## Semester III/ Year II

## DCE 31 Surveying

### Learning Hrs: 60

### Objective:

- To provide the concepts and Understanding toward Land measurement
- To give an ability to apply this knowledge on engineering applications and design problems

### Course Content

**Unit - I**Overview and Classification of Survey
Survey- Purpose and Use.
Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydro-graphic, Photogrammetry and Aerial.
Principles of Surveying.
Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale.

**(Hours:12)**

**Unit- II** Chain Surveying
Instruments used in chain survey: Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square.
Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.
Ranging: Direct and Indirect Ranging.
Methods of Chaining, obstacles in chaining.Errors in length: Instrumental error, personal error, error due to natural cause, random error.
Principles of triangulation.
Types of offsets: Perpendicular and Oblique.Conventional Signs, Recording of measurements in a field book.

**(Hours:12)**

**Unit- III** Compass Traverse Survey
Compass Traversing- open, closed.
Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination.
Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings.
Local attraction, Methods of correction of observed bearings - Correction at station and correction to included angles.Methods of plotting a traverse and closing error, Graphical adjustment of closing error.

**(Hours:12)**

**Unit- IV** Levelling and Contouring

Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.

Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level.

Types of Leveling Staff: Self-reading staff and Target staff.

Reduction of level by Line of collimation and Rise and Fall Method.

Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Leveling.

Contour, contour intervals, horizontal equivalent.

Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and

**(Hours:12)**

indirect.

**Unit- V** Measurement of Area and Volume

Components and use of Digital planimeter.

Measurement of area using digital planimeter.

Measurement of volume of reservoir from contour map.

**(Hours:12)**

## Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

## List of Practicals to be performed

- Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
- Undertake reciprocal ranging and measure the distance between two stations.
- Determine area of open field using chain and cross staff survey.
- Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
- Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
- Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.
- Plot the traverse on Al size imperial drawing sheet for data collected in Survey Project mentioned at practical No.6.
- Undertake simple leveling using dumpy level/ Auto level and leveling staff.

- Undertake differential leveling and determine Reduced Levels by Height of instrument meth¬od and Rise and fall method using dumpy level/Auto Level and leveling staff.
- Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff.
- Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
- Plot the L-section with minimum 3 cross-sections on Al size imperial sheet for data collected in Survey Project mentioned at practical
- Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m.
- Plot the contours on Al size imperial drawing sheet for data collected in Survey Project men-tioned at practical No.13.
- Measure area of irregular figure using Digital planimeter.

## Suggested learning resources

- Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
- Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
- Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
- Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
- Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
- Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Del¬hi.
- Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
- Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
- Arora K R , Surveying Vol. I, Standard Book House.

## Semester III/ Year II

## DCE 32 Material Technology

### Learning Hrs: 60

### Objective:

- To provide the concepts of importance of Material in Civil engineering Construction.
- Impart skill for Material testing.
- To develop vision and understanding toward Quality construction.

### Course Content

**Unit – I:** Construction Materials

Overview of Construction Materials

- Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only).
- Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy.
- Broad classification of materials -, Natural, Artificial, special, finishing and recycled.

Natural Construction Materials

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone.
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction.
- Asphalt, bitumen and tar used in construction, properties and uses.
- Properties of lime, its types and uses.
- Types of soil and its suitability in construction.
- Properties of sand and uses
- Classification of coarse aggregate according to size

Artificial Construction Materials

Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks -fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks.

Flooring tiles - Types, uses

Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses, field tests on cement.

Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses. Plywood, particle board, Veneers, laminated board and their uses. Types of glass: soda lime glass, lead glass and borosilicate glass and their uses. Ferrous and non-ferrous metals and their uses.

**(Hours:12)**

**Unit- II:** Special and Processed Construction Materials

- Special Construction Materials
- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials.
- Fibers - Types -Jute, Glass, Plastic Asbestos Fibers, (only uses).
- Geopolymer cement: Geo-cement: properties, uses.
- Processed Construction Materials
- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses.
- Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used).
- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials - Rice husk, Bagasse, coir fibres and their uses.

Special processed construction materials; Geosynthetic, Ferro Crete, Artificial timber, Artificial sand and their uses.

**(Hours:12)**

**Unit- III:** Cement, Aggregates and Water

Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes

Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement.

BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement.

Aggregates: Requirements of good aggregate, Classification according to size and shape.

Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand.

Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications.

Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456.

**(Hours:12)**

**Unit- IV** Concrete

Concrete: Different grades of concrete, provisions of IS 456.

Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456.

Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures.
Properties of Hardened concrete: Strength, Durability, Impermeability.
Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results.
Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests.
Quality Control of Concrete
Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete.
Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per
IS 456.
Waterproofing: Importance and need of waterproofing, methods of waterproofing and materials used for waterproofing.
Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.

**(Hours:12)**

**Unit- V** Chemical Admixture, Special Concrete and Extreme Weather concreting
Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers.
Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete.
Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition.
Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.

**(Hours:12)**

## Outcome:

- This course imparts ability to students to check quality of material and develop understanding toward understanding Material testing Report

## List of practical to be performed:

- Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
- Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns, (along and perpendicular to the grains)
- Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.
- Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
- Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mo-saic tiles, anti- skid tiles, chequered tiles, paving blocks and prepare report about the speci-fications.
- Apply the relevant termite chemical on given damaged sample of timber.
- Identify the type of glasses from the given samples.
- Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.
- Determine specific gravity, standard consistency, initial and final setting times of cement.
- Determine compressive strength of cement.
- Determine silt content in sand.
- Determine bulking of sand.
- Determine bulk density of fine and coarse aggregates.
- Determine water absorption of fine and coarse aggregates.
- Determine Fineness modulus of fine aggregate by sieve analysis.
- Determine impact value of aggregate
- Determine crushing value of aggregate.
- Determine elongation and flakiness index of coarse aggregates
- Determine workability of concrete by slump cone test.
- Determine workability of concrete by compaction factor test.
- To prepare concrete mix of a particular grade and determine compressive strength of con¬crete for 7 and 28 days.
- Demonstration of NDT equipments .

## Suggested learning resources

- Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
- Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
- Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
- Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
- Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.

- Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publish¬ers, New
- Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
- S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
- Varghese, PC. , Building Materials, PHI learning, New Delhi.
- Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
- Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
- Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
- Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
- Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
- Duggal, S. K, Building Materials, New International, New Delhi.

## Semester III/ Year II

## DCE 33 Building Construction

**Learning Hrs: 60**

### Objective:

- To provide the concepts of Building construction techniques.
- Impart skill for Construction of Buildings.
- To develop vision and understanding toward Quality construction.

### Course Content

**Unit - I:** Overview of Building Components

Classification of Buildings as per National Building Code Group A to I, As per Types of Con-structions- Load Bearing Structure, Framed Structure, Composite Structure.

Building Components - Functions of Building Components, Substructure - Foundation, Plinth.

Superstructure - Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.

**(Hours:12)**

**Unit - II:** Construction of Substructure

Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Cen¬ter Line and Face Line Method, Precautions.

Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embank¬ment, Material for plinth Filling, Tools and plants used for earthwork.

Foundation: Functions of foundation, Types of foundation - Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).

**(Hours:12)**

**Unit- III:** Construction of Superstructure

Stone Masonry: Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction.

Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick mason¬ry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Mason¬ry.

Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry.

Scaffolding and Shoring: Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal of formwork.

**(Hours:12)**

**Unit- IV:** Building Communication and Ventilation

Horizontal Communication: Doors -Components of Doors, Full Paneled Doors, Part¬ly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS.

Windows: Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators.

Fixtures and fastenings for doors and windows- Material used and functions of Window Sill and Lintels, Shed / Chajja.

Vertical Communication: Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase-steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails, newel post, landing, headroom, winder. Types of staircase (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden andMetal.

**(Hours:12)**

**Unit- V:** Building Finishes

Floors and Roofs: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Ma¬terials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.

Wall Finishes: Plastering - Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering. Pointing - Necessity, Types of pointing and procedure of Pointing. Painting -Necessity, Surface Preparation for painting, Methods of Application.

**(Hours:12)**

## Outcome:

- This course imparts ability to students to check quality of material and develop understanding toward understanding Material testing Report

## LIST OF SKETCHES

Name of Sketch

1 Various types of foundations.
2 Various types of brick bonds.
3 Various types of stair case.
4 Various types of doors and windows.
5 Lean to roof with components

## LIST OF EXPERIMENTS

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 line and level of plinth, sill, lintel, flooring, slab level of a building and writing report of the process.
4. Checking verticality (plumb line) of formwork for column, beam and wall at construction site and writing report of the process.
5. Observing and writing report of the process of plastering.
6. Observing and writing report of the process of water proofing of terrace or basement.
7. Observing the models, specimen of building materials kept in the model room for few building items and writing a report for any five models/materials.
8. Visit to a building where slab casting is in progress.
9. Use of water level, plum bob, sprit level, Thread, gunia, etc.

## Suggested learning resources

1. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
2. Sushil Kumar., Building Construction, Standard Publication.
3. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
4. Punmia B. C., and Jain A. K., Building Construction ,Firewall Media.
5. Sharma S. K., Building Construction, S. Chand and Co. Pvt. Ltd., New Delhi.
6. Janardan Zha , Building Construction, Khanna Publication.
7. Bhavikatti S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
8. Mantri S., A to Z Building Construction, Satya Prakashan, New Delhi.

## Semester III/ Year II

## DCE 34 Mechanics of Materials

### Learning Hrs: 60

### Objective:

- To provide the concepts and principles of Mechanics of Materials.
- To give an ability to calculate Forces/stresses on objects and its effect under external loadings.
- To give an ability to apply this knowledge on engineering applications and design problems.

### Course Content

**Unit - I** Moment of Inertia

Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations).

M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle sec-tion, Hollow sections and built up sections about centroidal axes and any other reference axis.

Polar Moment of Inertia of solid circular sections.

**(Hours:12)**

**Unit- II** Simple Stresses and Strains

Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elastic-ity.

Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses.

Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety.

Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading.

Concept of temperature stresses and strain, Stress and strain developed due to tempera-ture variation in homogeneous simple bar (no composite section)

Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only).

Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

**(Hours:12)**

**Unit- III** Shear Force and Bending Moment

Types of supports, beams and loads.

Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation).
Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.

**(Hours:12)**

**Unit- IV** Bending and Shear Stresses in beams
Concept and theory of pure bending, assumptions, flexural equation (without deriva¬tion), bending stresses and their nature, bending stress distribution diagram.
Concept of moment of resistance and simple numerical problems using flexural equation.
Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.
Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, cir-cular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.

**(Hours:12)**

**Unit- V** Columns
Concept of compression member, short and long column, Effective length, Radius of gy-ration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns.
Euler's theory, assumptions made in Euler's theory and its limitations, Application of Eu-ler's equation to calculate buckling load.
Rankine' s formula and its application to calculate crippling load.
Concept of working load/safe load, design load and factor of safety.

**(Hours:12)**

## Outcome:

- This course imparts ability to students to apply this knowledge on engineering applications and design problems.

## List of Practicals to be performed:

- Study and understand the use and components of Universal Testing Machine (UTM).
- Perform Tension test on mild steel as per IS:432(1).
- Perform tension teston Tor steel as per IS:1608, IS:1139.
- Conduct compression test on sample test piece using Compression Testing Machine.
- Conduct Izod Impact test on three metals, e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS: 1598.
- Conduct Charpy Impact test on three metals, e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS: 1757.
- Determine Water Absorption on bricks per IS: 3495 (part II), IS: 1077 or tile IS: 1237.
- Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.

- Conduct Abrasion Test on flooring tiles (any one) e.g. Mosaic tiles, Ceramic Tiles as per IS: 13630 (part7), Cement Tile as per IS: 1237.
- Perform Single Shear and double shear test on any two metals e.g. Mild steel/ brass/aluminum/copper / cast iron etc as per IS:5242.
- Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
- Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.
- Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including moment loading.
- Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.
- Conduct Flexure test on floor tiles IS:1237,IS:13630 or roofing tiles as per IS:654,IS:2690.

## Suggested learning resources:


- Bedi D.S. , Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
- Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
- Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
- Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
- Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
- Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
- Bansal R K, Strength of Materials, Laxmi Publications.

## Semester III/ Year II

## DCE 35 Hydraulics

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding to students toward property of fluid and impact of external forces on fluid
- To expose various pressure measuring devices, discharge measuring devices and metacentric height.
- Develop skill to address effect and distribution of loads by/on fluid.

### Course Content

**Unit - I** Pressure measurement and Hydrostatic pressure

Technical terms used in Hydraulics -fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics.

Physical properties of fluid - density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity.

Various types of pressure - Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of pressure head and its unit, Pascal's law of fluid pressure and its uses.Measurement of differential Pressure by different methods.

Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls.

Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side.

**(Hours:12)**

**Unit- II** Fluid Flow Parameters

Types of flow - Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number.

Discharge and its unit, continuity equation of flow.

Energy of flowing liquid: potential, kinetic and pressure energy.

Bernoulli's theorem : statement, assumptions, equation.

**(Hours:12)**

**Unit- III** Flow through pipes

Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.

Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.

Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe.

Hydraulic gradient line and total energy line.
Water hammer in pipes: Causes and Remedial measures.
Discharge measuring device for pipe flow: Venturi meter - construction and working. Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

**(Hours:12)**

**Unit- IV** Flow through Open Channel
Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radi¬us for rectangular and trapezoidal channel section.
Determination of discharge by Chezy's equation and Manning's equation.
Conditions for most economical rectangular and trapezoidal channel section.
Discharge measuring devices: Triangular and rectangular Notches.
Velocity measurement devices: current meter, floats and Pitot's tube.
Specific energy diagram, Froudes' Number.

**(Hours:12)**

**Unit- V** Hydraulic Pumps
Concept of pump, Types of pump - centrifugal, reciprocating, submersible.
Centrifugal pump: components and working
Reciprocating pump: single acting and double acting, components and working.
Suction head, delivery head, static head, Manometric head
Power of centrifugal pump.
Selection and choice of pump.

**(Hours:12)**

## Outcome:

- Able to use various pressure measuring devices, discharge measuring devices and metacentric height
- This course imparts skill to students to apply this knowledge on engineering applications

## List of Practicals to be performed:

1 Use piezometer to measure pressure at a given point.
2 Use Bourdon's Gauge to measure pressure at a given point.
3 Use U tube differential manometer to measure pressure difference between two given points.
4 Find the resultant pressure and its position for given situation of liquid in a tank.
5 Use Reynold's apparatus to determine type of flow.
6 Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
7 Use Friction factor Apparatus to determine friction factor for a given pipe.
8 Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
9 Determine minor losses in pipe fitting due to Bend and Elbow.
10 Calibrate Venturi meter to find out the discharge in a pipe.

11 Calibrate the Orifice to find out the discharge through a tank
12 Use Current meter to measure the velocity of flow of water in open channel.
13 Use Pitot tube to measure the velocity of flow of water in open channel.
14 Use triangular notch to measure the discharge through open channel.
15 Use Rectangular notch to measure the discharge through open channel.
16 Determine the efficiency of centrifugal pump.

## Suggested learning resources:


- Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
- S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
- Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
- Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
- Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
- Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford Uni-versity Press, New Delhi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL
Department of Civil Engineering
Diploma in Civil Engineering

## Semester III/ Year II

## DCE 36 Development of Life II

**Learning Hrs:**

**OBJECTIVE :-**

| S.No | The students will be able to: |
|---|---|
| 1. | Developing working in teams |
| 2. | Apply problem solving skills for a given situation |
| 3. | Use effective presentation techniques |
| 4. | Apply techniques of effective time management |
| 5. | Apply task management techniques for given projects |
| 6. | Enhance leadership traits |
| 7. | Resolve conflict by appropriate method |
| 8. | Survive self in today's competitive world |
| 9. | Face interview without fear |
| 10. | Follow moral and ethics |
| 11. | Convince people to avoid frustration |

## Course Content

**1 SOCIAL SKILLS**

SOCIETY, SOCIAL STRUCTURE, DEVELOP SYMPATHY AND EMPATHY.

**2** Swot Analysis – Concept, How to make use of SWOT.

**3 Inter personal Relation**

Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relations.

**4 Problem Solving**

**I )STEPS IN PROBLEM SOLVING,**

1)Identify and clarify the problem,
2)Information gathering related to problem,
3)Evaluate the evidence,
4)consider alternative solutions and their implications,
5)Choose and implement the best alternative,
6)Review

**II)Problem solving technique**.(any one technique may be considered)

1) Trial and error,
2) Brain storming,
3) Lateral thinking

**5 Presentation Skills**

Body language --
Dress like the audience
Posture, Gestures, Eye contact and facial expression.
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language,
Practice of speech.
Use of aids –OHP, LCD projector, white board

**6 Group discussion and Interview technique** –

Introduction to group discussion,
Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking, decision
Making
INTERVIEW TECHNIQUE
Necessity,
Tips for handling common questions.

**7 Working in Teams**

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them
To meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, handling frustrations in group.

**8 Task Management**

Introduction,
Task identification,
Task planning ,organizing and execution,
Closing the task

## Outcome:

Abilities and skills will be deloped to perform at highest degree of quality as an individual aswell as amember of core group or team. To enhance capabilities in the field of searching, assimilatinginformation, managing the given task, handling people effectively, solving challenging problems.

**LIST OF ASSIGNMENT:**

1) SWOT analysis:- Analyze yourself with respect to your strength and weaknesses, opportunities andthreats. Following points will be useful for doing SWOT.
   a) Your past experiences,

b) Achievements,
c) Failures,
d) Feedback from others etc.

2) Undergo a test on reading skill/memory skill administered by your teacher.

3) Solve the puzzles.

4)Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation,
Environment protection, camps on awareness like importance of cleanliness in slump area, social
Activitieslike giving cloths to poor etc.( One activity per group)

5) Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.

6) Watch/listen an informative session on social activities. Make a report on topic of your interest using
Audio/visual aids. Make a report on the programme.

7) Conduct an interview of a personality and write a report on it.

8) Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic
Discussed

9) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic
Givenby your teacher.

**Text Books:**

| **Name of Authors** | **Titles of the Book** | **Edition** | **Name of the Publisher** |
|---|---|---|---|
| Adams Time management | Marshall Cooks Viva Books | | VIVA BOOKS |
| Basic Managerial Skills for All | E.H. Mc Grath , S.J | | Pretice Hall of India, Pvt Ltd |
| Body Language | Allen Pease | | Sudha Publications Pvt. Ltd |
| Creativity and problem solving | Lowe and Phil | | Kogan Page (I) P Ltd |
| Decision making & Problem Solving | by Adair, J | | Orient Longman |
| Develop Your Assertiveness | Bishop Sue | | Kogan Page India |
| Make Every Minute Count | Marion E Haynes | | Kogan page India |

| **Name of Authors** | **Titles of the Book** | **Edition** | **Name of the Publisher** |
|---|---|---|---|
| Organizational Behavior | Steven L McShane and Mary Ann Glinow | | Tata McGraw Hill |
| Organizational Behavior | Stephen P. Robbins Pretice | | Hall of India, Pvt Ltd |
| Presentation Skills | Michael Hatton ( Canada – India Project) | | ISTE New Delhi |
| Stress Management Through Yoga and | --- | | Sterling Publisher Pvt Ltd |
| Meditation Target setting and Goal Achievement | Richard Hale ,Peter Whilom | | Kogan page India |
| Time management | Chakravarty , Ajanta | | Rupa and Company |
| Working in Teams | Harding ham.A | | Orient Longman |

**INTERNET ASSISTANCE**

1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy/swot/

## Semester IV/ Year II

## DCE 41 Advance Surveying

### Learning Hrs: 60

### Objective:

- To provide the concepts and Understanding toward Land measurement using advance Surveying instruments.
- To give an ability to apply this knowledge on engineering applications and design problems

### Course Content

**Unit - I** Plane Table Surveying
Principles of plane table survey.
Accessories of plane table and their use, Telescopic alidade.
Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method.
Methods of plane table surveys- Radiation, Intersection and Traversing.
Merits and demerits of plane table survey.

**(Hours:12)**

**Unit- II** Theodolite Surveying
Types and uses of Theodolite, Components of transit Theodolite and their functions, Read¬ing the Vernier of transit Theodolite.
Technical terms- Swinging, Transiting, Face left, Face right.
Fundamental axes of transit Theodolite and their relationship
Temporary adjustment of transit Theodolite.
Measurement of horizontal angle- Direct and Repetition method, Errors eliminated by method of repetition.
Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.
Measurement of vertical Angle.
Theodolite traversing by Included angle method and Deflection angle method.
Checks for open and closed traverse, Calculations of bearing from angles.
Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.

**(Hours:12)**

**Unit- III** Tachometric surveying and Curve setting
Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens.
Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.

Field method for determining constants of tacheometer, Determining horizontal and verti¬cal distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry.
Types of curves used in roads and railway alignments. Designation of curves.
Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.

**(Hours:12)**

**Unit- IV** Advanced surveying equipments
Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
Use of micro optic Theodolite and Electronic Digital Theodolite.
Use of Total Station, Use of function keys.
Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.

**(Hours:12)**

**Unit- V** Remote sensing, GPS and GIS
Remote Sensing - Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management.
Use of Global Positioning System (G.P.S.) instruments.
Geographic Information System (GIS): Over view, Components, Applications, Software for GIS.
Introduction to Drone Surveying.

**(Hours:12)**

## Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

## List of Practicals to be performed:

1 Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2 Use plane table survey to prepare plans, locate details by Intersection Method.
3 Use plane table survey to prepare plans, locate details by Traversing Method.
4 Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
5 Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.
6 Plot the traverse on Al size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
7 Use Thedolite as a Tacheometer to compute reduced levels and horizontal distances.
8 Set out a circular curve by Rankine's Method of Deflection Angles.
9 Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
10 Use EDM to measure horizontal distance.

11 Use Total station instrument to measure horizontal distances.
12 Use Total station instrument to measure vertical angle.
13 Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
14 Plot the traverse on Al size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
15 Use GPS to locate the coordinates of a station.

## Suggested learning resources:


- Kanetkar, T. P.; Kulkarni, S. V, Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
- Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
- Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
- Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
- Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
- Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
- Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., NewDelhi.
- Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
- Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Ed-ucation, Noida.

## Semester IV/ Year II

## DCE 42 Geotechnical Engineering

### Learning Hrs: 60

### Objective:

- To provide the concepts and Understanding of structure of earth
- To understand and demonstrate this knowledge on engineering applications and design problems

### Course Content

**Unit - I** Overview of Geology and Geotechnical Engineering

Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.Importance of soil as construction material in Civil engineering structures and as foundation bed for structures.

Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.

**(Hours:12)**

**Unit- II**Physical and Index Properties of Soil

Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass - bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.

Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.

Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.

**(Hours:12)**

**Unit- III** Permeability and Shear Strength of Soil

Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems).

Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil - cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength

equation for purely cohesive and cohesion less soils. Direct shear and vane shear test -laboratory methods.

**(Hours:12)**

**Unit- IV** Bearing Capacity of Soil

Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.

Field methods for determination of bearing capacity - Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.

Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.

**(Hours:12)**

**Unit- V** Compaction and stabilization of soil

Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content(OMC), maximum dry density(MDD), Zero air voids line. Factors affecting compaction, field methods of compaction - rolling, ram¬ming and vibration. Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.

Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction

Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil - dry strength test, ductility test and toughness test.

**(Hours:12)**

## Outcome:

- Acquire knowledge on the geometry, Material and type of structures present in earth.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
- Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
- Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand and Company LTD., New Delhi.

## Semester IV/ Year II

## DCE 43Building Planning & Drawing

### Learning Hrs: 60

### Objective:

- To provide the concepts and Understanding of Building Drawing and Planning
- To Develop skill to Understand and express need of its design for practical execution
- Develop understanding towards use of different codes - local, national and international, for execution of Buildings.
- Develop skill for drafting drawings for Civil Engineering Construction

### Course Content

**Unit - I** Conventions and Symbols

Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete ,woodwork and glass.

Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations.

Types of lines-visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions.

Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing.

Sizes of various standard papers/sheets.

Reading and interpreting readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer).

**(Hours:12)**

**Unit- II** Planning of Building

Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.

Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.

Rules and bye-laws of sanctioning authorities for construction work.

Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).

Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.

Line plans for public building-school building, primary health centre, restaurant, bank, post office, hostel, Function Hall and Library.

**(Hours:12)**

**Unit- III** Drawing of Load Bearing Structure

Drawing of Single storey Load Bearing residential building (2 BHK) with staircase.

Data drawing -plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building.

Working drawing - developed plan, elevation, section passing through staircase or WC and bath.

Foundation plan of Load bearing structure.

**Unit- IV** Drawing of Framed Structure

Drawing of Two storeyed Framed Structure (G+1), residential building (2 BHK) with staircase.

Data drawing - developed plan, elevation, section, site plan, schedule of openings, construc¬tion notes with specifications, area statement. Planning and design of staircase- Rise and Tread for residential and public building.

Working drawing of Framed Structure - developed plan, elevation, section passing through staircase or WC and bath.

Foundation plan of Framed Structure.

Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab.

Drawing with CAD- Draw commands, modify commands, layer commands.

**(Hours:12)**

**Unit- V** Perspective Drawing

Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing

Two Point Perspective of small objects only such as steps, monuments, pedestals.

## Outcome:

Skill developed for Plan, design, and Draft civil engineering structures and buildings.

This course imparts skill to students to apply this knowledge on engineering applications.

## List of Practicals/Drawings to be completed:

To learn basics of perspective drawings and Computer Aided Drawings.

a) Measure the units of existing building (Load Bearing / Frame structure).

b) Draw line plan of measured existing building at serial no 3a to the suitable scale.

Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom)

a) Residential Bunglows ( Minimum three plans)

b) Apartment ( Minimum two plans)

Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).

Draw the following plans for a Framed Structure (One/Two BHK) from given line plan.

a. Developed plan, Elevation

b. Section for above developed plan.

c. Site plan for above drawings including area statement, schedule of opening and construc¬tion notes.

B. Full Imperial Size Sheet (Al)

1 Draw submission drawing to the scale 1:100 of a single storey load bearing residential build¬ing (2BHK) with flat Roof and staircase showing a)Developed plan and elevation

b) Section passing through Stair or WC. and Bath

c) Foundation plan and schedule of openings.

d) Site plan (1:200), area statement, construction notes.

2 Draw submission drawing, to the scale of 1:100, of (G+l) Framed Structure Residential Build¬ing (2BHK) with Flat Roof and staircase showing: a) Developed plan.

b) Elevation.

c) Section passing through Staircase.WC and Bath

d) Site plan (1:200) and area statement

e) Schedule of openings and Construction Notes.

3 Draw the above mentioned drawing at serial number (B-2) using CAD software and enclose the print out.

a) Developed plan

b) Elevation.

c) Section passing through Staircase, WC. and Bath

d) Foundation plan.

e) Site plan (1:200), area statement, Schedule of openings and construction notes.

4 Draw working drawing for above mentioned drawing at serial number (B-2) showing: a)Foun-dation plan to the scale 1:50

b) Detailed enlarged section of RCC column and footing with plinth filling.

c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.

d) Detailed enlarged section of RCC staircase and slab.

5 Draw two point perspective drawing of small objects - steps, monuments, pedestals (any one) scale 1:50

a) Draw plan, elevation, eye level, picture plane and vanishing points

b) Draw perspective view.

## Suggested learning resources:


- Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
- Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publish¬ers, New Delhi.

- M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing compa¬ny Ltd. New Delhi.
- Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publica¬tion, Anand.
- Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.
- Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
- Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd. New Delhi.
- Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

## Semester IV/ Year II

## DCE44 Mechanics of structure

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding to students toward external forces on civil structures
- Develop skill to address effect and distribution of loads on Civil engineering structures

### Course Content

**Unit - I**Direct and Bending Stresses in vertical members

Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses and distribution diagram.

Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule.

Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base.

Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses, resultant stresses and distribution diagram at base.

**(Hours:12)**

**Unit - II**Slope and Deflection

Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation).

Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span.

Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.

**(Hours:12)**

**Unit- III** Fixed and Continuous Beam

Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam.

Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span.

Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam.

Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples.

Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span.
Drawing SF diagrams showing point of contraflexure, shear and BM diagrams showing net BM and point of contraflexure for continuous beams.

**(Hours:12)**

**Unit- IV** Moment distribution method
Introduction to moment distribution method, sign convention, Carry over factor, stiffness factor, distribution factor.
Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia, supports at same level, up to three spans and two unknown support moments only.
Introduction to portal frames - Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.

**(Hours:12)**

**Unit- V** Simple trusses
Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss)
Calculate support reactions for trusses subjected to point loads at joints
Calculate forces in members of truss using Method of joints and Method of sections.

**(Hours:12)**

## Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Ramamrutham.S, Theory of structures, Dhanpatrai & Sons.
- Khurmi, R. S. , Theory of Structures S. Chand and Co., New Delhi.
- Bhavikatti, S S , Structural Analysis Vol-1, ,Vikas Publishing House Pvt Ltd.New Delhi.
- Junnarkar, S. B. , Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
- Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
- Agor R, Structural Analysis, Khanna Publishing House, Delhi.

## Semester IV/ Year II

## DCE 45 Transportation Engineering

### Learning Hrs: 45

### Objective:

- To impart knowledge and understanding principles of development and planning of Highway/Railway with its design needs
- To expose various measuring devices for study of traffic flow and capacity, traffic regulation and control

### Course Content

**Unit - I** Overview of Highway Engineering

Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics.

Different modes of transportation - land way, waterway, airway. Merits and demerits of roadway and railway;

General classification of roads.

Selection and factors affecting road alignment.

**(Hours:12)**

**Unit- II** Geometric Design of Highway

Camber: Definition, purpose, types as per IRC - recommendations.

Kerbs: Road margin, road formation, right of way.

Design speed and various factors affecting design speed as per IRC - recommendations.

Gradient: Definition, types as per IRC - Recommendations.

Sight distance (SSD): Definition, types IRC - recommendations, simple numerical.

Curves: Necessity, types: Horizontal, vertical curves.

Extra widening of roads: numerical examples.

Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.

Standards cross-sections of national highway in embankment and cutting.

**(Hours:12)**

**Unit- III** Construction of Road Pavements

Types of road materials and their Tests - Test on aggregates-Flakiness and Elongation In¬dex tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.

Pavement - Definition, Types, Structural Components of pavement and their functions

Construction of WBM road. Merits and demerits of WBM & WMM road.

Construction of Flexible pavement / Bituminous Road, Types of Bitumen and its proper¬ties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR.

Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.

**(Hours:12)**

**Unit- IV** Basics of Railway Engineering

Classification of Indian Railways, zones of Indian Railways

Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selec¬tion of a gauge.

Rail, Rail Joints - requirements, types.

Creep of rail: causes and prevention.

Sleepers - functions and Requirement, types - concrete sleepers and their density

Ballast - function and types, suitability.

Rail fixtures and fastenings - fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.

**(Hours:12)**

**Unit- V** Track geometrics, Construction and Maintenance

Alignment- Factors governing rail alignment.

Track Cross sections - standard cross section of single and double line in cutting and em-bankment. Important terms-permanent land, formation width, side drains,

Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail.

Branching of Tracks, Points and crossings, Turn out- types, components, functions and in-spection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.

Station -Purpose, requirement of railway station, important technical terms, types of rail¬way station, factors affecting site selection for railway station.

Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshaling yards.

Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organization of track maintenance, Duties of permanent way inspector, gang mate and key man.

**(Hours:12)**

## Outcome:

- Able to use various measuring devices for study of traffic flow, regulation and control
- This course imparts skill to students to apply this knowledge on engineering applications

## Suggested learning resources:


- L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93¬82609-858) Edition 2018
- Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth¬ers, Roorkee.
- Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
- Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
- Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.
- Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication, New Delhi.
- Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna-tional (P) Limited, Publishers, New Delhi.
- Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

## Semester IV/ Year II

## DCE 46 Minor Project

**Learning Hrs:**

### Objective:

- To impart understanding and develop skill toward practical project development

### Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

## Semester IV/ Year II

## DCE 48 Essences of Indian Knowledge and Tradition

Learning Hrs/Week :

### Objective:

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system

### Course Content

Basic structure of Indian Knowledge System:
Modern Science and Indian Knowledge System
Yoga and Holistic Health care
Case studies–

### Outcome:

Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

### REFERENCES

Knowledge traditions and practices of India, CBSE Publication V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya+

- Vidya Bhavan, Mumbai. 5th Edition, 2014 Swami Jitatmanand, Modern Physics and Vedantharatiya Vidya Bhavan
- Swami Jitatmanand, Holistic Science and Vedantharatiya VidyaBhavan
- Fritzof Capra, Tao of Physics• Fritzof Capra, The Wave of life
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay
- Foundation, Velliarnad, Arnakulam Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata• GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya

,• Vidyanidhi Prakashan, Delhi 2016 RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi

- Prakashan, Delhi 2016 P B Sharma (English translation), Shodashang Hridayan
- PEDAGOGY: Problem based learning, group discussions, collaborative mini projects.

## Semester V/ Year III

## DCE 51 Estimating and costing

### Learning Hrs: 60

### Objective:

- To impart understanding of Engineering Estimation and Costing.
- To impart knowledge of measurement system in Civil Engineering Structures.
- To develop Skill of Estimation and Costing

### Course Content

**Unit - I** Fundamentals of Estimating and Costing

Estimating and Costing - Meaning, purpose, Administrative approval, Technical Sanction and Budget provision.

Types of estimates - Approximate and Detailed estimate.

Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate.

Roles and responsibility of Estimator.

Checklist of items in load bearing and framed structure.

Standard formats of Measurement sheet, Abstract sheet, Face sheet.

Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.

Rules for deduction in different category of work as per IS:1200.

Description / specification of items of building work as per PWD /DSR.

**(Hours:12)**

**Unit- II** Approximate Estimates

Approximate estimate- Definition, Purpose.

Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals)

Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects.

**(Hours:12)**

**Unit- III** Detailed Estimate

Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.

Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals)

Long wall and Short wall method, Centre line method.

Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements

Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.
Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

**(Hours:12)**

**Unit- IV** Estimate for Civil Engineering Works
Earthwork - Quantities for roads, Embankment and canal by - Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method.
Detailed estimate for septic tank, Community well.
Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.

**(Hours:12)**

**Unit- V** Rate Analysis
Rate Analysis: Definition, purpose and importance.
Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit,
Procedure for rate analysis.Task work- Definition, types. Task work of different skilled labour for different items.Categories of labours, their daily wages, types and number of labours for different items of work.Transportation charges of materials - Lead and Lift, Hire charges of machineries and equip¬ments. Preparing rate analysis of different items of work pertaining to buildings and roads.

**(Hours:12)**

## Outcome:

- Skill is develop to measure Civil Engineering Structures.
- Skill developed to takeout quantity for Estimation and Costing of Civil Engineering Structures

## List of Practical work to be performed

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. repare a report on market rates for given material, labour wages, hire charges of tools &equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Study of items with specification given in the DSR (for any ten item)
4. Recording in Measurement Book (MB) for any four items
5. Prepare bill of quantities of given item from actual measurements, (any four items).
6. Prepare approximate estimate for the given civil engineering works.
7. Calculate the quantity of items of work from the given set of drawings using standard mea-surement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase).

8. Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item from DSR along with face sheet and prepare quarry chart, lead statement ( G+l Building).
9. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab)
10. Prepare rate analysis for the given five item of works.
11. Prepare detailed estimate of road of one kilometre length from the given drawing.
12. Prepare detailed estimate of small Septic tank from the given set of drawings.
13. Prepare detailed estimate of well from the given set of drawing.
14. Use the relevant software to prepare detailed estimate of a Road.
15. Use the relevant software to prepare detailed estimate of a residential building.
16. RCC/ STEEL
17. Draw any five commonly used rolled steel sections and five built up sections.
18. Summarize the provisions of IS 800 required for the design of tension member in report form.
19. Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.
20. Draw sketches for single & double lacing of given built up columns.
21. Draw sketches for battening of given built up columns.
22. Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.
23. Draw cross section, strain diagram & stress diagram for singly reinforced section.
24. Draw cross section, strain diagram & stress diagram for doubly reinforced section.
25. Design simply supported I section steel beam for udl.
26. Design beams section for shear as per IS 800 provisions.
27. Draw sketches of different types of column footings.
28. Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.
29. Prepare a checklist for reinforcement provided from actual drawings used on site for var¬ious structural elements.
30. Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
31. Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.

## Suggested learning resources


- Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
- Peurifoy,Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGraw Hill Education, , New Delhi.
- Rangwala,S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
- Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
- Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

- Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
- PWD Schedule of Rates.
- Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
- Manual of Specifications and Standards for DBFOT projects, EPC works.

## Semester V/ Year III

## DCE 52 Public Health Engineering

### Learning Hrs: 60

### Objective:

- To impart understanding of Processes involved in water and wastewater treatment.
- To develop knowledge of types, operation and maintenance of water and wastewater treatment plants

### Course Content

**Unit - I** Sources, Demand and Quality of water

Water supply schemes - Objectives, components,

Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.

Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town.

Quality of water: Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Flu-oride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.

**(Hours:12)**

**UNIT II** Purification of water

Purification of Water: Objectives of water treatment, Aeration- objects and methods of aer¬ation, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator.

Filtration - mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, op¬erational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination-Application of chlorine, forms of chlorination, types of chlorination practices, residual chlo¬rine and its importance, Flow diagram of water treatment plants.

Miscellaneous water Treatments: Introduction to water softening, Defluoridation techniques

**(Hours:12)**

**UNIT III** Conveyance and Distribution of water

Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline.

Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

**(Hours:12)**

**UNIT IV** Domestic sewage and System of Sewerages

Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions - Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation.

Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe. Building Sanitary fittings- Water closet - Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types, qualities of good trap. Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape.

Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sew¬ers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

**(Hours:12)**

**UNIT V** Characteristics and treatment of Sewage

Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance., Central Pol-lution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant.

Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimenta¬tion of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.

**(Hours:12)**

## Outcome:

- Develop ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

## LIST OF EXPERIMENT

1. Turbidity and colour test.
2. Test for PH, Hardness, Chlorides, Iron & manganese.
3. Test for B-Coil.
4. Test for residual chlorime.
5. Test for total, volatile, fixed suspended and settable.
6. Test for D.O., B.O.D., C.O.D. and starbility.
8. To determine suspended solids, dissolved solids and total solids of waste water sample

9) Design the Septic Tank for the public building such as hostel or hospital. Draw Plan and Section of the same along with the drainage arrangement in soak pit.

**VISITS :**

1. Intake site and adjoining pumping station.
2. Water treatment plant and testing lab.
3. Sewage treatment plant.

## Suggested learning resources

- Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
- Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
- Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, Dhanpat Rai
- Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
- Rao, C.S., Environmental Pollution Control Engineering, New Age International
- Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
- Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
- Basak N N, Environmental Engineering, McGraw Hill Publishers.

## Semester V/ Year III

## DCE 53 Water Resources Engineering

**Learning Hrs: 60**

### Objective:

- The knowledge of hydrology is prerequisite for the irrigation engineering and also for design of hydraulic structure.
- To impart knowledge and understanding towards concepts of Water Resources Management.
- To expose various Water Resources Management techniques and control
- Develop understanding laws pertaining to Water Resources Management.

### Course Content

**Unit - I** Introduction to Hydrology

Hydrology: Definition and Hydrological cycle Rain Gauge: Symons rain gauge, automatic rain gauge,

Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method.

Runoff, Factors affecting Run off, Computation of run-off.

Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems.

Yield and Dependable yield of a catchment, determination of dependable yield.

**(Hours:12)**

**Unit - II** Crop water requirement and Reservoir Planning

Irrigation and its classification.

Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal.

Methods of application of irrigation water and its assessment. Surveys for irrigation project, data collection for irrigation project. Area capacity curve.

Silting of reservoir, Rate of silting, factors affecting silting and control measures. Control levels in reservoir, Simple numerical problems on Fixing Control levels.

**(Hours:12)**

**Unit - III** Dams and Spillways

Dams and its classification: Earthen dams and Gravity dams (masonry and concrete).

Earthen Dams - Components with function, typical cross section, seepage through embankment and foundation and its control.

Methods of construction of earthen dam, types of failure of earthen dam and preventive measures.

Gravity Dams - Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam.
Spillways-Definition, function, location, types and components, Energy dissipaters.

**(Hours:12)**

**Unit - IV** Minor and Micro Irrigation

Bandhara irrigation: Layout, components, construction and working, solid and open bandhara.
Percolation Tanks - Need, selection of site. Lift irrigation Scheme-Components and their functions, Lay out. Drip and Sprinkler Irrigation- Need, components and Layout.
Well irrigation: types and yield of wells, advantages and disadvantages of well irrigation.

**(Hours:12)**

**Unit - V** Diversion Head Works & Canals

Weirs - components, parts, types, K.T. weir - components and construction
Diversion head works - Layout, components and their function.
Barrages - components and their functions. Difference between weir and Barrage.
Canals - Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section.
Canal lining - Purpose, material used and its properties, advantages.
Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing.
Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets.

**(Hours:12)**

## Outcome:

- Able to understand needs, techniques and control pertaining to Water Resources Management.
- This course imparts skill to students to apply this knowledge on engineering applications

## Suggested learning resources:

1. Punmia, B.C., Pande, B, Lai, Irrigation and water power engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
6. Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

Semester V/ Year III

# DCE 54 Elective I

# DCE 54 (A) Precast and Pre-stressed Concrete

## Learning Hrs: 60

## Objective:

- To impart understanding of type and use of Precast and Pre-stressed Concrete Technology.
- To equip the students with a thorough understanding of the behavior and design of pre-stressed concrete beam, slab and column.
- To develop knowledge of execution of Civil engineering Structure using Precast and Pre-stressed Concrete Technology.

## Course Content

**Unit - I**Precast concrete Elements
Advantages and disadvantages of precast concrete members
Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Man¬hole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications
Structural Precast elements - tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles
Testing of Precast components as per BIS standards.

**(Hours:12)**

**Unit- II** Prefabricated building
Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements,
Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications
Modular co-ordination, modular grid, and finishes
Prefab systems and structural schemes and their classification including design considerations
Joints - requirements of structural joints and their design considerations
Manufacturing, storage, curing, transportation and erection of above elements, equipment needed.

**(Hours:12)**

**Unit- III** Introduction to Prestressed Concrete
Principles of pre-stressed concrete and basic terminology.
Applications, advantages and disadvantages of prestressed concrete
Materials used and their properties, Necessity of high-grade materials
Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications.

**(Hours:12)**

**Unit- IV** Methods and systems of prestressing

Methods of prestressing - Internal and External pre-stressing, Pre and Post tensioning- applications

Systems for pre tensioning - process, applications, merits and demerits - Hoyer system

Systems for post-tensioning - process, applications, merits and demerits - Freyssinet sys¬tem, Magnel Blaton system, Gifford Udall system.

Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoring stage.

Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress).

BIS recommendations for percentage loss in case of Pre and Post tensioning.

**(Hours:12)**

**Unit- V** Analysis and design of Prestressed rectangular beam section

Basic assumptions in analysis of pre-stressed concrete beams.

Cable Profile in simply supported rectangular beam section - concentric, eccentric straight and parabolic

Effect of cable profile on maximum stresses at mid span and at support.

Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only.

Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)

**(Hours:12)**

## Outcome:

- Able to understand type and use of Precast and Pre-stressed Concrete Technology.
- Develop skill of execution of Civil engineering Structure using Precast and Pre-stressed Concrete Technology.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources


- Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.
- Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi
- Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Tech-nology, Createspace Independent Publication.
- Indian Concrete Institute., Handbook on Precast Concrete buildings.
- Elliott, Kim S., Precast Concrete Structures, CRC Press, New York.

- Lin, T.Y., Design of Pre-Stressed Concrete Structures, John Wiley and Sons, New York Nagara-jan, Pravin., Pre-stressed Concrete Structures, Pearson Education India
- BIS, New Delhi. IS 12592 Precast Concrete Manhole Cover and Frame, BIS, New Delhi
- BIS, New Delhi. IS 15658 Precast concrete blocks for paving - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 458 Precast Concrete Pipes (with and without reinforcement) — Specifica¬tion, BIS, New Delhi

## Semester V/ Year III

## DCE 54 Elective I

## DCE 54 (B) Construction Management

### Learning Hrs: 60

### Objective:

- To impart understanding of procedure involved in project Initiation, Planning and Design, Construction and Execution, Monitoring and Control, Completion..
- To develop knowledge of Communication and supervision pertaining to the project.

### Course Content

**Unit - I** Construction industry and management

Organization-objectives, principles of organization, types of organization: government/pub¬lic and private construction industry, Role of various personnel in construction organization

Agencies associated with construction work- owner, promoter, builder, designer, architects.

Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.

**(Hours:12)**

**Unit - II** Site Layout

Principles governing site layout.

Factors affecting site layout.

Preparation of site layout.

Land acquisition procedures and providing compensation.

**(Hours:12)**

**Unit- III** Planning and scheduling

Identifying broad activities in construction work & allotting time to it, Methods of Schedul-ing, Development of bar charts, Merits & limitations of bar chart.

Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events.

CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path,

Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration.

Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity

Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in)

**(Hours:12)**

**Unit IV** Construction Contracts and Specifications
Types of Construction contracts
Contract documents, specifications, general special conditions
Contract Management, procedures involved in arbitration and settlement (Introduction only).

**(Hours:12)**

**Unit- V** Safety in Construction
Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures.
Labour Laws and Acts pertaining to Civil construction activities (Introduction only).

**(Hours:12)**

## Outcome:

- Develop understanding of procedure involved in project Initiation, Planning and Design, Construction and Execution, Monitoring and Control, Completion..
- Impart skill of Communication and supervision pertaining to the project
- This course imparts skill to students to apply this knowledge on engineering applications

## Suggested learning resources

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Pub-lishing, New Delhi
- Gahlot,P.S. and Dhir, B.M Construction planning and management New Age International
- (P) Ltd. Publishers, New Delhi.
- Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. NewDelhi
- Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
- Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
- Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
- Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
- Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
- Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

## Semester V/ Year III

## DCE 54 Elective I

## DCE 54 (C) Rural Construction Technology

### Learning Hrs: 60

### Objective:

- To impart understanding of type and use of Rural Construction Technology.
- To develop knowledge of execution of Civil engineering Structure using Rural Construction Technology.

### Course Content

**Unit I** - Rural Development and Planning

Scope; development plans; various approaches to rural development planning.
Significance of rural development.
Rural development programme/projects.

**(Hours:12)**

**Unit II** -Rural Housing
Low cost construction material for housing
Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and Soil-stabilized un-burnt brick; Plinth protection of mud walls.
Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rat-trap bond for walls; Panels for roof, ferro-cement flooring/roofing units.
Biomass - types of fuels such as firewood, agricultural residues, dung cakes.
Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewable energy.
Working of gobar gas and bio gas plants.

**(Hours:12)**

**Unit III** Water Supply and Sanitation for Rural Areas
Sources of water: BIS & WHO water standards.
Quality, Storage and distribution for rural water supply works.
Hand pumps-types, installation, operation, and maintenance of hand pumps.
Conservation of water - rainwater harvesting, drainage in rural areas.
Construction of low cost latrines: Two pit pour flush water seal, septic tank etc.
Low cost community and individual Garbage disposal systems, Ferro-cement storage tanks.

**(Hours:12)**

**Unit IV** - Low Cost Rural Roads
Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases.
Guidelines for Surfacing of Rural Road as per relevant IRC codes.

Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.

**(Hours:12)**

**Unit V** - Low Cost Irrigation

Design consideration and construction of tube-well, drip & sprinkler irrigation systems.

Watershed and catchment area development -problems and features of watershed management.Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm pond, Bandhara system.

**(Hours:12)**

## Outcome:

- Able to understand use of Rural Construction Technology.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low cost Hous¬ing Oxford and IBH Publishing Co. Pvt. Ltd.
- CBRI, Roorkee, Advances in Building Materials and Constriction.
- Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis, Himalaya Publishing House, Delhi.
- Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.
- Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications In¬dia Pvt Ltd.
- Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.
- Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

## Semester V/ Year III

## DCE 55 S.D.D.-I (Design of RCC Structures )

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding of development and planning of RCC Structure with its design needs.
- Develop skill to design RCC Structure accordance to latest version of IS:456 with SP-16 (Design aids). .

### Course Content

**Unit - I**INTRODUCTION TO RCC : S.I. Units, Meaning of R.C.C.purpose of reinforcement.Materials of reinforcement steel as a reinforcing material. Types of steel used for reinforcement mild steel, Tor steel, permissible stresses in concrete and steel. Different mixes of concrete to be used for R.C.C. work use of I.S. code No. 456-2000 and I.S. 875-1984 for designing R.C.C. structures. Introduction to RCC design software like STRUUDS,resist,

FIXED & CONTINUOUS BEAM : Concept of fixity, fixity, advantages and disadvantages of fixed beam. Fixed end moments from first principle for beam subjected to UDL over entire span, central point load, Point load other than mid span. Application of standard formulae in finding moments and drawing S.F. and B.M. diagrams for a fixed beam. Clapevron's theorem of three moment (no derivation). Application of theorem maximum up to three spans and two unknown support moment only, Support at same level, spans having same moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. Drawing SF and BM diagrams for continuous beams.

**(Hours:12)**

**Unit – II**WORKING STRESS METHOD & PRESTRESSED CONCRETE Introduction to reinforced

concrete, R.C. Sections their behavior, grades of concrete steel. Permissible stresses, Assumptions in W.S.M. Equivalent bending stress distribution diagram for singly reinforced section. Concept of under-reinforced, over-reinforced and section, neutral axis co-efficient Simple numerical problems on determining design constants, moment of resistance and area of steel for singly & doubly reinforced beam. Concept of pre stressed concrete, externally and internally prestressed member. Advantages and disadvantages of pre stressed concrete. Methods of prestressing, pre tensioning and post tensioning. Losses in pre stressing. (No numerical problems shall be asked in written examination on pre-stressed concrete).

**(Hours:12)**

**Unit – III**LIMIT STATE METHOD Definition, types of limit states, partial safety factors for materials strength, characteristics strength, characteristics load, design load. Loading on

structure as per I.S. 875. I.S. Specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchoring effective span for beam & slab.

ANALYSIS AND DESIGN OF SINGLY REINFORCED Sections (LSM) Limit State of collapse (Flexure), Assumptions stress. Strain relationship for concrete and steel neutral axis, Stress block diagram and Strain diagram for singly reinforced section. Concept of under-reinforced, over-reinforced and balanced section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for balanced singly R.C. Section. Simple numerical problems on determining design constants, moment of resistance and area ofsteel.

ANALYSIS AND DESIGN OF DOUBLY REINFORCED SECTIONS (LSM) General features, necessity of providing doubly reinforced section reinforcement limitations. Analysis of doubly reinforced section, strain diagram stress diagram, depth of neutral axis, moment of resistance of the section. Simple numerical problems on finding moment of resistance and design of beam sections.

SHEAR, BOND AND DEVELOPMENT LENGTH (LSM) NOMINAL SHEAR STRESS IN R.C. SECTION, design shear strength of concrete, Maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, forms of shear reinforcement. Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value of hooks 90° bend and 45° bend Standard Lapping of bars, check for development length.

SIMPLE NUMERICAL PROBLEMS on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilevers beams and slab, check for development length. Analysis and Design of T-Beam (LSM) General features, advantages, effective width of flange as per IS:456-2000 code provisions.

**(Hours:12)**

**Unit – IV**ANALYSIS OF SINGLY REINFORCED T-BEAM, strain diagram & stress diagram, depth

of neutral axis, moment of resistance of T-beam Section with neutral axis lying within the flange. Design of T-beam for moment and shear for Neutral axis within or up to flange bottom. Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section with N.A. lies within or up to the bottom of flange shall be asked in written examination.

DESIGN OF SLAB (LSM) DESIGN OF SIMPLY SUPPORTED one-way slabs for flexure check for deflection control, and shear. Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear. Design of two-way simply supported slab for flexure with corner free to lift. Design of dog-legged staircase.Simple numerical problems on design of one-way simply supported slabs

cantilever slab & two -way simply supported slab.(No problem on design of dog-legged staircase shall written examination.)

**(Hours:12)**

**Unit – V**DESIGN OF AXIALLY LOADED COLUMN AND FOOTING (LSM) Assumptions in limitstate of collapse- compression. Definition and classification of columns, effective length of column. Specification for minimum reinforcement; maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties. Analysis and design of axially loaded short, square; rectangular and circular columns with lateral ties only, check for short column and check for minimum eccentricity may be applied. Types of footing, Design of isolated square footing for flexure and shear. Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment and two way shear only.)

PRINCIPAL OF EARTH QUAKE ENGINEERING Introduction ,RICHTER SCALE, Soft story effect, detailing of structural elements ,ductile detailing ,earthquake zone in India Different earthquake I S codes (IS 1893-1984) IS 4326-1976 causes of failure of structure during earth quake ,principal of constructing earthquake resistant buildings .

**(Hours:12)**

## Outcome:

- Understanding development and planning of RCC Structure with its design needs.
- Skill is developed to design RCC Structure accordance to latest version of IS:456 with SP-16 (Design aids)
- This course imparts skill to students to apply this knowledge on engineering applications

## Sketch book :

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution & strain distribution diagrams R.C.C. section / detailing of reinforcement in joints / members. Design of R.C.C. structural components by LSM.

Introduction to RCC design software STRUUDS

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on any five of the following R.C.C. components members of a two-storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920.

1. One-way simply supported slab.
2. Two-way simply supported slab.
3. Cantilever slab/chajja.
4. T-Beam

5. Column and column footing.
6. Dog-legged staircase.

**FIELD VISITS -**

Visit to a construction site where the RCC work is in progress. Visit to a construction site where the irrigation work is in progress.
Visit to a bridge site. Batching plant for cement concrete and bituminous road
Visit to water treatment plant.
Visit to a dam site Canal site
. Visit for a power plant site .
Visit for a construction site where multistoried mall /shopping complex

## Suggested learning resources

- Limit State Theory & Design of Reinforced Concrete. Dr. V.L. Shah & Late Dr. S.R. Karve Structure Publications
- Fundamentals of Reinforced concrete. N.C. Sihna & S.K. Roy S.Chand& Company
- Reinforced concrete Design (IS456-2000) Principles & N.Krishna Raju R.N.Pranesh International Practice
- Prestressed Concrete N. Krishna Raju
- Reinforced concrete Design S.U. Pillai & Devdas Menon Tata Mcgraw Hill.
- LimitState Design of Reinforced Concrete.P.C. Varghase Prentice Hall of India.
- R.C.C. Design Shah & Kale

## Semester V/ Year III

## DCE 56 Open Elective I

## DCE 56 (A) Computer aided drawing (CAD)

**Learning Hrs: 60**

### Objective:

- To impart knowledge to students toward use of Computer and allied technology Civil engineering drafting need.
- Develop skill of Civil engineering Drafting using Computers.

### Course Content

**Unit 1:** INTRODUCTION TO CAD

Starting CAD , CAD Screen Components ,Drawing Area, Command Window, Navigation bar ,Status bar, Invoking Commands in CAD, Keyboard, Ribbon, Application Menu, Tool Palettes , Menu Bar ,Toolbar, Shortcut Menu, CAD Dialog Boxes, Starting a New Drawing, Open a Drawing, Start from Scratch, Use a Template, Use a Wizard, Saving Your Work, Save Drawing as Dialog box, Using the Drawing Recovery Manager to Recover Files, Closing a Drawing, Opening an Existing Drawing, Opening an Existing Drawing Using the Select File Dialog Box, Opening an Existing Drawing Using the Start up Dialog Box ,Opening an Existing Drawing Using the Drag and Drop Method, Quitting CAD, Creating and Managing Workspaces, Creating a New Workspace,Modifying the Workspace Settings.

**(Hours:12)**

**Unit 2:** GETTING STARTED WITH CAD

Dynamic Input Mode ,Enable Pointer Input , Enable Dimension Input where possible , Show command prompting and command input near the crosshairs, Drafting Tooltip Appearance, Drawing shapes in CAD ,The Close Option,The Undo Option, Invoking tools Using Dynamic INPUT/Command Prompt, Understanding and using Coordinate Systems , Direct Distance Entry, Erasing Objects, Cancelling and Undoing a Command, Object Selection Methods , Window Selection,Window Crossing Method, BASIC Display Commands, Setting Units Type and Precision, Specifying the Format, Specifying the Angle Format, SETTING the Limits OF A DRAWING

**(Hours:12)**

**Unit 3:** STARTING WITH ADVANCED SKETCHING

working with drawing aids ,editing sketched objects,creating text and tables, basic dimensioning, geometric dimensioning, and tolerancing, editing dimensions, dimension styles, multilayer styles, and system variables,model space viewports, paper space viewports, and layouts

**(Hours:12)**

**Unit 4:** PLOTTING and HATCHING DRAWINGS

Plotting Drawings in CAD ,Plotting Drawings Using the Plot Dialog Box,Page setup Area,Printer/plotter Area,Paper size Area,Number of copies Area,Plot area,Plot offset (origin set to printable area) Area,Plot scale Area,Plot style table (pen assignments) Area,Shaded viewport options Area,Plot options Area,Preview,Adding Plotters,The Plotter Manager Tool,Using Plot Styles,Adding a Plot Style ,Hatching Drawings.

**(Hours:12)**

**Unit 5:** WORKING WITH BLOCKS

The Concept of Blocks, Advantages of Using Blocks ,Drawing Objects for Blocks,Converting Entities into a Block , Inserting Blocks, Creating and Inserting Annotative Blocks, Block Editor,Adding Blocks in Tool Palettes,Drag and Drop Method

Modifying Existing Blocks in the Tool Palettes,Layers, Colours, Line types, and Line weights for Blocks,Nesting of Blocks,Creating Drawing Files using the Write Block Dialog Box,Exploding Blocks Using the XPLODE Command,Renaming Blocks ,Deleting Unused Blocks, Editing Constraints to Blocks.

## Outcome:

- Apply/develop solutions using Computers to address need of Civil engineering Drafting.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources

- Mastering AutoCAD and AutoCAD LT by George Omura and Brian C. Benton
- AutoCAD and AutoCAD LT Bible by Ellen Finkelstein
- Mastering AutoCAD and AutoCAD LT (Autodesk Official Training Guides) by George Omura and Rick Graham
- AutoCAD For Dummies (For Dummies (Computers)) by David Byrnes

# Semester V/ Year III

## DCE 56 Open Elective I

## DCE 56 (B) Disaster Management

### Learning Hrs: 60

### Objective:

- Learn basic concepts of Disaster, Types, Trends, Causes and Consequences.
- Develop understanding on various Management system to Control of Disasters.
- To develop skill on Technique to manage Disaster.

### Course Content

**Unit - I: Understanding Disaster**

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity - Disaster and Development, and disaster management.

**(Hours:12)**

**Unit - II: Types, Trends, Causes, Consequences and Control of Disasters**

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends - Emerging Risks of Disasters - Climate Change and Urban Disasters.

**(Hours:12)**

**Unit- III: Disaster Management Cycle and Framework**

Disaster Management Cycle - Paradigm Shift in Disaster Management.

Pre-Disaster - Risk Assessment and Analysis, Risk Mapping, zonation and Micro-zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster - Evacuation - Disaster Communication - Search and Rescue - Emergency Operation Centre - Incident Command System - Relief and Rehabilitation

Post-disaster - Damage and Needs Assessment, Restoration of Critical Infrastructure - Early Recovery - Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Framework of Action.

**(Hours:12)**

**Unit- IV: Disaster Management in India**

Disaster Profile of India - Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 - Institutional and Financial Mechanism,National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter Governmental Agencies.

**(Hours:12)**

**Unit- V: Applications of Science and Technology for Disaster Management**

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).Disaster Communication System (Early Warning and Its Dissemination).Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters.

**(Hours:12)**

## Outcome:

- Develop skill to understanding various Management system and Technique to manage Disaster.
- This course imparts skill to students to apply this knowledge on engineering applications.

**Suggested learning resources**


- Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
- Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
- Srivastava, H. N, and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- Alexander, David, Natural Disasters, Kluwer Academic London
- Ghosh, G. K., Disaster Management, A P H Publishing Corporation
- Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

## Semester V/ Year III

## DCE 56 Open Elective I

## DCE 56 (C) Project Management

### Learning Hrs: 60

### Objective:

- To impart understanding of Project Management
- To develop knowledge of Communication and supervision pertaining to the Project Management.

### Course Content

**UNIT-I: Concept of a project:** Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time)project priority matrix- work break down structure.

**(Hours:12)**

**UNIT-II: Capital budgeting process:** Planning- Analysis-Selection-Financing-Implementation-Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process-Technical analysis

**(Hours:12)**

**UNIT-HI: Financial estimates and projections:** Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

**UNIT-IV: Basic techniques in capital budgeting:** Non discounting and discounting methods- payback period- Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

**(Hours:12)**

**UNIT-V: Project administration:** progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off.
Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management software.

**(Hours:12)**

### Outcome:

- Develop understanding of procedure involved in project administration and budgeting.

- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources

- Project planning, analysis, selection, implementation and review - Prasannachandra - Tata McGraw Hill
- Project Management - the Managerial Process - Clifford F. Gray & Erik W. Larson - McGraw Hill
- Project management - David I Cleland - Mcgraw Hill International Edition, 1999
- Project Management - Gopala krishnan - Mcmillan India Ltd.
- Project Management-Harry-Maylor-Peason Publication

## Semester V/ Year III

## DCE 57 Project- I

**Learning Hrs:**

**Objective:**

- To impart understanding and develop skill toward practical project development

**Outcome:**

- This course imparts skill to students to apply this knowledge on engineering applications.

## Semester VI/ Year III

## DCE 61 S.D.D-II (Design of Steel Structures)

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding of development and planning of Steel Structure with its design needs.
- Develop skill to design Steel Structure accordance to latest version of IS:800 with Steel table

### Course Content

**Unit – I**INTRODUCTION:
Types of sections used, Hollow Square section Rectangular section Tubular section, Z Section, Angle Section, T, I, C, L Section etc. Grades of steel and strength characteristics; advantages and disadvantages of steel as construction material; Use of steel table and relevant I. S. code; Types of loads on steel structure and its I. S. code specification.
CONNECTIONS :
Riveted connections, Types of rivets and their use, Nominal dia, Gross dia. Unwin's formula, Pitch of rivets, Edge distance, Tacking rivets, permissible stress in rivet riveted joint and its failure, Strength of riveted joint and efficiency of a riveted joint. Assumptions in theory of riveted joint, Design of riveted joint for axially loaded member. Eccentric riveted connection Welded connection Introduction, Permissible stress in weld, strength of weld, advantages and disadvantages of welded joint. Types of weld and their symbols. Design of fillet weld and butt weld subjected to axial load.
TENSION MEMBER :
Types of Sections used, Permissible Stresses in Axial Tension, gross and net cross sectional area of tension member, Analysis and design of tension member with welded and riveted connection.

**(Hours:12)**

**Unit – II**COMPRESSION MEMBER :
Criteria of failure of short column and long column , end conditions effective length of a column, slenderness ratio and corresponding compressive stress : Angle struts Types of sections used, Analysis and Design of axially loaded angle struts with welded and riveted connection. Stanchion and Columns, types of sections used, simple and built up sections. Analysis and design of axially loaded column. Design of compound column. Design of lacing angles and Batten plates.
COLUMN BASES :
Types of column bases ,design of slab base & concrete block. Cleat angles, their use, introduction to gusseted base (no numerical problems on gusseted Base)

**(Hours:12)**

**Unit – III**STEEL BEAMS :

Different steel sections used; Simple and built-up sections Permissible bending stresses. Design of simple beams, check for shear only. Design of built-up beams (Symmetrical I Section with cover plates only), check for shear only, bending, bearing and deflection. Introduction to Plate Girder: Various components and their functions. (No numerical Problem on Plate Girder)

**(Hours:12)**

**Unit – IV**ROOF TRUSS :

Types of steel roof truss & its selection criteria. span and slope, Rise and pitch, loads acting on the Roof. Dead load; Live load and wind load as per I.S. 875-1987. Combination of loads for design of truss, Forces in the members (Graphical method). Design of members of truss, Design of Angle purlin as per I.S.06 16 .Arrangement members.

**(Hours:12)**

**Unit – V**TIMBER STRUCTURES :

Grades of Timber - stress in timber. Factors affecting stress/ strength of timber. Design of Timber column & Timber Beam.

**(Hours:12)**

## Outcome:

- Understanding development and planning of Steel Structure with its design needs.
- Skill is developed to design Steel Structure accordance to latest version of IS:800 with Steel table
- This course imparts skill to students to apply this knowledge on engineering applications

## LIST OF EXPERIMENT

PRACTICAL: Term work shall consists of sketch book and design 30 report of steel roof truss for an industrial building. Sketch book shall consists of any five plates out of the below mentioned

1. Sketching of different types of riveted joints and welded joints. Typical sketches of sections of tension member, determination of net effective cross-sectional area of tension member for angle section.
2. Typical sketches of sections of compression member, lacing and battening.
3. Graphical solution of frames to find out the stress in the member. Type of trusses for differentspans.
4. Working drawing of steel truss with the details of joint
5. Detailed drawing of slab base and gusseted base.
6. Important information of clauses of IS800-1984 and IS875 (Part-1,2 & 3)

## Suggested learning resources

- Steel structures By Ramanatham
- Structural Engg. Vol.-IV (Steel)
- Steel Structures By Ramchandra
- Steel Structures By Arya and Ajmani
- Steel Structures By Malhotra M.M.
- Steel Structures By R.K. Dhoble & D.S.

## Semester VI/ Year III

## DCE 62 Elective II

## DCE 62 (A) Solid Waste Management

### Learning Hrs: 60

### Objective:

- Learn basic concepts of solid waste management, beginning from source generation to waste disposal in a system of municipality organizational structure.
- Develop understanding on various technological applications for processing of waste and their disposals in various ways.

### Course Content

**Unit -1** Introduction

- Definition of solid waste, different solid waste - domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc.
- Sources of solid waste, Classification of solid waste - hazardous and non- hazardous waste.
- Physical and chemical characteristics of municipal solid waste.

**(Hours:12)**

**Unit- II** Storage, Collection and Transportation of Municipal Solid Waste

- Collection, segregation, storage and transportation of solid waste.
- Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community bin - like movable and stationary bin.
- Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location.
- Role of rag pickers and their utility for society.

**(Hours:12)**

**Unit- III** Composting of Solid Waste

- Concept of composting of waste, Principles of composting process. Factors affecting the composting process.
- Methods of composting - Manual Composting - Bangalore method, Indore Method, Mechanical Composting - Dano Process, Vermi composting.

**(Hours:12)**

**Unit IV** Techniques for Disposal of Solid Waste

- Solid waste management techniques - solid waste management hierarchy, waste prevention and waste reduction techniques

- Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste
- Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste - Definition, Methods

**(Hours:12)**

**Unit- V** Biomedical and E-waste management

Definition of Bio medical Waste.

Sources and generation of Biomedical Waste and its classification Bio medical waste Management technologies. Definition, varieties and ill effects of E- waste, Recycling and disposal of E- waste.

**(Hours:12)**

## Outcome:

- Develop skill to manage solid waste.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

## Semester VI/ Year III

## DCE 62 Elective II

## DCE 62 (B) Green Building and Energy Conservation

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding concept of Green Building and Energy Conservation.
- Develop skill to Construct Green Building and Energy Conservation in it.

### Course Content

**Unit I :** Introduction to Green Building and Design Features
Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.
Site selection strategies, Landscaping, building form, orientation, building envelope and fen-estration, material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction

**(Hours:12)**

**Unit-II** Energy Audit and Environmental Impact Assessment (EIA)
Energy AudiT: Meaning, Necessity, Procedures, Types, Energy Management Programs
Environmental Impact Assessment(EIA): Introduction, EIA regulations, Steps in environ¬mental impact assessment process, Benefits of EIA, Limitations of EIA, Environmental clearance for the civil engineering projects.

**(Hours:12)**

**Unit- III** Energy and Energy conservation
Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Bio-mass Energy
Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Biofuels.
Energy conservation: Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.

**(Hours:12)**

**Unit- IV** Green Building
Introduction: Definition of Green building, Benefits of Green building,
Principles: Principles and planning of Green building
Features: Salient features of Green Building, Environmental design (ED) strategies for building construction.

Process: Improvement in environmental quality in civil structure
Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing.

**(Hours:12)**

**Unit V** Rating System
Introduction to (LEED) criteria,
Indian Green Building council (IGBC) Green rating,
Green Rating for Integrated Habitat Assessment. (GRIHA) criteria
Heating Ventilation Air Conditioning (HVAC) unit in green Building
Functions of Government organization working for Energy conservation and Audit(ECA)-
National Productivity council(NPC)
Ministry of New and Renewable Energy (MNRE)
Bureau of Energy efficiency (BEE)

**(Hours:12)**

## Outcome:

- Develop skill to Construct Green Building and Energy Conservation in it.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hobo-u ken, New Jersey.
- Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
- O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
- Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
- Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
- Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
- Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IK International.

## Semester VI/ Year III

## DCE 62 Elective II

## DCE 62 (C) Repairs and Maintenance of Structures

### Learning Hrs: 60

### Objective:

- To impart knowledge and understanding of causes of Structure failure.
- Develop skill to Repair and Maintenance of Civil structure.

### Course Content

**Unit - I** Basics of maintenance

Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration.

Necessity, objectives and importance of maintenance.

Approach of effective management for maintenance.

Periodical maintenance: check list, maintenance manual containing building plan, reinforce¬ment details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

**(Hours:12)**

**Unit- II** Causes and detection of damages

Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement.

Various aspects of visual observations for detection of damages.

Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection micro¬scope, digital crack measuring gauge.

Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

**(Hours:12)**.

**Unit- III** Materials for maintenance and repairs

Types of repair material, material selection.

Essential parameters for maintenance and repair materials such - bond with substrate, durability.

Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.

Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.

Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement con¬crete, emulsions and paints.

**(Hours:12)**.

**Unit- IV** Maintenance and repair methods for masonry Construction
Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation.
Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.
Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5 mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.
Remedial measures for dampness & efflorescence in wall.

**(Hours:12)**.

**Unit- V** Maintenance and repair methods for RCC Construction

- Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation.

Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.
Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting.
Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.

**(Hours:12)**.

## Outcome:

- Develop skill to assess reason of Structural Failure.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi
- Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies
- Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
- Relevant BIS codes

## Semester VI/ Year III

## DCE 63 Elective III

## DCE 63 (A) Renewable Energy Technologies

### Learning Hrs: 60

### Objective:

- To impart understanding of type and use of Renewable Energy Technology.
- To develop knowledge of use and implementation technologies for harnessing renewable energy project.

### Course Content

**UNIT-I:** Introduction: World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achieve¬ments / Applications; Economics of renewable energy systems.

**(Hours:12)**.

**Unit-II:** Solar energy: Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrat¬ing Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

**(Hours:12)**.

**Unit-Ill:** Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Perfor¬mance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

**(Hours:12)**.

**Unit-IV:** Bio-Energy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Etha-nol production; Bio diesel; Cogeneration; Biomass Applications.

**(Hours:12)**.

**Unit-V:** Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

**(Hours:12)**.

### Outcome:

- Able to understand use of Renewable Energy Technology.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources


- Non-Conventional Energy Sources, Rai. G.D., Khanna Publishers, New Delhi, 2011.
- Renewable Energy Sources, Twidell, J.W & Weir, A, EFN Spon Ltd., UK, 2006.
- Solar Energy, Sukhatme. S.P, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
- Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
- Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.
- Energy and The Environment, RA Ristinen and J J Kraushaar, second edition, John Willey & Sons, New York, 2006.
- Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

## Semester VI/ Year III

## DCE 63 Elective III

## DCE 63 (B) Advanced Construction Technology

### Learning Hrs: 60

### Objective:

- To impart understanding of type and use of Advance Construction Technology.
- To develop knowledge of execution of Civil engineering Structure using Advance Construction Technology.

### Course Content

**Unit - I** Advanced Construction Materials
Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, waterproofing materials, adhesives.
Use of waste products and industrial by products in bricks, blocks, concrete and mortar.
**(Hours:12)**.

**Unit- II** Advanced Concreting Methods and Equipments
Ready Mix Concrete: Necessity and use of ready mix concrete. Products and equipments for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
Underwater Concreting: Procedure and equipments required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.
Special concrete: procedure and uses of special concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, shotcreting.
**(Hours:12)**.

**Unit- III** Advanced Technology in Constructions
Construction of bridges and flyovers: Equipments and machineries required for foundation and super structure.
Construction of multi-storeyed Building: Equipments and machinery required for construc-tion of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrica¬tion, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.
Strengthening of embankments by soil reinforcing techniques using geo-synthetics.
**(Hours:12)**.

**Unit- IV** Hoisting and Conveying Equipments

Hoisting Equipments: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.

Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

**(Hours:12)**.

**Unit- V** Miscellaneous Machineries and Equipments

Excavation Equipments: Use, working and output of following machinery - bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines.

Compacting Equipments: Output of different types of rollers such as plain rollers, ship footed rollers, vibratory, pneumatic rollers rammers.

Miscellaneous Equipments: Working and selection of equipments: Pile driving equipments, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equipments, floor polishing and cutting machine selection of drilling pattern for blasting, Bentonite/mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

**(Hours:12)**.

## Outcome:

- Able to understand use of Advance Construction Technology.
- This course imparts skill to students to apply this knowledge on engineering applications.

## Suggested learning resources:

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
- Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
- Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
- Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
- Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
- Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
- Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.
- Rangawala,S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
- Ghose,D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

## Semester VI/ Year III

## DCE 63 Elective III

## DCE 63 (C) Precast and Pre-stressed Concrete

**Learning Hrs: 60**

### Objective:

- To provide the concepts of importance of Precast and Pre-stressed Concrete structure system in civil engineering field.
- To equip the students with a thorough understanding of the behavior and design of pre-stressed concrete beam, slab and column. Various time dependent factors, such as cracking, creep and shrinkage of concrete and pre-stress losses, are discussed thoroughly.

### Course Content

**Unit - I**Precast concrete Elements
Advantages and disadvantages of precast concrete members
Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Man¬hole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications
Structural Precast elements - tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles
Testing of Precast components as per BIS standards.

**(Hours:12)**.

**Unit- II** Prefabricated building
Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements,
Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications
Modular co-ordination, modular grid, and finishes
Prefab systems and structural schemes and their classification including design considerations
Joints - requirements of structural joints and their design considerations
Manufacturing, storage, curing, transportation and erection of above elements, equipment needed.

**(Hours:12)**.

**Unit- III** Introduction to Prestressed Concrete
Principles of pre-stressed concrete and basic terminology.
Applications, advantages and disadvantages of prestressed concrete

Materials used and their properties, Necessity of high-grade materials
Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications.

**(Hours:12)**.

**Unit- IV** Methods and systems of prestressing
Methods of prestressing - Internal and External pre-stressing, Pre and Post tensioning-applicationsSystems for pre tensioning - process, applications, merits and demerits - Hoyer system
Systems for post-tensioning - process, applications, merits and demerits - Freyssinet sys¬tem, Magnel Blaton system, Gifford Udall system.
Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoring stage.
Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress).
BIS recommendations for percentage loss in case of Pre and Post tensioning.

**(Hours:12)**.

**Unit- V** Analysis and design of Prestressed rectangular beam section
Basic assumptions in analysis of pre-stressed concrete beams.
Cable Profile in simply supported rectangular beam section - concentric, eccentric straight and parabolic
Effect of cable profile on maximum stresses at mid span and at support.
Numerical problems on determination of maximum stresses at mid spans with linear (con-centric and eccentric) cable profiles only.
Simple steps involved in Design of simply supported rectangular beam section (No numerical problems).

**(Hours:12)**.

## Outcome:

- This course imparts ability to students to apply this knowledge on engineering applications and design problems.

## Suggested learning resources

- Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.
- Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi
- Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Tech-nology, Createspace Independent Publication.
- Indian Concrete Institute., Handbook on Precast Concrete buildings.
- BIS, New Delhi. IS 12592 Precast Concrete Manhole Cover and Frame, BIS, New Delhi

- BIS, New Delhi. IS 15658 Precast concrete blocks for paving - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice, BIS, New Delhi
- BIS, New Delhi. IS 458 Precast Concrete Pipes (with and without reinforcement) — Specifica¬tion, BIS, New Delhi

## Semester VI/ Year III

## DCE 64 Elective IV

## DCE 64 (A) Tendering and Accounts

### Learning Hrs: 60

### Objective:

- To provide the concepts of importance of Tendering and Accounts in civil engineering field.

### Course Content

**Unit - I** Procedure to execute the work

Administrative approval, Technical sanction, budget provision, expenditure sanction.

Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis.

**(Hours:12)**.

**Unit- II** Contracts

Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act.

Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract.

Introduction of FIDIC Conditions of contract.

Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor.

Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).

**(Hours:12)**.

**Unit- III** Tender and Tender Documents

Definition of tender, necessity of tender, types of tender- Local, Global, Limited.

E -Tendering System - Online procedure of submission and opening of bids (Technical and Financial).

Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice.

Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award.
Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid.
Tender documents - Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc.
Terms related to tender documents - contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause(escalation), defect liability Period, liquidated Damages.
Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.

**(Hours:12)**.

**Unit- IV** Accounts
Various account forms and their uses - Measurement Books, E- Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.
Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.

**(Hours:12)**.

**Unit- V** Introduction to Valuation
Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value.
Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.
Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation - Straight Line Method, Sinking Fund Method, Constant Percentage Method.
Fixation of rent, Lease - types of lease, lease hold property and free hold property. Mortgage - Mortgage deed, precautions to be taken while making mortgage.

**(Hours:12)**.

## Outcome:

- This course imparts ability to students to apply this knowledge on engineering applications and design problems.

## Suggested learning resources:

1. Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi
2. Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distributers Pvt. Ltd.

3. Rangawala, S. C, Estimating and Costing, Charotar Publishing House PVT. LTD., Gujrat
4. Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd., New Delhi
5. Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai

## Semester VI/ Year III

## DCE 64 Elective IV

## DCE 64 (B) Traffic Engineering

### Learning Hrs: 60

### Objective:

- To provide the concepts of importance of Trafficengineering .
- Competence in building the background in Traffic engineering and understanding its features with a technical sense.
- To develop Better Comprehension of various probable alternatives to describe the Traffic situation..
  Better Comprehension of various probable alternatives to describe the Traffic situation.

### Course Content

**Unit - I** Fundamentals of Traffic Engineering.

- Traffic engineering- Definition, objects, scope
- Relationship between speed, volume and density of traffic
- Road user's characteristics-physical, mental, emotional factors.
- Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks.
- Road characteristics - gradient, curve of a road, design speed, friction between road and tyre surface.
- Reaction time - factors affecting reaction time. PIEV Theory.

**(Hours:12)**.

**Unit- II** Traffic Studies

- Traffic volume count data- representation and analysis of data.
- Necessity of Origin and Destination study and its methods.
- Speed studies - Spot speed studies, and its presentation.
- Need and method of parking study.

**(Hours:12)**.

U**nit- III** Road Signs and Traffic Markings

- Traffic control devices -definition, necessity, types.
- Road signs - definition, objects of road signs.
- Classification as per IRC: 67-Mandatory or Regulatory, Cautionary or warning, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Points to be considered while designing and erecting road signs.
- Traffic markings- definition, classification, carriage way, kerb, object marking and reflector markers.

**(Hours:12)**.

**Unit- IV** Traffic Signals and Traffic Islands

- Traffic signals- Definition, Types, Traffic control signals, pedestrian signals.
- Types of traffic control signals - Fixed time, manually operated, traffic actuated signals and location of signals.
- Compute signal time by fix time cycle, Webster's and IRC method and sketch timing diagram for each phase.
- Traffic islands -Definition, advantages and disadvantages of providing islands.
- Types of traffic islands - rotary or central, channelizing or Refuge Island.
- Road intersections or junctions - Definition, Types of road intersection.
- Intersection at grade- Types, basic requirements of good intersection at grade.
- Grade separated intersection- advantages and disadvantages, types - flyovers-partial and full Cloverleaf pattern, Diamond intersection, Trumpet type, underpass.

**(Hours:12)**.

**Unit- V** Road Accident Studies and Arboriculture

- Road Accidents-Definition, types and causes for collision and non-collision accidents.
- Measures to prevent road accidents.
- Collision and condition diagram.
- Street lighting -definition, necessity, types-luminaire, foot candle, lumen, factors affecting their utilization and maintenance.
- Arboriculture- definition, objectives, factors affecting selection of type of trees.
- Maintenance of trees-protection and care of road side trees.

**(Hours:12)**

## Outcome:

- Ability to plan, design, and implement safe, efficient, cost effective, sustainable Traffic need to meet societal and environmental needs.
- This course imparts ability to students to apply this knowledge on engineering applications.

## Suggested learning resources:

1. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi
3. Vazirani, V N, Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.
4. Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
5. Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

## Semester VI/ Year III

## DCE 64 Elective IV

## DCE 64 (C) Pavement Design and Maintenance

### Learning Hrs: 60

### Objective:

- To provide the concepts of importance of Pavement Design and Maintenance in Civil engineering Construction.
- Impart skill to develop process of collecting data required for design, factors affecting pavement design, and maintenance of pavement.
- To develop vision and understanding toward Quality construction of Pavement.

### Course Content

**Unit - I** Basics of pavement Design

Types of pavement - Flexible, Rigid and Semi Rigid, Comparison of Rigid and flexible pavement according to Design precision, life maintenance, initial cost, stages of construction, availability of materials, surface characteristic, penetra¬tion of water in the pavement, utility location, glare and night visibility.Functions and characteristics of pavement.Factors affecting selection of type of pavement.

**(Hours:12)**.

**Unit- II** Fundamentals of pavement design

Factors affecting pavement design-design wheel load .Traffic factors, Environmental factors, Road geometry and material, Characteristics of soil and Drainage situation.

**(Hours:12)**.

**Unit- III**Design overview of Flexible and Concrete pavement

Methods of flexible pavement design-Theoretical method, Empirical method with and without soil strength test.

IRC37 guidelines for design of flexible pavement (overview only) Factors affecting design of concrete pavement. IRC58 guidelines for design of concrete pavement (overview only) Joints-Need, Types, requirements, spacing of joints

**(Hours:12)**.

**Unit- IV** Pavement evaluation

Definition and purpose of pavement evaluation

Methods of Pavement evaluation -Visual rating, Pavement serviceability index, Roughness measurements, Benkelman Beam deflection method

**(Hours:12)**.

**Unit V -** Pavement Maintenance

Types of pavement maintenance - routine, periodic, and special. Need for inspection and maintenance schedule. Causes of pavement failure and remedial measures. Typical flexible and rigid pavement failures

Types and causes of damages in flexible pavement, surface defects, cracks. Deformations - Rutting, fatigue, settlement and upheaval. Disintegration- loss of aggregate, stripping, pothole. Remedial measures - slurry seal, liquid seal, fog seal, patching, ready mix patch.

Types of damages to rigid pavement - cracking, spalling, slab rocking, settlement, joint seal¬ant failure. Methods of repair - repair of spalled joints, full depth reconstruction, replacement of dowel bars.

**(Hours:12)**.

## Outcome:

- Contribute to the development of transportation infrastructure that is sustainable.
- This course imparts ability to students to apply this knowledge on engineering applications and design problems.

## Suggested learning resources

1. Kadiyali, L.R., Highway Engineering, Khanna Book Publishing House, New Delhi (ISBN: 978-93-86173-133)
2. Chakroborty, Partha Das, Animesh., Principles of Transportation engineering, Prentice-Hall of India Pvt. Ltd
3. Vazirani, V N, Chaondola, S P., Transportation Engineering Vol. I & II, Khanna Publishers. Delhi
4. Yoder, E J, Principles of Pavement Design, Wiley India Pvt Ltd.
5. Bindra, S P., Highway Engineering, Dhanpat Rai Publications (P) Ltd
6. Kumar R S, Pavement Evaluation and Maintenance Management system, University Press (In¬dia), Pvt. Ltd.

## Semester VI/ Year III

## DCE 65 Entrepreneurship

### Learning Hrs: 60

### Objective:

- To provide the concepts of importance of Entrepreneurship in Civil engineering Construction.
- Impart skill to develop student as Entrepreneur.
- To develop vision and understanding toward Quality construction.

### Course Content

**Unit 1** - Introduction to Entrepreneurship and Start – Ups
• Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation
• Types of Business Structures, Similarities/differences between entrepreneurs and managers.
**(Hours:12)**.

**Unit 2** – Business Ideas and their implementation
• Discovering ideas and visualizing the business
• Activity map
• Business Plan
**(Hours:12)**.

**Unit 3** – Idea to Start-up
• Market Analysis – Identifying the target market,
• Competition evaluation and Strategy Development,
• Marketing and accounting,
• Risk analysis
**(Hours:12)**.

**Unit 4** – Management
• Company's Organization Structure,
• Recruitment and management of talent.
• Financial organization and management
**(Hours:12)**.

**Unit 5** - Financing and Protection of Ideas
• Financing methods available for start-ups in India
• Communication of Ideas to potential investors – Investor Pitch
• Patenting and Licenses
Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy
**(Hours:12)**.

## Outcome:

- This course imparts skill to students to apply this knowledge to develop its own Bussiness.

## SUGGESTED LEARNING RESOURCES:

1. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company Steve Blank and Bob Dorf K & S Ranch ISBN – 978-0984999392
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Eric Ries Penguin UK ISBN – 978-0670921607
3. Demand: Creating What People Love Before They Know They Want It Adrian J. Slywotzky
with Karl Weber Headline Book Publishing ISBN – 978-0755388974
4. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business Clayton M. Christensen Harvard business ISBN: 978-142219602

## Semester VI/ Year III

## DCE 66 PROJECT-II

**Learning Hrs/Week :**

**Objective:**

- To impart understanding and develop skill toward practical project development

**Outcome:**

- This course imparts skill to students to apply this knowledge on engineering applications.

**Semester VI/ Year III**

**DCE 67 Seminar**

## Semester VI/ Year III

## DCE 68 Evaluation of Internship-II

**Learning Hrs/Week :**

**Objective:**

- To impart hands on practical training towards Civil engineering construction

**Outcome:**

- This course imparts skill to students to apply this knowledge on engineering applications.

## Semester VI/ Year III

## DCE 69 Constitution of India

Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom andAmerica.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India have played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic

contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in theworld".

Historic revolutions in france england america and particularly european renaissance and india and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world". reformation movement have resuleted into progressive legal reform in the form of "constitutionalism" in many countries. theconstitutionofindiawasmadebyborrowingmodelsandprinciplesfrommanycountries including united kingdom and america.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basicideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of Course content

1. Meaning of the constitution lawandconstitutionalism
2. Historical perspective of the Constitution ofIndia
3. Salient features and characteristics of the Constitution ofIndia
4. Scheme of thefundamentalrights
5. The scheme of the Fundamental Duties and its legalstatus
6. The Directive Principles of State Policy – Its importanceandimplementation
7. Federal structure and distribution of legislative and financial powers betwee the Union and theStates
8. Parliamentary Form of Government in India – The

constitution powers and status of the PresidentofIndia

9. Amendment of the Constitutional Powers andProcedure
10. The historical perspectives of the constitutional amendments inIndia
11. Emergency Provisions : National Emergency, President Rule, FinancialEmergency
12. Local Self Government – Constitutional Scheme inIndia
13. Scheme of the Fundamental RighttoEquality
14. Scheme of the Fundamental Right to certain Freedom under Article19
15. Scope of the Right to Life and Personal Liberty under Article21.