-7, 1983 National Building code of India group 1 to 5. Planning of Residential

Building (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate. Low cost Housing-Materials & Methods (conceptual introduction only) H Maintenance, Repairs, Rehabilitation of Structures. (conceptual introduction only)

**Text Books:**

1. S.K. Sharma Building Construction
2. Sushil Kumar Building Construction
3. B.C. Punmia Building Construction

## **CE007 CONCRETE STRUCTURE (RCC) DESIGN-I**

### **UNIT-I**

Introduction: Design loads ,Reinforced concrete, properties of concrete and steel, stress-strain curves, permissible stresses, introduction of component and structural system, introduction to design philosophies working stress design, ultimate strength and limit state design method, difference b/w working stress method and limit state method.

### **UNIT-II**

Limit State Design Method: Introduction, Limit States, characteristic strength, characteristic loads, design values for materials and loads, factored loads. Limit State of Collapse (Flexure) Types of failures, assumptions for analysis and design of singly reinforced, doubly reinforced sections, and flanged sections. Limit State of Collapse (Shear, bond and torsion) ,limit state of serviceability in deflection, crack width .Design of short column and long column subjected to uniaxial, biaxial bending.

### **UNIT-III**

Limit State Design of various elements and miscellaneous structures: Design of Rectangular, Flanged beams, and continuous beam. Design of Lintels, Design of one-way slabs and two-way rectangular slabs, Circular slabs. Design of stair case.

### **UNIT-IV**

Application of SP 16 and Detailing of Reinforcement: Use of SP: 34, Codal Provision for RC Elements: (I) General (II) for ductility.

### **Text Books:**

1. Gambhir, M.L., Fundamentals of Reinforced Concrete Design, Prentice Hall of India (2009).
2. Ram Chandra, Limit State Design, Standard Book House (1990).
3. Pillai, Sunnikrishnan and Menon, D., Reinforced Concrete Design, TMH
4. Varghese, P.C., Limit State Design of Reinforced Concrete, PHI
5. Sinha, S.N. and Roy, S.K., Fundamentals of Reinforced Concrete, S. Chand
6. Jain, Ashok. K., Reinforced Concrete Limit State Design, Nem Chand Brothers (2007).

## **CE008 CONSTRUCTION MACHINERY & PROJECT PLANNING**

### **UNIT-I**

Introduction : Need for project planning & management, value engineering , time value of money, activity & event, bar chart, Milestone chart, uses & draw backs.

### **UNIT-II**

PERT : Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.

### **UNIT-III**

CPM : Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems.

### **UNIT-IV**

Cost analysis and contract : Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, flexible budgets, cost & quality control, profit planning control & decision making, cost accounting systems, numerical problems. Updating a project, when to update, time grid diagram, resource scheduling planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

### **UNIT-V**

Earth moving machinery : Tractors, bull dozers, rippers, scrappers power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment maintenance and repair cost. Hoisting & Transporting Equipments: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons.

### **UNIT-VI**

Construction equipment : Plants for grading, batching, mixing, types of mixers, concrete pumps, bitumen plants.

#### **Text Books:**

1. Peurifoy R.L. , Construction Planning and Equipment, TMH
2. Srinath L. S , PERT and CPM, East West Press
3. Mahesh Verma, Construction Equipment & Planning and Application.



## **CE009 STRUCTURAL ANALYSIS**

### **UNIT-I**

Analysis of Determinate Structures: Revision of analysis of plane trusses, Analysis of pin jointed space trusses using tension coefficients and equilibrium equations.

### **UNIT-II**

Displacements: Energy Methods: Strain energy in members, Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, Unit load method, Deflections of trusses and 2D-frames.

### **UNIT-III**

Indeterminate Structures: Introduction, Static and kinematic indeterminacies, Stability of structures, Internal forces in two and three-dimensional structures.

### **UNIT-IV**

Analysis of Indeterminate Beams and Frames: Methods of consistent deformation, Method of least work, and Theorem of three moments; Conventional methods of Analysis of rigid frames: Slope deflection method, Moment distribution method; Approximate methods: Portal method, and Cantilever method.

### **UNIT-V**

Moving Loads and Influence Line Diagrams: Bending moment and shear force diagrams due to single and multiple concentrated rolling loads and uniformly distributed moving loads, Equivalent UDL, Muller Breslau principle: Influence lines for beams, Girders with floor beams and frames calculations of the maximum and absolute maximum, shear force and bending moment envelopes.

### **UNIT-VI**

Influence lines for Indeterminate Structures: Cable and suspension, influence diagram for truss reaction.

### **UNIT-VII**

Analysis of Typical Structures: Three hinged and two hinged arches, influence lines for thrust, radial shear and bending moment.

#### **Text Books:**

1. Wang, C.K., Indeterminate Structural Analysis, McGraw Hill (1983).
2. Norris, C.H., Wilbur, J.B. and Utku, S., Elementary Structural Analysis, McGraw Hill
3. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, S.M.T.S.2 Theory of Structures, Laxmi Publications

## **CE010 SURVEYING –II**

### **UNIT-I**

Tacheometric Surveying: Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs – Stadia constants - Anallactic lens - Subtense bar.

### **UNIT-II**

Control Surveying: Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre – Trigonometrical levelling - Single and reciprocal observations - Modern trends.

### **UNIT-III**

Survey Adjustments: Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks. **(8 hours)**

### **UNIT-IV**

Astronomical Surveying: Celestial sphere - Astronomical terms and definitions - Motion of sun and stars – Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems – Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth.

### **UNIT-V**

Miscellany: Electromagnetic distance measurement - Carrier waves - Principles – Instruments - Trilateration – Total Station - GPS Surveying - Hydrographic Surveying - Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem – Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies.

#### **Text Books:**

1. Singh, Narinder, Surveying, TMH
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, LPH
3. Agor, R., Surveying, Khanna Publishers (1982).
4. Kanetkar, T.P., and Kulkarni, S.L., Surveying and Leveling Part I and II, Pune Vidhyarthi Griha Prakashan

## **BM 104 TOTAL QUALITY MANAGEMENT**

### **UNIT-I**

Introduction to quality management: Definitions – TOM framework, benefits, awareness and obstacles. Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

### **UNIT-II**

Principles and philosophies of quality management: Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi introduction, loss function, techniques – parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology.

### **UNIT-III**

Statistical process control and process capability: Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve. Total productive maintenance (TMP) – relevance to TQM, Terotechnology. Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

### **UNIT-IV**

Tools and techniques for quality management: Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking and POKA YOKE.

### **UNIT-V**

Quality systems organizing and implementation: Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward- Introduction to software quality.

#### **Text Books:**

1. Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education

## **CE006P BUILDING PLANNING DRAWING & CONSTRUCTION LABORTOARY**

Skills to be developed:

Intellectual skills :- Students will be able to

- a) Identify component of building.
- b) Differentiate and identify types of building materials
- c) Select appropriate material for building construction
- d) Supervise the building construction activities.

Motor Skills :- Students will be able to

- a) Mark layout of building on the ground.
- b) Check and mark various levels in building.

### **List of Practicals:**

1. Preparing foundation plan and marking on ground layout of load bearing structure by face line method from the given plan of the building.
2. Preparing foundations plan and marking on ground layout of framed structure by face line method from the given plan of the building.
3. Checking and transferring lines and level of plinth, sill, lintel, flooring, slab level of a building and writing report of the process.
4. Checking vertically (plumb line) of formwork for column, beam and wall at construction site and writing report of the process.
5. Laying and constructing the process of construction of brickwork and report writing of the process.
6. Observing the process of painting in residential/ public building and writing a report with reference to process and type of paint selected.
7. Observing and writing report of the process of plastering.
8. Observing and writing report of the process of water proofing of terrace or basement.
9. Observing the model, specimen of building materials kept in the model room for few building items and writing a report for any five models/ materials.

## **CE007P CONCRETE STRUCTURE (RCC) DESIGN-1 LABORTOARY**

### **List of Experiments:-**

The following experiments are to be performed in the Concrete Lab.

1. To Determine the Specific Gravity of cement.
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement.
3. To Determine Soundness of Cement.
4. To Determine the Compressive Strength of Cement.
5. To Determine the Compressive Strength of Bricks/Tiles.
6. To Determine the Fineness Modulus of Fine and Coarse Aggregates.
7. To Determine the Bulk Density, Water Absorption and Sp. Gr. of Fine and Coarse Aggregates.
8. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.
9. Mix Design of Concrete.
10. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
11. To carry out the Tensile and Flexural tests of Concrete.
12. To determine the Compressive Strength of hardened Concrete by Non-

### **Destructive Test Books/Manuals :-**

1. Concrete manual By M.L. Gambhir, Dhanpat Rai & Sons Delhi
2. Concrete Lab Manual by TTTI Chandigarh

## **CE009P STRUCTURE ANALYSIS LABORTOARY**

### **List of Experiments:-**

1. To verify Betti's Law.
2. To find the deflection of a pin connected truss.
3. To determine the flexural rigidity ( $EI$ ) of a given beam.
4. To verify Moment-Area Theorems for slope and deflection of a beam.
5. To study the behavior of different types of struts.
6. To determine the loads in three suspension rods supporting an elastic beam.
7. To obtain experimentally the influence line for the horizontal thrust in a two hinged arch.
8. To determine the elastic displacement of curved members.
9. To determine the horizontal displacement of the roller end in a curved beam.
10. To make computer programs for theoretical verification of the above experiments.

## **CE010P SURVEYING II LABORTOARY**

### **List of Experiments:-**

1. Setting out works - Foundation marking - Simple curve (right/left-handed) – Transition curve.
2. Theodolite Traversing
3. Heights and Distances – Triangulation problem – Single plane method
4. Tachometry - Tangential system - Stadia system - Sub tense system.
5. Field observation on SUN to calculate azimuth.
6. Experiments on Total Station – GPS.
7. Study of Micro Optic Theodolite - Digital Theodolite.

## **CE011 ENVIRONMENTAL ENGINEERING-I**

### **UNIT-I**

Public water supply: Beneficial uses of water, water demand, per capita demand, variation in demand; causes, detection and prevention of wastage of water, population forecasting.

### **UNIT-II**

Sources of water supply: Surface and underground sources, relation and development of source in r/o quality and quantity of water, Development of wells, Storage reservoir-balancing and service storage, capacity determination by mass curve method. Intake and transmission system distribution systems: network design.

### **UNIT-III**

Quality and examination of water: Necessity for examination of water impurities in water, sampling of water, physical, chemical and bacteriological quality for domestic water supply. Drinking water quality standards and criteria.

### **UNIT-IV**

Water supply and drainage of buildings : System of water supply houses connections, metering, internal distribution, and sanitary fittings pipe joints, Different types of pipes and pipes materials.

### **UNIT-V**

Water treatment: Unit operations in water treatment screening, sedimentation, and its theory sedimentation aided with coagulation, flocculation, sand filtration-slow, rapid, gravity and pressure filters, Disinfecting, Necessary: requirements of disinfectant, methods, of disinfecting different practices of chlorinating.

### **UNIT-VI**

Miscellaneous methods of water treatment: Aeration, taste and odour control iron and manganese removal water softening processes Base exchange process, Swimming pool water Treatment

#### **TextBooks:**

1. Water Supply Engineering Environmental Engg. I by B.C. Punmia, Ashok Jain, Arun Jain.
2. Environmental Engineering - A Design Approach by ARCADIO P. SINCERO, GREGORIA A. SINCERO
3. Environmental Engineering and Technology, by PEAVY, ROWE.



## **CE013 GEOTECHNICAL ENGINEERING**

### **UNIT-I**

Basic Concepts: Definition of soil and soil mechanics common soil problems in Civil Engineering field. Principal types of soils. Important properties of very fine soil i.e. adsorbed water, Base Exchange and soil structure. Characteristics of main Clay mineral groups i.e. montmorillonite, illite and kaolinite, Basic definitions in soil mechanics. Weight volume relationship theory and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.

### **UNIT-II**

Index Properties: Grain size analysis. Stokes' law and Hydrometer analysis. Consistency and sensitivity Clay as per I.S. Code Atterberg Limits Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse grained soils. Classification of fine-grained soils as per Indian standard classification system (IS-1498-1970).

### **UNIT-III**

Compaction: Definition and object of compaction and concept of O.M.C. and zero Air Void Line. Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relative suitability. Field compactive effort. Field control of compaction by proctor.

### **UNIT-IV**

Consolidation: Definition and object of consolidation difference between compaction and consolidation. Concept of various consolidation characteristics i.e.  $a_v$ ,  $m_v$  and  $c_v$  primary and secondary consolidation. Terzaghi's Differential equation and its derivation Boundary conditions for Terzaghi's solution for one dimensional consolidation concept of  $c_v$ ,  $t_v$  &  $U$ . consolidation test determination of  $c_v$  from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance on  $e$ -Log  $\sigma$  curves of normally consolidated clays, importance of consolidation settlement in the design of structures.

### **UNIT-V**

Permeability and Seepage: Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, coefficient of permeability and its determination in the laboratory. Average permeability of stratified soil mass, factors affecting 'K' and brief discussion.

## UNIT-VI

Shear Strength: Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stresses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands.

## UNIT-VII

Earth Pressure: Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium and derivations of expressions for  $K_a$  and  $K_p$  for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Rankine's Earth pressure for a cohesionless backfill with sloping surface (with proof) concept of active and passive Earth pressure on the basis of stability of a sliding wedge. Coulomb's method for cohesion less backfill. Merits and demerits of Rankine and Coulomb's theories graphical construction and Rebhan's graphical construction (without surcharge load).

### Text Books:

1. Soil Mech. & Foundation Engg, by K.R.Arora
2. Geotechnical Engineering, by P. Purshotama Raj
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy

## **CE015 TRANSPORTATION ENGINEERING I**

### **UNIT-I**

Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

### **UNIT-II**

Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.

### **UNIT-III**

Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

### **UNIT-IV**

Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.

### **UNIT-V**

Highway Materials: Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

### **UNIT-VI**

Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.

### **UNIT-VII**

Highway Drainage: Importance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas.

### **UNIT-VIII**

Highway Maintenance: Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

### **UNIT-IX**

Highway Economics & Financing : Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

### **UNIT-X**

Traffic Engineering: Introduction about Road User Characteristics, Driver Characteristics, Vehicular Characteristics, Traffic Studies: Volume and Speed Studies, O-D Survey, Parking Study ,Traffic Safety: Cause and Type of Accidents, Use of Intelligent Transport System, Traffic Control Measures: Signs, Markings, Islands, Signals, Traffic Environment Interaction: Noise Pollution, Vehicular Emission, Pollution Mitigation Measures

**Text Books:**

1. Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5. Khanna S.K., and Justo, C.E.G. “Highway Material Testing Laboratory Manual”, Nem Chand and Brothers, Roorkee, 1997.

## **CE016 CONCRETE STRUCTURE (RCC) DESIGN – II**

### **UNIT-I**

Foundation-Theory and design: Isolated footing (Square, rectangular and circular with uniform depth and slope), Combined footing (Rectangular, Trapezoidal, Strap) Raft footing, strip footing.

### **UNIT-II**

Design of retaining wall: Cantilever type retaining wall, counterfort type retaining wall.

### **UNIT-III**

Introduction to water retaining structures: Design of circular and rectangular water tank resting on ground, underground and over ground

### **UNIT-IV**

Design of flat slab

#### **Text Books:**

1. Design of Reinforced Concrete Structures P. Dayaratnam
2. Reinforced Concrete Fundamentals Ferguson
3. Design of Concrete Structures Nilson and Winter
4. Limit State Design Ramachandra
5. Limit State Design A.K. Jain
6. Limit State Design of Reinforced Concrete P.C. Vergese
7. Earthquake Resistant design of structures by Pankaj Aggarwal & Manish Shikahande-PHI Publications.
8. Earthquake Design concept by CVR Murthy & Andrew Charleson published by Niecee-IIT Kanpur
9. Reinforced concrete design Pillai & Menon

## **CE039 ESTIMATING AND COSTING**

### **UNIT-I**

Overview of Estimating & Costing

Meaning of the terms estimating, costing, purpose of estimating and costing.

Types of estimate- Approximate and Detailed.

Approximate estimate types- plinth area rate method, Cubic Content method, Service unit method.

Typical bay method, Approximate Quantity method, problems on plinth area rate method & application of service unit method for selection of service unit for application of service unit method for selection of service unit for different types of civil Engineering Structures.

Types of detailed estimate.

Detailed estimate for new work

Revised estimate.

Supplementary estimate.

Revised & Supplementary estimate.

Maintenance & repair estimate.

Uses of detailed estimate.

### **UNIT-II**

Detailed Estimate

Unit quantity method, Total quantity method, Data required for detailed estimate. Factors to be considered during preparation of detailed estimate, specification, Quantity availability of material, Location of site, Labour Component.

Steps in preparing detailed estimate. Taking out quantities, squaring, abstracting.

Preparing check list- by adoption of sequence of execution. Drafting Brief specification of items, contents of measurement sheet, Abstract sheet, face sheet.

### **UNIT-III**

Mode of Measurements.

General Rules for fixing units of Measurements for different items of work as per IS 1200 & as per PWD hand book.

Desired accuracy in taking Measurement of various items of work & rules for deductions as per IS 1200 & P.W.D hand book.

### **UNIT-IV**

Procedure for Preparing Detailed Estimate

Procedure for taking out quantities for various items of works by P.W.D 7 IS 1200 for.

a) For load bearing Structure – Long wall and short wall method, Center line method.

b) Framed Structure building.

By using thumb rules for reinforcement quantity calculation.

By preparing bar bending Schedule.

Provisions in detailed estimate for contingencies, Work charged establishment, Provisional items, Provisional sum, Provisions for water supply & Sanitary works, Electrical wiring installations, sent age charges, tools & Plants, Prime cost, Day work.

## UNIT-V

### Rate Analysis

Meaning of term rate analysis – Factors affecting rate analysis lead, lift task work materials and labour components, Market rate and Labour rate.

Transportation of Materials, load factor for different materials. Standard lead, Extra lead Transportation charges, Labour – Categories of labours, labour rates, overheads, contractors profit, water charges, taking out quantities of materials for different items of works.

Preparing rate analysis of different items of work

Standard Schedule of rates, Full rates & labour rates.

## UNIT-VI

Taking Out Quantities of work for different Civil Engineering Works

Roads, Dam, Canals, Railway embankments, methods of mean area, Mid section area, Trapezoidal, Prismoidal formula. Calculation of Quantity of earth work.

### Text Books:

1. Estimating & costing in civil engineering B.N Dutta USB Publishers Distributors Pvt Ltd New Delhi.
2. Estimating & Costing Specification and valuation in Civil Engineering M. Chakraborti ,Calcutta
3. Estimating & costing S.C. Rangwala Charotar Publication Anand
4. Civil engineering estimating Contracts and accounts Vol 1 B.S. Patil , Orient longman, Mumbai
5. Estimating & Costing G.S. Birdie , Dhanpat Rai And Sons Delhi.

**CE011P ENVIRONMENTAL ENGINEERING-1**  
**LABORATORY**

**List of Experiments:**

1. To measure the PH value of a sample
2. To find the turbidity of a given sample
3. To find B.O.D. of a given sample
4. To measure D.O. of a given sample
5. Determination of Hardness of a given sample
6. Determination of total solids, dissolved solids, suspended solids of a given sample
7. To determine the concentration of sulphates in water/wastewater sample.
8. To find chlorides in a given sample
9. To find acidity/alkalinity of a given sample
10. To determine the COD of a wastewater sample.



## **CE013P GEOTECHNICAL ENGINEERING LABORTOARY**

### **List of Experiments:**

1. Determination of in-situ density by core cutter method.
2. Determination of in-situ density by sand replacement method.
3. Determination of Liquid Limit & plastic Limit by Casagrande apparatus and penetrometer method.
4. Determination of specific gravity of soil solids by pyconometer method.
5. Grain size analysis of a given sample of sand and determination of coefficient of uniformity and coefficient of curvature.
6. Direct shear and triaxial test on a given soil sample.
7. Unconfined compression test for fine grained soil.
8. Determination of permeability by constant Head Methods and variable head method.
9. Compaction test (proctor) and modified proctor test.
10. Plot of zero air voids line.
11. Determination of Relative Density of soil.

## **CE015P TRANSPORTATION ENGINEERING LABORTOARY**

### **List of Experiments:**

1. Tests on Sub-grade Soil
  - IS Compaction Test
  - California Bearing Ratio Test
2. Tests on Road Aggregates
  - Gradation Test
  - Crushing Value Test
  - Abrasion Value Test
  - Impact Value Test
  - Specific Gravity & Water Absorption Test
  - Shape Test
  - Marshal Stability Test
3. Tests on Bituminous Materials
  - Penetration Test
  - Ductility Test
  - Softening Point Test
  - Flash & Fire Point Test
  - Bitumen Extraction Test
4. Field Tests
  - Roughness Measurements of Road by Profilograph

## **CE016P CONCRETE STRUCTURE DESIGN (RCC)-II LABORTOARY**

### **List of Experiments:-**

1. Design of a concrete mix in accordance with IS and ACI guidelines.
2. Determination of flexural strength of concrete.
3. Determination of split tensile strength of concrete.
4. Plotting of stress-strain curve of given concrete mix and to determine the modulus of elasticity.
5. Plotting stress-strain curve of mild steel and HYSD bars.
6. Behaviour of following RCC beams subjected to flexure  
(a) Under - reinforced beam. (b) Over - reinforced beam. (c) Balanced Section.
7. Behaviour of RCC beams in shear.
8. Effect of partial replacement of cement by fly ash on properties of concrete.
9. Demonstration of Non-destructive testing equipment like Impact Hammer, Ultrasonic Pulse Velocity Tester, Profometer, Corrosion analyser and Resistometer.

## **CE039P ESTIMATING AND COSTING LABORATORY**

### **List of Assignments:**

1. Prepare Check list of items of following type of Civil Engineering works
  - i. Load Bearing type Building
  - ii. Framed structure type building
  - iii. W.B.M. road
  - iv. Septic Tank
  - v. Community well
2. Writing the rules of deductions for below mentioned items of work as per IS 1200
  - i. Brick/ Stone masonry
  - ii. Plastering/Pointing
3. Taking out quantities of various items of work for load bearing building.
  - i. Earth work in excavation for foundation
  - ii. Base Concrete of foundation
  - iii. U.C.R/BB Masonry work in foundation and plinth.
  - iv. D.P.C.
  - v. Plinth filling.
  - vi. Brick work in masonry.
  - vii. Flooring
  - viii. Plastering
  - ix. Wood work in doors and windows.
4. Taking out quantities of following items for small R.C.C. Hall.
  - i. Concreting for footing, Column, BEAM, Slab.
  - ii. Reinforcement for above items by preparing schedule of bars.
  - iii. Form work for all above items.
5. Preparing detailed estimate of a RCC single and two storied residential building for all items of work ( The quantity of reinforcement shall be calculated by percentage)
6. Preparing rate analysis of following items: Building work-Brick work, P.C.C, R.C.C., Plastering, Flooring, Doors, windows.
7. Taking out quantities of earth work for a road profile prepared in surveying subject. Prepare the lead statement.
8. Taking out quantities of work for a community well or jack well or septic tank.
9. Taking out quantities of work for pipe culvert.

### **CE100 SURVEY CAMP (Global Positioning system and its Application)**

The students will be required to make a topographic map of an undulating hilly terrain measuring about 250 acres. The work will be as under:

Reconnaissance, selection of main stations, measurement of horizontal and vertical angles, measurement of base line, determination of R.L. of main station by double levelling from B.M., measurement of bearing of any one line, computation of coordinates of station points, plotting of details, interpolation of contours.

- I. The duration of survey camp is of 4 weeks.

## **CE012 HYDROLOGY AND DAMS**

### **UNIT-I**

Introduction, Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

- a) Interception, Evapo- transpiration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapo transpiration.
- b) Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination.

### **UNIT-II**

Runoff: Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Synder's synthetic unit hydrograph.

### **UNIT-III**

Peak Flows: Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph.

### **UNIT-IV**

Gravity Dams: Non Overflow Section: Forces acting, Stability factors, stresses on the faces of Dam, Design of profile by the method of zoning, elementary profile of a dam.

### **UNIT-V**

Gravity Dams-Spillways: Creagers profiles neglecting velocity of approach, profile taking velocity of approach into account, Upstream lip and approach ramp, Advantages of gated spillways, Discharge characteristics of spillways.

### **UNIT-VI**

Arch and Buttress Dams: Classification of arch dam- constant radius, constant angle and variable radius , Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams.

### **UNIT-VII**

Earth Dams: Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods.

#### **Text Books:**

1. Engineering Hydrology - J.Nemec.
2. Engineering Hydrology - Stanley Buttlar.
3. Engineering for Dams Vol. II & III - Creager Justin & Hinds.
4. Design of Small Dams - U.S.B.R.
5. Hydrology by. S.K.Garg
6. Hydrology by. R.K. Sharma
7. Irrigation and Power Engg. By B.C. Punmia

## **CE014 DESIGN OF STEEL STRUCTURES-I**

### **UNIT-I**

Allowable stresses in direct tension, compression, bearing and shear in structural steel.

### **UNIT-II**

Riveted, Bolted and Welded connection for axial loads.

### **UNIT-III**

Design of Tension and Compression Members (Laced and Battened Columns)

### **UNIT-IV**

Design of steel Beams: Laterally supported and Unsupported

### **UNIT-V**

Design of Built up Columns under Axial Loading using Lacing and Battening Systems.

### **UNIT-VI**

Design of Column Bases under direct and eccentric Loads ( Slab Base, Gusseted Base and Grillage foundation)

### **UNIT-VII**

Design of Steel Roof Truss : design of members for the given loads, design of riveted and welded connections, detailed working drawings.

### **UNIT-VIII**

Design of Plate Girder for static loads ( UDL or Concentrated Loads at fixed points)

#### **Text Books:**

1. Design of Steel Structures Vol.-III By Vazirani & Ratwani
2. Design of Steel Structures By Arya & Azmani
3. Steel Structures By S.K. Duggal
4. Design of Steel Structures Vol.-I By Ram Chandra

**UNIT-I**

Shallow Foundation-I: Type of shallow foundation Depth and factors affecting it. Definition of ultimate bearing capacity, safe b.c. and allowable b.c. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skemptions equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Their procedure, merits and demerits Factors affecting 'N' value Corrections to be applied to observed value.

**UNIT-II**

Shallow Foundation-II: Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmarks chart and its construction. Two - to one method of load distribution. Comparison of Bosussinesq and westerguard analysis for a point load. Limitations of elastic formula. Contact pressure Distribution. Causes of settlement of structures comparison of Immediate and consolidation settlement calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts. Proportioning of rafts in sand-s and Clays. Various methods of designing raft. Floating foundation.

**UNIT-III**

Machine Foundations: Basic definition of theory of vibration terms, Analysis of theory of single degree system for :-

- i. Free vibrations.
- ii. Damped Free vibration
- iii. Forced vibrations with constant Harmonic Excitation (Frequency response curves) Dynamic soil properties (Equivalent spring constants) Determination of  $C_u$  by cyclic plate load test and Block vibration test. Natural frequency of foundation-soil system by Barkan's Method. Co-relation between  $C_u$  and other dynamic properties of soil. Type of machine Foundations - Neat sketches and brief description.

**UNIT-IV**

Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples.

- i. Open Drive samples
- ii. Stationery piston sampler
- iii. Rotary sampler

Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

**UNIT-V**

Pile Foundations – I: Necessity and uses of piles classification of piles. Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Pile load test-object, prerequisites, test arrangement, procedure and assessment of safe load. Separation of skin friction and point resistance using cyclic pile load test date. Related numerical problems.



## UNIT-VI

Pile Foundation – II: Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay-Safe load on a Friction and point Bearing pile. Pile in sand Spacing of piles in a group, factors affecting capacity of a pile group by Terzaghi - peck approach. Efficiency of pile group by converse - Labare formula and feds formulas. Bearing capacity of apile group in clay by block failure and individual action approach. Approximate methods for determination of stress on lower strata in pile groups.

Calculation of settlement of friction pile group in clay using the following equation.  $S = H \times C_c \log_{10} \left( \frac{\sigma + \Delta \sigma}{\sigma} \right) \frac{1}{e_0}$  Sigma Related Numerical problems. Settlement of pile groups in sand Negative skin friction.

## UNIT-VII

Caissons and Wells: Major areas of use of caissons advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Terzaghi's analysis for PTU/BOS/CE/101/08-05-2004/BATCH 2004 38 lateral stability for a light well-embedded in sand. Modification of the analysis for a heavy well. Forces acting on a well foundation. Computation of scour depth.

### **TextBooks :**

1. Soil Mechanics & Foundation Engineering by B.C.Punmia
2. Geotechnical Engineering by Alam Singh
3. Soil Mechanics by V.N.S. Murthy

## **CE019 IRRIGATION ENGINEERING-I**

### **UNIT-I**

Methods of irrigation:

Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relation-ship and soil fertility, sprinkler irrigation advantages & limitations. Planning and design of sprinkler irrigation, drip irrigation advantages & limitations, suitability.

### **UNIT-II**

canal irrigation:

Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories, suspended and bed loads.

### **UNIT-III**

Lined canals:

Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

### **UNIT-IV**

Losses in canals, water logging and drainage:

Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging-anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

### **UNIT-V**

Investigation and preparation of irrigation projects:

Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi - purpose projects, Major, Medium and minor projects, planning of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

### **UNIT-VI**

Tube - well irrigation :

Types of tube - wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions, Theim & Dupuit's

formulae. Interference of tube wells with canal or adjoining tube-wells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tubewell.

### **UNIT-VII**

River training works:

Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Artificial cut-off objects and design Considerations River control - objectives and methods.

**TextBooks:**

1. Principles & practice of Irrigation Engg. S.K..Sharma
2. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal

3. Fundamentals of Irrigation Engg. Dr. Bharat Singh
4. Irrigation Engg. & Hydraulic Structure S.R.Sahasrabudhe
5. Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta
6. Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg

## **CE020 TRANSPORTATION ENGINEERING - II**

### **UNIT-I**

Introduction to Railway Engineering: History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways.

### **UNIT-II**

Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

### **UNIT-III**

Railway Track: Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways.

### **UNIT-IV**

Components of Railway Track: Rails, Sleepers, Ballast, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

### **UNIT-V**

Geometric Design of Railway Track: Alignment, Gradients, Horizontal Curve, Super-elevation, Equilibrium Cant, Cant Deficiency, Transition Curves.

### **UNIT-VI**

Points and Crossings: Functions, Working and Design of Turnout, Various types of Track Junctions and their layouts, Level-crossing.

### **UNIT-VII**

Railway Stations & Yards: Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations.

### **UNIT-VIII**

Signalling and Interlocking: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking.

### **UNIT-IX**

Modernization of Railway Tracks: High Speed Tracks, Improvement in existing track for high speed, Ballastless Track, MAGLEV Track.

#### **Text Books:**

1. Aggarwal, M.M. "Railway Engineering", Prabha and Company, New Delhi, 1997.
2. Saxena, S.C., and Arora, S.P. "A Text Book of Railway Engineering", Dhanpat Rai and Sons, Delhi,

## **Elective I**

### **CE028 ARCHITECTURE AND TOWN PLANNING**

#### **UNIT-I**

Brief history of Architecture, Egyptian, Greek, Roman and Indian architecture. Evolution of various structural forms. Impact of materials on building forms and construction techniques.

#### **UNIT-II**

Philosophy of architectural design: scale, form, texture, balance, skyline, unity, harmony, contrast, proportion. Color in architecture, site selection and orientation of residential buildings.

#### **UNIT-III**

Evolution of human settlements: Factors and Forces. Utopian concepts of city planning: garden city, vertical city, broad acre city, linear city, siper Block and neighborhood unit concepts.

#### **UNIT-IV**

Concept for spatial arrangements of land uses: concentric zone, sector and multiple nuclei concepts, and their applicability to Indian condition Density in residential and non-residential areas.

#### **UNIT-V**

Master plans; case studies: one for a new town plan and one for master plan of an existing city. Zoning and sub-division regulations and building byelaws. Agencies for implementation of master plans. Public participation.

#### **UNIT-VI**

Problem of slums. Approaches for environmental improvement of slums.

**Important note**\_\_\_\_\_

Site Planning Exercise

Seminar

#### **Text Books:**

1. A history of Architecture by Sir Banister Flechure.
2. A General History of Architecture by Bruce All sopp.
3. Architecture by John Gloag.
4. The Principles of Architecture Composition by Howard Robertson.
5. Indian Architecture by Percy Brown.
6. The Urban Pattern City planning and Design by Arthur B. Galion and Simon Eisner

## **Elective I**

### **CE044 PRESTRESSED CONCRETE**

#### **UNIT-I**

##### **Introduction**

Basic concepts of prestressed concrete, advantage of prestressed concrete in comparison with RCC application of prestressed to various building elements, bridge, water tanks and precast elements.

#### **UNIT-II**

##### **Materials**

Materials requirements for prestressing concrete- High strength concrete prestressing steel wires, strands and high strength bars. Stresses in high strength steel and stress strain relationship, tendon profile.

#### **UNIT-III**

##### **Prestressing Methods**

Introduction to prestressing methods- pre tensioning and post tensioning, their suitability and comparison, circular prestressing and its application.

#### **UNIT-IV**

##### **Bending and Shear Capacity**

Concept of bending and shear capacity of prestressed members. Calculation of bending stresses in rectangular simply supported beams with straight and parabolic profile of tendons.

#### **UNIT-V**

##### **Losses in Prestressing**

Types of losses in prestress- Elastic shortening, creep and shrinkage of concrete, friction loss and stress relaxation in prestress steel. Computation of losses for simple beam problems.

## **Elective I**

### **CE045 QUANTITY SURVEYING AND VALUATION**

#### **UNIT-I**

Introduction to quantity surveying and its importance. Duties of quantity surveyor.

#### **UNIT-II**

Types of estimates

- a) Preliminary estimates
  - Plinth area estimate
  - Cubic rate estimate
  - Estimate per unit base
- b) Detailed estimates

Definition stage of preparation- details of measurement and calculation of quantities and abstract.

#### **UNIT-III**

Measurement

Units of measurement for various items of work as per BIS:1200. Rules for measurements

Different methods of taking out quantities- centre line methods and long wall and short wall method.

#### **UNIT-IV**

Preparation of Details and Abstract Estimates from Drawing for:

A small residential buildings with a flat roof comprising of Two rooms with W.C, bath, kitchen and verandah. Earthquake for unlined channel. WBM road and pre-mix carpeting. Single span RCC slab culvert. Earthquake for plain and hill roads. RCC work in beams, slab, column and lintel, foundation 10 users septic tank.

#### **UNIT-V**

Calculation of quantities of material for

Cement mortars of different proportion, Cement concrete of different proportion, Brick/ stone masonry in cement mortar, Plastering and pointing, White washing, painting

#### **UNIT-VI**

Analysis of Rates

Steps involved in the analysis of rates, Requirement of material, labour, sundries, contractor's profit and overheads

Analysis of rates for finished items when data regarding labour, rates of material and labour is given:

Earthquake in excavation in hard/ ordinary soil and filling with a concept of lead and lift.

RCC in roof slab/ beam/ lintels/ columns

Brick masonry in cement mortar

Cement plaster, White washing, painting

Running and maintenance cost of construction equipment.

## **UNIT-VII**

### **Contractorship**

Meaning of contract, Qualities of a good contractor and their qualification, Essentials of a contract

Types of contracts, their advantages, disadvantages and suitability, system of payment, Single and two cover-bids; tender forms and documents, tender notice, submission of tender and deposit of earnest, money, security deposit, retention money, maintenance period, Classification and types of contracting firms/ construction companies

## **UNIT-VIII**

Preparation of Tender Document based on common schedule Rates(CSR)

Introduction to CSR and calculation of cost based on premium on CSR. Exercises on writing detailed specification of different types of building works from excavation to foundations, superstructure and finishing operation.

Exercise on preparing tender document for the following:

Earth work, Construction of a small house as per given drawing, RCC works, Pointing, plastering and flooring, White-washing, distempering and painting, Wood work including polishing, Sanitary and water supply installations, False ceiling, aluminum(glazed) partitioning, Tile flooring including base course

## **UNIT-IX**

Exercises on preparation of comparative statements for item rate contract.

## **UNIT-X**

### **Valuation**

Purpose of valuation, principles of valuation

Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.

Methods of valuation (i) replacement cost method (ii) rental return method.



## **Open Elective**

### **CE042 CONSTRUCTION MANAGEMENT AND ACCOUNTS**

#### **UNIT-I**

Introduction:

Significance of construction management. Main objectives of construction management and overview of the subjects. Function of construction management, planning, organizing, staffing and directing, controlling and coordinating, meaning of each of these with respect to construction job. Classification of construction into light, heavy and industrial construction, Stages in construction from conception to completion, The construction team: owner, engineer, architect and contractors, their functions and inter-relationship.

#### **UNIT-II**

Construction planning:

Importance of construction planning, Stages of construction planning, Pre-tender stage, Contract stage Scheduling construction works by bar charts, Definition of activity, identification of activities through preparation of bar charts for simple construction work, Preparation of schedules for labor, materials, machinery and finances for small works, Limitations of bar charts, Scheduling by network techniques Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology

#### **UNIT-III**

Organization

Types of organization line. Line and staff, functional and their characteristics

#### **UNIT-IV**

Site Organization:

Principal of storing and stacking material at site, Location of equipment, Preparation of actual job layout for a building, Organization labour at site

#### **UNIT-V**

Construction labour

Conditions of construction workers in India, wages paid to workers

Important provisions of the following acts:

Labour welfare fund act 1936 (as amended)

Payment of wages act 1936(as amended)

Minimum wages act 1948 (as amended)

#### **UNIT-VI**

Control of progress:

Methods of recording progress, Analysis of progress, Taking corrective actions keeping head office informed, Cost time optimization for simple jobs- Direct and indirect cost, variation with time, cost optimization

#### **UNIT-VII**

Inspection and quality control:

Need for inspection and quality control, Principles of inspection, Stages of inspection and quality control for, Earth work, Masonry, RCC, Sanitary and water supply services

### **UNIT-VIII**

Accidents and safety in construction

Accidents—causes and remedies, Safety measures for, Excavation work, Drilling and blasting, Hot bituminous works, Scaffolding, ladders, from work, Demolitions, Safety campaign and safety devices

### **UNIT-IX**

Accounts

Public works accounts:

Introduction, technical sanction, allotment of funds, re-appropriation of funds bill, Contractor ledger, measurement book running and final account bills complete, Preparation of bill of quantities (BOQ), completion certificate and report, hand receipt, a quittance roll. Muster roll labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, account of stock, misc. W.advances T & P-verification, survey report, road metal material charged direct to works, account- Expenditure and revenue head, remittance and deposit head, definition of cash, Precaution of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills.

#### **Text books**

1. Shrinath LS, "PERT and CPM-Principals and Applications", New Delhi, East West press.
2. Harpal Singh, "Construction Management and Accounts", New Delhi, Tata Mc Graw Hill publishing Company.
3. Peurifoy, RL, "Construction planning, Equipment and methods", Tokyo, Mc Graw Hill
4. Wakhlo, ON: "Civil Engineering Management", New Delhi light and life publishers.

## **Open Elective**

### **CE043 REPAIR AND MAINTENANCE OF BUILDINGS**

#### **UNIT-I**

Need for Maintenance, Importance and significance of repair and maintenance of building, Meaning of maintenance, Objectives of maintenance, Factors influencing the repair and maintenance.

#### **UNIT-II**

Agencies Causing Deterioration (Source, Causes, Effects ), Definition of deterioration/decay, Factors causing deterioration, their classification, Human factors causing deterioration, Chemical factors causing deterioration, Environmental conditions causing deterioration, Miscellaneous factors, Effects of various agencies of deterioration on various building materials i.e. bricks timber, concrete, paints, plastics, stones

#### **UNIT-III**

Investigation and Diagnosis of Defects, Systematic approach/procedure of investigation, Sequence of detailed steps for diagnosis of building defects/ problems, List non- destructive and others tells on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests.

#### **UNIT-IV**

Defects and their root causes, Define defects in building, Classification of defects, Main causes of building defects in various building elements, Foundations, basements and DPC Walls, Column and beams, Roof and terraces, Joinery, Decorative and protective finishes, Services, Defects caused by dampness

#### **UNIT-V**

Materials for Repair, maintenance and protection, Compatibility aspects of repair materials

State application of following materials in repairs:

Anti corrosion coatings, Adhesives/bonding aids, Repair mortars, Curing compounds, Joints sealants  
Waterproofing systems for roofs, Protective coatings

#### **UNIT-VI**

Remedial measures for Building Defects ,Preventive maintenance considerations , Surface preparation techniques for repair, Crack repair methods, Epoxy injection, Grooving and sealing, Stitching, Adding reinforcement and grouting, Flexible sealing by sealant, Repair of surface defects of concrete, Bug Holes, Form tie holes, Honey comb and larger voids, Repair of corrosion in RCC elements, Steps in repairing, Prevention of corrosion in reinforcement, material placement techniques with sketches Pneumatically applied (The gunite techniques) , Open top placement, Pouring from the top to repair bottom face, Bird's mouth, Dry packing, Form and pump, Preplaced aggregate concrete ,Trowel applied method, Repair of DPC against rising dampness, Physical methods, Electrical methods, Chemical methods Repair of walls, Repair of mortar joints against leakage, Efflorescence removal  
Waterproofing of wet areas and roofs, Water proofing of wet areas, Water proofing of flat RCC roofs  
Various water proofing systems and their characteristics, Repair of joints in buildings, Types of sealing joints with different types of sealants, Techniques for repair of joints, Repair of overhead and underground water tanks

**TextBooks**

1. Gahlot P.S. Sanjay Sharma, Building defects and maintenance Management by CBS publishers, New Delhi
2. Nayak, BS: “Maintenance Engineering for civil Engineers” Khanna publishers, Delhi
3. Ransom W H: “ Building Failures-Diagnosis and Avoidance” publishing E and F.N Span
4. Hutchinson B D:etc “Maintenance and Repair of buildings” published by Newness-butterworth

## **CE040P BUILDING PLANNING AND DESIGN**

### **List of Experiments:**

#### **Drawing No. 1**

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

#### **Drawing No.2**

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond.

#### **Drawing No. 3**

Elevation, sectional plan and sectional side elevation of flush door, panelled door with wire gauge shutter. Sketches of various joints of different members

#### **Drawing No. 4:**

Drawing plan, elevation of a one room and four rooms building from the given site plan, the foundation detail and sectional elevation.

## **CE041P CONCRETE STRUCTURE DRAWING (COMPUTER AIDED)**

### **List of Experiments:**

Detailed Working Drawings (Computer Aided):

1. Isolated Footing : Rectangular, Circular and Square footing.
2. Combined Footing : Rectangular, Trapezoidal, Strap and Raft Footing
3. Spherical and Conical Domes
4. Cantilever and Counterfort Retaining Walls
5. Intz Tank
6. Design & detailing of an RCC multistorey frame with the help of design and detailing software.

## **CE-021 EARTHQUAKE RESISTANT DESIGN & STRUCTURAL DYNAMICS**

### **UNIT-I**

Introduction to Earthquakes, Causes of earthquakes, basic Terminology, Magnitude, Intensity, Peak ground motion parameters.

### **UNIT-II**

Past earthquakes and Lessons learnt.

### **UNIT-III**

Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.

### **UNIT-IV**

Lateral Force analysis, Floor Diaphragm action, Moment resisting frames, shear walls.

### **UNIT-V**

Concepts of seismic design, Lateral Strength, stiffness, ductility and structural configuration.

Provision of IS 1893 for buildings.

### **UNIT-VI**

Seismic Design of Masonry Structures, Provision of IS 4326

### **UNIT-VII**

Seismic Design and Detailing of R.C.C. buildings, Provision of IS 13920.

#### **Text Books:**

1. Dynamics of Structures by R.W. Clough and Joseph Penzien.
2. Structural Dynamics by Mario & Paz
3. Earthquake Resistant Design by David J. Dowrick
4. Elements of Earthquake Engg By Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra
5. I.S. 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
6. I.S. 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
7. I.S. 13920-1993 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

## **CE-022 IRRIGATION ENGINEERING-II**

### **UNIT-I**

Theories of Seepage: Seepage force and exit gradient, salient features of Bligh's Creep theory, Lane's weighted Creep theory and Khosla's theory, Determination of uplift. Pressures and floor thickness.

### **UNIT-II**

Design of Weirs: Weirs versus barrage, design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

### **UNIT-III**

Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

### **UNIT-IV**

Diversion Head Works: Functions and investigations: component parts of a diversion head work and their design considerations, silt control devices.

### **UNIT-V**

Distributory Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.

### **UNIT-VI**

Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

### **UNIT-VII**

Cross-Drainage works : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

### **UNIT-VIII**

Canal Out-lets : Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

#### **Text Books:**

1. Design of Irrigation Structures by S.K. Sharma.
2. Irrigation and Water Power Engg. By B.C. Punmia & Pande B.B. Lal.
3. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe.
4. Irrigation Engg. Vol.I, II & III by K.R. Sharma.
5. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani.
6. Fundamentals of Irrigation Engg. by Dr. Bharat Singh.



## **CE-024 DESIGN OF STEEL STRUCTURE II**

**Note:** Use relevant Indian Standard is allowed.

### **UNIT-I**

Detailed design of prestress steel Water tank.

### **UNIT-II**

Foot bridge :Design and drawing of steel truss for pedestrian loading.

### **UNIT-III**

Railway bridge : Design of a single track railway bridge with lattice girder having parallel chords , design of stringer, main girder, various members and their joints, portal and sway bracings, roller and elastomeric bearings.

### **UNIT-IV**

Industrial buildings: Design of industrial buildings frames, gantry girder , column bracket, mill bent, lateral and longitudinal bracings for column bent.

#### **Text Books :**

1. Limit state design of steel structures, S.K. Duggal
2. Design of steel structures , N.Subramanian
3. Design of steel structures , Ram Chandra
4. Design of steel structures, Arya (Nemchand brothers)
5. Design of steel structures (by limit state method as per IS 800:2007); S.S. Bhavikatti
6. IS 800:2007 ( general construction in steel code practice) ,BIS new delhi

## **CE025 HYDRO POWER ENGINEERING**

### **UNIT-I**

Hydro Power Development: Estimation of available water power, flow and power duration curves, firm power and secondary power, plant capacity, installed capacity, constraints in hydropower development, operation and maintenance of hydropower plants, small hydropower development.

### **UNIT-II**

Classification & Components of hydropower plants: Classification of hydropower plants based on storage characteristics, operating head, load, capacity. Principal components of hydroelectric scheme.

### **UNIT-III**

Hydro electric plants: Layout of hydropower plants, types of power houses, various components, investigations and studies, safety requirements. Storage zones of a reservoir, reservoir sedimentation, trap efficiency, life of a reservoir, principle of desilting, design of desilting basins. Alignment and location of various types of intakes, trashracks, design of intake structures. Conveyance channels and tunnels, water hammer, surge tanks, design of surge tanks, penstocks classification and layout, hydraulic design of penstocks, hydraulic valves and gates, tail race channels.

### **UNIT-IV**

Economics of hydro power installation: Engineering feasibility, political consideration, economic feasibility, analysis of cost of hydro power, preparation of pre-feasibility report, detailed project report, cost and estimate report.

### **UNIT-V**

Turbines and Pumps: Brief description of types and working of turbines and pumps.

#### **Text Books:**

1. Hydroelectrical Engineering : Creager and Justin
2. Water Power Engineering : Barrows
3. Water Power Development (Vol.I and II) : Mosony L. Emil
4. Hydro –Electric and Pump storage Plants – MG Jog , Wiley Eastern Limited
5. Micro Hydroelectric Power Stations – By L. Monition,
6. Hydro Power Plant Familiarization- NPTI Publication.

**ELECTIVE- II**  
**CE046 WASTE MANAGEMENT**

**UNIT-I**

Waste water Collection: Plumbing, types of sewers design consideration. Construction & maintenance  
.Storm water sewers.

**UNIT-II**

Wastewater Characterization: Constituents.

**UNIT-III**

Wastewater Treatment: On side and centralized treatment systems.

**UNIT-IV**

Pre-and Primary Treatment: Screen grit removal, oil and grease removal

**UNIT-V**

Secondary treatment: Activated sludge process, conventional and extended aeration. Waste  
Stabilization ponds. UASB process. UASB post treatment.

**UNIT-VI**

Advanced wastewater treatment.

**UNIT-VII**

Wastewater and sludge disposal: Reuse systems. Wastewater disposal on land and water bodies,  
disposal of sludge.

**UNIT-VIII**

Municipal Solid waste: Collection, characterization, transport.treatment7disposal.

**UNIT-IX**

Types of industrial waste: Liquid, solid, atmospheric and hazardous, hazardous wastes:  
Characterization and treatment

**Text Books:**

1. Davis M.L.andCornwell.D.A.”Introduction to Environmental Engineering” McGraw Hill.
2. Masters.G.M.” introduction to environmental engineering and Science” Prentice hall of India.
3. Environment Engineering: Sewage Disposal and Air Pollution Engineering by S.K. Garg

**ELECTIVE- II**  
**CE047 ADVANCED CONSTRUCTION MATERIALS**

**UNIT I**

Advanced Construction Materials :-Fibers and Plastics:-Types of Fibers- Steel Carbon, Glass fibers, use of Fibers as construction materials. Properties of Fibers'.Types of Plastic- PVC, RPVC, HDPE,FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material  
Artificial Timber:-Properties and uses of artificial timber. Types of artificial timber available in market, Strength of artificial timber.  
Miscellaneous materials:-Properties and uses of acoustics materials, wall claddings, plaster board, micro-silica, artificial sand, bonding agents, adhesives etc.

**UNIT II**

Advanced Concreting Methods:-Prestressed Concrete:-Grades of concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prestressing Precautions during prestressing of members.  
Under water Concreting:-Underwater concreting for bridge piers and bored pile construction. Tremy method of underwater concreting, procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required.  
Ready mix Concrete:-Necessity and use of ready Mix Concrete. Production and equipments for RMC.Ready mix Concrete plant.Conveying of RMC. Transit Mixers-working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.  
Tremix Concreting method:-Definition, application of vacuum dewatering concreting. Equipment used in tremix concreting. Procedure of vacuum dewatering concreting (Tremix).  
Special concretes:-Properties, uses and procedure of roller compacted concrete. Properties and uses of high impact Resisting concrete.Properties, uses and constituents of steel fiber reinforced concrete.Percentage of steel fibers in SFRC. Effects of size, aspect ratio and percentage of steel fibers on strength of concrete.

**UNIT III**

Advanced Construction method:-Steel formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning use of slip formwork.  
Process of concreting with slip forms.  
Construction of multistoried Buildings:-Use of lifts, belt conveyors, Pumped concrete, equipments and machinery required for construction of multistoried buildings. Precautions and safety measures.  
Prefabricated Construction:-Meaning of prefabrication and precast. Methods of prefabrication-plant prefabrication and site prefabrication.Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, Wall panels, jointing of structural members.

Soil Reinforcing Construction:-Necessity of soil reinforcing, use of wire mesh and geosynthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.

**UNIT IV**

Hoisting and conveying Equipments:-Hoisting Equipments:-Principal and working of towers cranes, Crawler cranes, Truck mounted cranes, gantry cranes, mast cranes, Derricks.  
conveyingEquipments:-Working of belt conveyors. Types of belts and conveying mechanism.Capacity and use of dumpers, tractors and trucks.

#### **UNIT V**

Earth moving machinery:- Excavation Equipments:-Use, working and outputs of bulldozers, scrapers, graders and power shovels, JCB, draglines.

Compacting Equipments:-Use of rollers, roller types –plain rollers, sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.

#### **UNIT VI**

Concreting Equipments:-concrete Mixers:-Types of concrete mixers. Weigh batching equipments, equipments for transportation of concrete-trolleys, lifts, Transit mixers, Concrete Vibrators- Needle vibrators, Screed vibrators. Automatic concrete plants- layout, process and working.

Stone Crushers:-Types of stone crushers, capacities and working. Equipments for production of artificial sand.

#### **UNIT VII**

Miscellaneous Equipments and Equipment management:-Miscellaneous equipments

Pile driving equipments, pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver.Groutingequipments, Floor polishing machine.

Equipment management:-Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment.Preventive maintenance of equipment, Break down maintenance of equipments

#### **Practical**

Skills to be developed:

Intellectual Skills:

1. Know the new materials of construction.
2. Get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

#### **List of practical:**

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (I/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.

6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two storied framed structured residential building.

**ELECTIVE- II**  
**CE050 AIRPORT ENGINEERING AND PAVEMENT DESIGN**

**UNIT I**

Introduction to Airport Engineering: Air Transport Scenario in India and Stages of Development, National and International Organisations.

**UNIT II**

Airport Planning: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport.

**UNIT III**

Obstructions and Zoning Laws: Imaginary Surfaces, Approach Zones and Turning Zones.

**UNIT IV**

Runway Orientation and Design: Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration, Aircraft Parking System.

**UNIT V**

Taxiway Design: Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.

**UNIT VI**

Visual Aids: Marking and Lighting of Runway, Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

**UNIT VII**

.PAVEMENTS DESIGN: Design factors, design of flexible pavements, CBR, gI and Burmister methods, design of rigid pavements.

**UNIT VIII**

PAVEMENT MATERIALS: Soils aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete.

**UNIT IX**

HIGHWAYS MAINTENANCE: Pavement failures, maintenance of highway pavement, evaluation and strengthening of existing pavements.

**Text Books:**

1. Airport planning and design by Khanna, Arora & Jain, Nem Chand Publishers
2. Airport Engineering by S. C. Rangwala, Charotar Publishing Co.
3. Planning and design of airports, by Robert Horenjeff & Francis X McKelvy, McGraw Hill.
4. Khanna, S.K., Arora, M.G., and Jain, S.S. "Airport Planning and Design", Nem Chand & Bros. Roorkee, 1999.

**ELECTIVE-III**  
**CE051-OPEN CHANNEL FLOW**

**UNIT-I**

Introduction: Types of open channels, Prismatic and non-prismatic channel, classification of flows, continuity equation, energy and momentum correction factors.

**UNIT II**

Specific energy: critical depth, critical flow computations, flow transitions.

**UNIT III**

Uniform flow: Chezy's and Mannings equation, roughness coefficients, equivalent roughness, Hydraulically efficient channel cross sections.

**UNIT IV**

Gradually varied flow: Governing Equation, classification and analysis of flow profiles, GVF computations.

**UNIT V**

Hydraulic jump: momentum equation for jump, classification of jumps, energy dissipation using hydraulic jump, location of jump.

**UNIT VI**

Spillway and stilling basins: Spillway capacity, energy dissipation below spillways, stilling basins, gates and valves aerators.

**UNIT VII**

Rapidly Varied Flow: Rapidly varied flow measurements, spatially varied flow. Introduction to unsteady flow.

**Text Books:**

1. Flow in open Channels: K. Subramanya
2. Open Channel Flow: K.G. Rangaraju



**ELECTIVE-III**  
**CE052 GIS AND REMOTE SENSING**

**UNIT-1**

Remote Sensing – Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials – Spectral Signature and Spectral Signature curves for water, soil and Earth Surface.

**UNIT II**

Satellites - Classification – Satellite Sensors – satellite and sensor parameters - Resolution – Types of Remote Sensing - Visual Interpretation of Satellite Images – Digital Image processing – Characteristics of different platforms: Landsat, SPOT, IRS series, IKONOS, QUICKBIRD – Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems introduction of GPS- data receiving mode- DTM generation-View shed analysis.

**UNIT III**

GIS - History of Development - Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Data Input Sources— DBMS – Data Output - Data models - Raster and Vector data structures – Data compression – Raster vs. vector comparison.

**UNIT IV**

Analysis using Raster and Vector data – Operations – Overlaying - Buffering – Modelling in GIS - Digital Terrain Modelling, Analysis and application – Products of DEMs and their uses – Sources of errors in GIS and their elimination.

**UNIT V**

Applications of Remote Sensing and GIS – Advanced applications of GIS – Disaster management, Water resource, Landuse – Land cover – Urban planning - Intelligent Transport Systems - Development of Resources Information Systems.

**Text Books:-**

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.
2. C.P. Lo and Albert K. W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice- Hall India, 2006.
3. Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003.

**ELECTIVE-III**  
**CE053 DESIGN OF RCC CULVERT AND BRIDGES**

**UNIT I**

Components of Bridges – Classification – Importance of Bridges – Investigation for Bridges – Selection of Bridge site – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth – Traffic projection – Choice of bridge type.

**UNIT II**

Specification of road bridges – width of carriageway – loads to be considered – dead load – IRC standard live load – Impact effect.

**UNIT III**

General design considerations – Design of culvert – Foot Bridge - Slab Bridge – Tbeambridge – Pre-stressed concrete bridge – Box Culvert - Fly over bridges.

**UNIT IV**

Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments – Type of foundations.

**UNIT V**

Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Electrometric bearing – Joints – Expansion joints. Construction and Maintenance of bridges – Lessons from bridge failures.

**Text Books:-**

1. Ponnuswamy, s., Bridge Engineering, Tata McGraw - Hill, New Delhi, 1997
2. Victor, D.J., Essentials of Bridge Engineering, Oxford & IBH Publishers Co., New Delhi, 1980.
3. N. Rajagopalan, Bridge Superstructure, Narosa Publishing House, New Delhi, 2006.

## **CE022P IRRIGATION ENGINEERING-II LABORTOARY**

### **List of Experiments:**

Following drawings are to be prepared by students:

1. Unlined canal sections
2. Lined canal sections
3. Guide Bank
4. Weir/Barrage
5. Head/ Cross regulator
6. Canal Fall (Sarda/ Inglis/ Straight Glacis/ Baffle Type)
7. Syphon Aqueduct
8. APM Outlet

## **CE103 PROJECT**

**Note:-** Dear students, choose your project related to civil engineering.(Current Topics)

### **Instructions:**

1. Differentiate through teams.
2. Reflection & goal setting.
3. Mini lessons, centres,& resources.
4. Differentiate through formative assessments.
5. Balance team work & individual work.
6. Choose a good cause for your project.
7. Be creative .....but stay focused.
8. Choose an appropriate angle & make it applicable.
9. Remember presentation & planning are essential

