Fourth Semester

CONCRETE TECHNOLOGY (DCE-401)

Discipline core (DC) : Credit 4(3-0-2)

Objective: Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

COURSE OUTLINE: (03 periods)

1. Introduction: Definition of concrete, uses of concrete in comparison to other building materials.
2. Ingredients of Concrete: (07 periods) 2.1 Cement: physical properties of cement; different types of cement as per IS Codes

2.2 Aggregates:

2.2.1 Classification of aggregates according to size and shape

2.2.2 Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials, soundness

2.2.3 Grading of aggregates: coarse aggregate, fine aggregate; All-in- aggregate; fineness modulus; interpretation of grading charts

2.3 Water: Quality requirements as per IS:456-2000

3. Water Cement Ratio: (03 periods) 3.1 Hydration of cement, principle of water-cement ratio, Duff Abram‟s Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete
4. Workability: (08 periods) 4.1 Workability factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consistometer; Recommended slumps for placement in various conditions
5. Properties of Concrete: (09 periods) 5.1 Properties in plastic state: Workability, Segregation, Bleeding and Harshness 5.2 Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes.
6. Proportioning for Normal Concrete: (05 periods) 6.1 Objectives of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456-2000

6.2 Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability

6.3 Difference between nominal and controlled concrete

6.4. Introduction to IS-10262-2009-Code for controlled mix design

7. Introduction to Admixtures for improving performance of concrete (04 periods)
8. Special Concretes (only features) (07 periods) 8.1 Concreting under special conditions, difficulties and precautions before, during and after concreting

8.1.1 Cold weather concreting

8.1.2 Under water concreting
8.1.3 Hot weather concreting
8.2 Ready mix concrete
8.3 Fiber reinforced concrete
8.4 Polymer Concrete
8.5 Fly ash concrete
8.6 Silica fume concrete
9. Concreting Operations: (16 periods) 9.1 Storing of Cement:
9.1.1 Storing of cement in a warehouse
9.1.2 Storing of cement at site
9.1.3 Effect of storage on strength of cement
9.1.4 Determination of warehouse capacity for storage of Cement
9.2 Storing of Aggregate: Storing of aggregate at site
9.3 Batching (to be shown during site visit)
9.3.1 Batching of Cement
9.3.2 Batching of aggregate by:
9.3.2.1 Volume, using gauge box (farma) selection of proper gauge box
9.3.2.2 Weight spring balances and batching machines
9.3.3 Measurement of water
9.4 Mixing:
9.4.1 Hand mixing
9.4.2 Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers
9.4.3 Maintenance and care of machines
9.5 Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.
9.6 Placement of concrete: Checking of form work, shuttering and precautions to be taken during placement
9.7 Compaction:
9.7.1 Hand compaction
9.7.2 Machine compaction - types of vibrators, internal screed vibrators and form vibrators

PRACTICAL EXERCISES:

i) To determine the physical properties of cement as per IS Codes
ii) To determine flakiness and elongation index of coarse aggregates
iii) To determine silt in fine aggregate
iv) Determination of specific gravity and water absorption of aggregates
v) Determination of bulk density and voids of aggregates
vi)To determine surface moisture in fine aggregate by displacement method
vii) Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
viii) To determine necessary adjustment for bulking of fine aggregate

ix) To determine workability by slump test:

x) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump

xi) Compaction factor test for workability

xii) Non destructive test on concrete by: a)Rebound Hammer Test b)Ultrasonic Pulse Velocity Test

xiii) Tests for compressive strength of concrete cubes for different grades of concrete

RECOMMENDED BOOKS

i) Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi

ii) Krishnamurthy, KT; Rao, A Kasundra and Khandekar, AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi

SOIL AND FOUNDATION ENGINEERING (DCE-402)

Discipline core (DC) : Credit 4(3-0-2)

Objective: Civil Engineering diploma engineers are required to supervise the construction of structural buildings, roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties

COURSE OUTLINE:

1. Introduction: (03 periods)

1.1 Importance of soil studies in Civil Engineering

1.2 Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in J&K, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.

1.3 Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils: (04 periods) 2.1 Constituents of soil and representation by a phase diagram

2.2 Definitions of void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them

2.3 Simple numerical problems with the help of phase diagrams

3. Classification and Identification of Soils (04 periods)

3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils

3.2 Gradation and its influence on engineering properties
3.3 Relative density and its use in describing cohesionless soils
3.4 Behaviour of cohesive soils with change in water content, Atterberg‟s limit - definitions, use and practical significance
3.5 Field identification tests for soils
3.6 Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil
4. Flow of Water Through Soils: (04 periods) 4.1 Concept of permeability and its importance
4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability 4.3 Comparison of permeability of different soils as per BIS
4.4 Measurement of permeability in the laboratory
5. Effective Stress: (Concept only) (04 periods) 5.1 Stresses in subsoil
5.2 Definition and meaning of total stress, effective stress and neutral stress
5.3 Principle of effective stress
5.4 Importance of effective stress in engineering problems
6. Deformation of Soils (04 periods) 6.1 Meaning, conditions/situations of occurrence with emphasis on practical significance of: a) Consolidation and settlement b) Creep c) Plastic flow d) Heaving e) Lateral movement f) Freeze and thaw of soil
6.2 Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
6.3 Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects
6.4 Settlement due to construction operations and lowering of water table
6.5 Tolerable settlement for different structures as per BIS
7. Shear Strength Characteristics of Soils: (09 periods) 7.1. Concept and Significance of shear strength
7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law
7.3 Examples of shear failure in soils
8. Compaction: (04 periods) 8.1 Definition and necessity of compaction
8.2 Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts
8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction
9. Soil Exploration: (08 periods) 9.1 Purpose and necessity of soil exploration
9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)
9.3 Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.
9.4 Presentation of soil investigation results

PRACTICAL EXERCISES

1. To determine the moisture content of a given sample of soil

2. Auger Boring and Standard Penetration Test

a) Identifying the equipment and accessories

b) Conducting boring and SPT at a given location

c) Collecting soil samples and their identification

d) Preparation of boring log and SPT graphs e)Interpretation of test results

3. Extraction of Disturbed and Undisturbed Samples

a) Extracting a block sample

b) Extracting a tube sample

c) Extracting a disturbed samples for mechanical analysis.

d) Field identification of samples

4. Field Density Measurement (Sand Replacement and Core Cutter Method)

a) Calibration of sand

b) Conducting field density test at a given location

c) Determination of water content

d) Computation and interpretation of results

5. Liquid Limit and Plastic Limit Determination:

a) Identifying various grooving tools

b) Preparation of sample

c) Conducting the test

d) Observing soil behaviour during tests

e) Computation, plotting and interpretation of results

6. Mechanical Analysis

a) Preparation of sample

b) Conducting sieve analysis

c) Computation of results

d) Plotting the grain size distribution curve

e) Interpretation of the curve

7. Laboratory Compaction Tests (Standard Proctor Test)

a) Preparation of sample

b) Conducting the test

c) Observing soil behaviour during test

d) Computation of results and plotting

e) Determination of optimum moisture content and maximum dry density

8. Demonstration of Unconfined Compression Test

a) Specimen preparation

b) Conducting the test

c) Plotting the graph

d) Interpretation of results and finding/bearing capacity

9. Demonstration of:

a) Direct Shear and Vane Shear Test on sandy soil samples

b) Permeability test apparatus

RECOMMENDED BOOKS

1. Punmia, BC, "Soil Mechanics and Foundations"; Standard Publishers, Delhi
2. Bharat Singh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee

WATER SUPPLY AND WASTE WATER ENGINEERING (DCE-403)

Discipline core (DC): Credit 4(3-0-2)

Objective: One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems.

COURSE OUTLINE:

A. WATER SUPPLY

1. Introduction (02 periods)
1.1 Necessity and brief description of water supply system.
2. Quantity of Water (06 periods)
2.1 Water requirement
2.2 Rate of demand and variation in rate of demand
2.3 Per capita consumption for domestic, industrial, public and fire-fighting uses as per BIS standards (no numerical problems)
2.4 Population Forecasting
3. Quality of Water (04 periods) 3.1 Meaning of pure water and methods of analysis of water
3.2 Physical, Chemical and bacteriological tests and their significance
3.3 Standard of potable water as per Indian Standard
3.4 Maintenance of purity of water (small scale and large scale quantity)
4. Water Treatment (brief introduction) (09 periods) 4.1 Sedimentation - purpose, types of sedimentation tanks
4.2 Coagulation floculation - usual coagulation and their feeding
4.3 Filtration - significance, types of filters, their suitability
4.4 Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.
4.5 Flow diagram of different treatment units, functions of (i) Areation fountain (ii) mixer (iii) floculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

5. Conveyance of Water (09 periods) 5.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.

5.2 Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses

5.3 Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes

5.3.1 Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories.

5.3.2 Wastage of water - preventive measures

5.3.3 Maintenance of distribution system

5.3.4 Leakage detection

6. Laying out Pipes (06 periods) 6.1 Setting out alignment of pipes

6.2 Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil.

6.3 Handling, lowering beginning and jointing of pipes

6.4 Testing of pipe lines

6.5 Back filling

6.6 Use of boring rods

7. Building Water Supply (02 periods) 7.1 Connections to water main (practical aspect only)

7.2 Water supply fixtures and installations and terminology related to plumbing

B. WASTE WATER ENGINEERING

8. Introduction (04 periods) 8.1 Purpose of sanitation

8.2 Necessity of systematic collection and disposal of waste

8.3 Definition of terms in sanitary engineering

8.4 Collection and conveyance of sewage

8.5 Conservancy and water carriage systems, their advantages and Disadvantages

8.6 (a) Surface drains (only sketches) : various types, suitability (b) Types of sewage: Domestic, industrial, storm water and its seasonal variation

9. Sewerage System (05 periods) 9.1 Types of sewerage systems, materials for sewers, their sizes and joints

9.2 Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

LIST OF PRACTICALS

1) To determine turbidity of water sample

2) To determine dissolved oxygen of given sample

3) To determine pH value of water

4) To perform jar test for coagulation

5) To determine BOD of given sample

6) To determine residual chlorine in water

7) To determine conductivity of water and total dissolved solids

8) To study the installation of following: a)Water meter b)Connection of water supply of building with main c)Pipe valves and bends d)Water supply and sanitary fittings

9) To determine Bacteriological Quality of Drinking Water

10) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I. pipes and PVC pipes.

11) To demonstrate the laying of SW pipes for sewers

12) Study of water purifying process by visiting a field lab.

13) To test house drainage 14)To determine TDS by TDS meter.

RECOMMENDED BOOKS

1. Duggal, KN; "Elements of Public Health Engineering";, S. Chand and Co. New Delhi

2. Rangwala, SC; "Water Supply and Sanitary Engineering"; Anand Charotar Book Stall

IRRIGATION ENGINEERING (DCE-404)

Discipline core (DC): Credit 3(3-0-0)

Objective: Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation

COURSE OUTLINE:

1. Introduction: (02 periods) 1.1 Definition of irrigation

1.2 Necessity of irrigation

1.3 History of development of irrigation in India

1.4 Major, medium and minor irrigation projects

2. Water Requirement of Crops (06 periods)

2.1 Principal crops in India and their water requirements

2.2 Crop seasons – Kharif and Rabi

2.3 Soil water, soil crop and water relationships, duty, delta and base period, their relationship and evapotranspiration

3. Hydrological Cycle, Catchment Area and Run-off (06 periods) Rainfall , definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall

4. Methods of Irrigation (07 periods) 4.1 Flow irrigation - its advantages and limitations
4.2 Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages
4.3 Sprinkler irrigation conditions favorable and essential requirements for sprinkler irrigation, sprinkler system
5. Canals (08 periods) 5.1 Classification, appurtenance of a canal and their functions, sketches of different canal cross-sections (unlined)
5.2 Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal x-sections
5.3 Breaches and their control
6. Tube Well Irrigation (09 periods) 6.1 Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation
6.2 Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well
6.3 Types of tube wells, cavity, strainer and slotted type;
6.4 Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance
6.5 Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface.
7. Dams (07 periods) 7.1 Classification of dams; earthen dams - types, causes of failure; cross-section of zoned earthen dams, method of construction, gravity dams – types, cross-sections of a dam, method of construction
7.2 Concept of small and micro dams
7.3 Concept of spillways and energy dissipaters
8. Canal Head Works and Regulatory Works (06 periods) Definition, object, general layout, functions of different parts of head works. Difference between weir and barrage
10. Definitions of following Hydraulic Structures with Sketches (02 periods) 10.1 Falls
10.2 Cross and head regulators
10.3 Outlets
10.4 Canal Escapes
11. River Training Works (04 periods) Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off
12. Water Logging and Drainage (03 periods)
12.1 Definition of water logging – its causes and effects, detection, prevention and remedies
12.2 Reclamation of soil
12.3 Surface and sub-surface drains and their layout

RECOMMENDED BOOKS

1. Bharat Singh, `Fundamentals of Irrigation Engineering', Nem Chand and Bros, Roorkee

2. Garg, Santosh Kumar, `Irrigation Engineering and Hydraulics Structures', Khanna Publishers, Delhi

SURVEYING – II (DCE-405)

Discipline core (DC): Credit 4(3-0-2)

Objective: The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying; tachometry surveying, curves and use of minor and modern instruments have been included in this subject.

COURSE OUTLINE:

1. Contouring: (08 periods) Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map
2. Theodolite Surveying: (12 periods) Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal and vertical angles. Prolonging a line (forward and backward) measurement of bearing of a line; traversing by included angles and deflection angle method; traversing by stadia measurement, theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Height of objects – accessible and non-accessible bases
3. Tacho-metric surveying (06 periods) Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry
4. Curves: (15 periods)

4.1 Simple Circular Curve: Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve: a) By linear measurements only: - Offsets from the tangent -

Successive bisection of arcs - Offsets from the chord produced b) By tangential angles using a theodolite

4.2 Transition Curve: Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets

4.3 Vertical curve Setting out of a vertical curve

5. Introduction to the use of Modern Surveying equipment and techniques such as: (03 periods)

a) EDM or Distomat b) Total station

c) Introduction to remote sensing and GPS

6 Minor Instruments:- (04 periods)

6.1. Introduction and use of minor instruments like Ceylon Ghat Tracer,
Clinometer, Pantograph, Abney Level etc.

6.2. Use of plan meter for computing areas

PRACTICAL EXERCISES

I.Contouring:

i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer

ii) Preparing a contour plan by method of squares

iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

II. Theodolite:

i) Taking out the Theodolite, mounting on the tripod and placing it back in the box

ii) Study of a transit vernier theodolite; temporary adjustments of theodolite

iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods

iv)Measurement of vertical angles and use of tachometric tables

v) Measurement of magnetic bearing of a line

vi) Running a closed traverse with a theodolite (at least five sides) and its plotting vii)Height of objects with and without accessible bases

III. Curves

i) Setting out of a simple circular curve with given data by the following methods a)Offsets from the chords produced b)One theodolite method

ii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

II. Theodolite:

i) Taking out the Theodolite, mounting on the tripod and placing it back in the box

ii) Study of a transit vernier theodolite; temporary adjustments of theodolite

iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods

iv) Measurement of vertical angles and use of tachometric tables

v) Measurement of magnetic bearing of a line

vi) Running a closed traverse with a theodolite (at least five sides) and its plotting

vii) Height of objects with and without accessible bases

III. Curvesi) Setting out of a simple circular curve with given data by the following methods

a)Offsets from the chords produced b)One theodolite method

IV Minor instruments:

i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantograph, Abney level etc.

ii) Use of planimeter for computing areas VDemonstration of digital instruments through field visits to Survey of India and other government agencies.

VI Total Station (only demonstrations)

RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delhi

2. Deshpande, RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,

Structural Mechanics (DCE-406)

Discipline core (DC) : Credit 4(3-0-2)

Objective: Diploma holders in this course are required to analyses reasons for failure of different components and select the material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. Hence this subject has been introduced.

COURSE OUTLINE:

1. Introduction to Material Properties 03 Period

Mechanical properties of materials such as elasticity, plasticity, ductility, brittleness, toughness, hardness, fatigue, malleability, stiffness. Elastic bodies, plastic bodies and rigid bodies, deformation.

2. Stresses and Strains 08 Period

2.1 Force, its definition and types, units, different types of loads.

2.2 Definition of stress and strain, axial loading, different types of stresses and strains, tensile and compressive stress and strain, elastic limit, Hooke's law, stress-strain curve for ductile and brittle material, salient features of stress-strain curve. Young's modulus of elasticity

2.3 Factor of safety.

2.4 Stress and strain in straight, stepped bars and taper bar of circular cross section, determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only

2.5 Stress and strain on composite section under axial loading, stress and strain due to temperature variations in homogeneous and composite bars.

2.6 Shear load, shear stress and strain, modulus of rigidity, lateral strain, Poisson's ratio

2.7 Volumetric strain, bulk modulus. Relation between modulus of elasticity, modulus of rigidity and bulk modulus

3. Shear Force and Bending Moment 06 Period

3.1 Types of beams.

3.2 Concept of shear force and bending momen.

3.3 Shear force and bending moment diagram for cantilever and simply supported beams subjected to point load and uniformly distributed loads only. Maximum bending moment and point of contraflexure.

4. Theory of Simple Bending 06 Period

4.1 Concept of pure bending, neutral axis, moment of resistance, section Modulus, bending equation, bending of simple, beams of uniform strength.

4.2 Application of flexural formula for solid rectangular and circular section, Channel section, hollow rectangular and circular section.

5. Strain Energy 06 Period

5.1 Concept of strain energy, proof resilience and modulus of resilience.

5.2 Stresses developed due to gradual, sudden and impact load.

5.3 Strain energy stored due to gradual, sudden and impact load.

5.4 Strain energy due to bending and torsion.

6. Slope and Deflection 06 Period

6.1 Introduction, determination of slope and deflection by Macaulay's method, moment area of method

6.2 Simple cases of slope and deflection in simply supported beam with uniformly distributed load on whole of the length and a point load at the centre

6.3 Cantilever beam with uniformly distributed load on whole length and a point load at the end.

7. Torsion 05 Period

7.1 Pure torsion, torsion equation (relation between twisting moment, shear stress and angle of twist), polar modulus of section

7.2 Assumptions in theory of pure torsion

7.3 Strength of circular solid shaft and hollow shaft in pure torsion

7.4 Power transmitted by shaft

8. Springs 05 Period

8.1 Effect of falling load helical spring

8.2 Helical Springs closed coiled and open coiled helical springs subjected to axial load

8.3 Angle of twist, strain energy, shear stress and maximum deflection under axial load

8.4 Laminated spring (semi-elliptical and quarter-elliptical type), deterination of number of plates, maximum deflection under axial load

9. Thin Cylinder and spheres 07 Period

9.1 Introduction

9.2 Thin cylinder Vessel Subjected to internal Pressure

9.3 Stresses in a Thin cylinder Vessel Subjected to internal Pressure

9.4 Expression for circumferential stresses

9.5 Expression for longitudinal stresses

9.6 Stresses in a Thin cylinder Vessel Subjected to internal Pressure and external pressure

9.7 Stresses in a thin sphere shells subjected to internal Pressure

10. Riveted Joints 06 Period

10.1 Introduction

10.2 Types of rivets joints

10.3 Failure of riveted joints

10.4 Strength of the riveted joints

10.5Efficiency of riveted joints

LIST OF PRACTICALS

1. Tensile test on bars of mild steel and aluminum
2. Shear test on specimen of two different metals
3. Impact test on metals (a) Izod test (b) Charpy test
4. Torsion test on specimens of different metals for determining the angle of twist for a given torque
5. To determine the stiffness of a helical spring and to plot a graph between load and extension
6. Hardness test on metal and finding the Rockwell hardness

RECOMMENDED BOOKS

1. Strength of Materials by Srivatava & Gope, PHI Publication.
1. Strength of Materials by R.S. Khurmi; S. Chand and Company, Delhi.
2. Strength of Materials by S. Ramamurtham; Dhanpat Rai Publishing Co.(P) Limited, Delhi.

PHE & IRRIGATION ENGINEERING DRAWING (DCE-407)

Discipline core (DC) : Credit 2(0-0-4)

Objective: Diploma holders in Civil Engineering are expected to supervise construction of water supply and wastewater treatment works and irrigation structures. This subject aims at imparting skills for preparing water supply and waste water and irrigation engineering drawings to develop competencies for reading the drawings, and their execution in their field

COURSE OUTLINE:

A) WATER SUPPLY AND WASTE WATER ENGINEERING DRAWING

1. Drains and Sewers Cross section of standard types of open drains (circular, v-shaped and h-shaped) with their foundations Cross section of earthen ware and RCC sewer pipes Cross sections of masonry sewers (circular and egg shaped)
2. Traps, manholes and inspection chamber Detailed section of floor trap and gully trap Detailed plan and section of an inspection chamber Detailed plan and section of a manhole

3. Septic Tank and Soak Pit Detailed plan and cross sections of a domestic septic tank with soak pit for 25 users

4. Bath room and W.C connections:

4.1 Cross-section through the external wall of lavatories at ground and first floor showing the one and two pipe system and the connections of the lavatory to inspection chamber

4.2. Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers

5. Draw sectional elevation of a two strayed building showing details of one pipe and two pipes systems with sanitation system.

6. Practice of reading water supply and sanitary engineering working drawings (PWD/urban Development agencies) including hot water and cold water supply system of a two room set.

B) IRRIGATION ENGINEERING DRAWING:

1. Typical cross-section of a channel

- L-section of a channel for given data

- Typical cross section of an unlined and lined channel in cutting, partly cutting and partly filling and fully in filling with given design data.

2. Layout plan of a canal head works.

3. Draw the typical L-section of a weir

4. Draw the X-section of an Earthen Dam

i) Homogeneous

ii) Zoned type

iii) Diaphragm type

5. Cross section of a tube well

6 Layout and cross section of rain water harvesting system.

RECOMMENDED BOOKS

1. Layal JS “Civil Engineering Drawing”, Satya Parkashan, New Delhi

2. Chandel RP “ Civil Engineering Drawings”