



Course Curriculum

Session – 2023- 2024

Three Year Diploma Course

In

Civil Engineering

UNIVERSITY POLYTECHNIC

GLA UNIVERSITY POLYTECHNIC
COURSE STRUCTURE, CONTACT HOURS and CREDITS

DISCIPLINE: CIVIL ENGG.
YEAR : II (FULL-TIME)

SEMESTER : III (FULL-TIME)

Sr. No.	Subject Code	Subject Name	Periods Per Week			Cr
			L	T	P/D	
1	DCE 3101	Fluid Mechanics	3	0	0	3
2	DCE 3002	Structural Mechanics	3	1	0	4
3	DCE 3003	Surveying – I	2	0	0	2
4	DCE 3104	Building Materials & Construction	3	0	0	3
6	DCE 3081	Civil Engineering Drawing Lab – I	0	0	4	2
7	DCE 3182	Fluid Mechanics Lab	0	1	2	2
8	DCE 3083	Structural Mechanics Lab	0	0	2	1
9	DCE 3184	Surveying Lab - I	0	1	4	3
10	DCE 3085	Building Materials & Construction Lab	0	0	2	1
11	DCE 3095	Soft Skills-I	0	0	2	1
TOTAL			11	3	16	22

L- Lecture Period, **T-**Tutorial Period, **P-** Practical Period, **D-** Drawing Practice Period, **Cr.** Credits,

GLA UNIVERSITY POLYTECHNIC
COURSE STRUCTURE, CONTACT HOURS and CREDITS

DISCIPLINE: CIVIL ENGG.

YEAR : II (FULL-TIME)

SEMESTER : IV (FULL-TIME)

Sr. No.	Subject Code	Subject Name	Periods Per Week			Cr
			L	T	P/D	
1	DCE 4001	Concrete Technology	3	0	0	3
2	DCE 4102	Water Supply & Waste Water Engineering	3	0	0	3
4	DCE 4004	Surveying – II	2	0	0	2
5	DCE 4105	Design of Reinforced Concrete Structures	3	1	0	4
6	DCE 4081	Civil Engineering Drawing Lab – II	0	0	6	3
7	DCE 4082	Concrete Technology Lab	0	0	2	1
8	DCE 4083	Water Supply And Waste Water Engineering Lab	0	0	2	1
9	DCE 4184	Surveying Lab-II	0	1	6	4
10	DCE 4195	Soft Skills-II	0	0	2	1
TOTAL			12	2	18	22

L- Lecture Period, T-Tutorial Period, P- Practical Period, D- Drawing Practice Period, Cr. Credits,

GLA UNIVERSITY POLYTECHNIC
COURSE STRUCTURE, CONTACT HOURS and CREDITS

DISCIPLINE : CIVIL ENGG.
YEAR : III (FULL-TIME)

SEMESTER : V (FULL-TIME)

Sr. No.	Subject Code	Subject Name	Periods Per Week			Cr
			L	T	P/D	
1	DCE 5101	Estimation & Costing	3	0	0	3
2	DCE 5102	Transportation Engineering-I	3	0	0	3
3	DCE 5103	Soil Mechanics	3	0	0	3
4	DCE 5104	Earthquake engineering	3	0	0	3
5	DCE 5181	Structural Drawing Lab.	0	1	4	3
6	DCE 5182	Transportation Engineering Lab	0	0	2	1
7	DCE 5183	Soil Mechanics Lab.	0	1	2	2
8	DCE 5084	Cad Lab I	0	0	4	2
9	DCE 5085	Seminar	0	0	2	1
10	DCE 5186	Project-I	0	0	2	1
TOTAL			12	2	16	22

L- Lecture Period, **T-**Tutorial Period, **P-** Practical Period, **D-** Drawing Practice Period, **Cr.** Credits,

* Survey camp to be held in 5th sem and of 7 day.

GLA UNIVERSITY POLYTECHNIC
COURSE STRUCTURE, CONTACT HOURS and CREDITS

DISCIPLINE : CIVIL ENGG.
YEAR : III (FULL-TIME)

SEMESTER : VI (FULL-TIME)

Sr. No.	Subject Code	Subject Name	Periods Per Week			Cr
			L	T	P/D	
1	DCE 6101	Design of Steel Structures	3	0	0	3
2	DCE 6102	Transportation Engineering II	3	0	0	3
3	DCE 6103	Irrigation Engineering	3	0	0	3
4	DCE 6104	Construction Management and accounts	3	0	0	3
5	DCE 6181	Survey lab III	0	1	4	3
6	DCE 6182	Project - II	0	0	8	4
7	DCE 6083	Cad Lab-II	0	0	4	2
8	DCE 6095	Soft Skills-III	0	0	2	1
TOTAL			12	1	18	22

L- Lecture Period, T-Tutorial Period, P- Practical Period, D- Drawing Practice Period, Cr. Credits,

Elective

- DCE 6104– Construction Management and accounts**
- DCE 6105- Repair and maintenance of Building

DCE 3101: FLUID MECHANICS

Introduction: Fluid mechanics is the branch of continuous mechanics which deals with the relationship between forces, motion, statically conditions in a continuous material.

Objective: To understand the properties of fluids and fluid statics. & analyze laminar and turbulent flows.

Credits: 3

Semester III

L-T-P: 3-0-0

Module No.	Contents	Teaching Hours
I	<p>Introduction: Ideal and real fluids, fluid mechanics, Hydrostatics, Hydrodynamics, Hydraulics.</p> <p>Properties of Fluid: Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion and, capillarity, vapour pressure. Units of measurement and their conversion, compressibility.</p> <p>Hydrostatic Pressure: Pressure, intensity of pressure, pressure head, Pascal's law and its applications. Total pressure, resultant pressure, and center of pressure. Total pressure and center of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular.</p> <p>Buoyancy: Buoyancy, metacentre, stability of floating body.</p> <p>Measurement of Pressure: Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. Piezometer, simple manometer and differential manometer.</p>	18
II	<p>Fundamentals of Fluid Flow: Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Discharge and continuity equation (flow equation). Types of hydraulic energy: Potential energy, kinetic energy, pressure energy. Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems.</p> <p>Flow Measurement: Venturimeter and mouthpiece, Pitot tube, Orifice and Orifice meter, Current meters, Notches and weirs.</p> <p>Flow in Pipes: Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment, Critical velocity and velocity distributions in a pipe for laminar flow, Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction, Hydraulic gradient line and total energy line, Flow from one reservoir to another through a long pipe of uniform cross section, Pipes in series and parallel, Water hammer phenomenon and its effects</p> <p>Flow through open channels: Definition of an open channel, uniform flow and non-uniform flow, Estimation of Discharge using Chezy's and Manning's formula, Most economical channel sections (rectangular and trapezoidal, Head loss in open channel due to friction.</p> <p>Hydraulic Pumps: Hydraulic pump, reciprocating pump, centrifugal pumps</p>	18

Reference Books/ Text Books / Case Studies:

- ❖ Asawa, G.L. (2009), Fluid Flow in Pipes and Channels, CBS Publishers and Distributors, New Delhi.
- ❖ Gupta, V. and Gupta, S.K. (1984), Fluid Mechanics and its Applications, New Age International (P) Limited, Publishers, New Delhi.
- ❖ Massey, B.S. (revised by John Ward-Smith) (1998), Mechanics of Fluids, Chennai Micro Print Pvt. Ltd., Chennai.
- ❖ Streeter, V.L., Wylie, E.B., and Bedford, K.W. (1998), Fluid Mechanics, McGrawHill Companies, Singapore.

Intended Outcome: After completion of the course students will be able to-

- ❖ Determine the properties of fluid and pressure and their measurement.
- ❖ Compute force on immersed planes.
- ❖ Compute the frictional loss in laminar and turbulent flow.
- ❖ Applying continuity equation and energy equation in solving problems on flow through conduits

DCE 3002: STRUCTURAL MECHANICS

Introduction: Structural mechanics is the computation of deformation, deflection and internal forces and stresses with in structure.

Objective: To learn about the concepts of stress, strain and deformation of solid and state of stresses.

Credits: 4

Semester III

L-T-P: 3-1-0

Module No.	Contents	Teaching Hours
I	<p>Properties of Materials : Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials, Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.</p> <p>Simple Stresses and Strains: Concept of stress, normal and shear stresses, Concept of strain and deformation, longitudinal and transverse strain, Poisson's ratio, volumetric strain, Hooke's law, modulus of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants. Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars (two or three) due to axial load, Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety, Temperature stresses and strains.</p> <p>Shear Force and Bending Moment: Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hanged, cantilever and continuous beams, Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc.) and types of loading (point, uniformly distributed and uniformly varying loads, Concept of bending moment and shear force, sign conventions, Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed, Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contra-flexure.</p>	18
II	<p>Bending in Beams: Concept of pure/simple bending, Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T sections only, Moment of resistance, Calculation of bending stresses in simply supported beam.</p> <p>Shear Stress in Beams: Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T section</p> <p>Combined Direct and Bending Stresses: Concentric and eccentric loads single axis eccentricity only, Effect of eccentric load on the section stresses due to eccentric loads, Numerical in the case of short columns.</p> <p>Slope and Deflection: Necessity for determination of slope and deflection, Moment area theorem.</p> <p>Columns and Struts: Combined bending and direct load on short column, Middle third and middle quarter rules, Euler's theory for long columns.</p> <p>Analysis of Truss: Concepts of a perfect, redundant and deficient frames, Assumptions and analysis of truss by method of joints, method of sections, graphical method.</p>	18

Reference Books/ Text Book / Cases:

- ❖ Pytel, A. and Kiusalaas, J. (2003), Mechanics of Materials, Cengage Learning, New Delhi.
- ❖ Ryder, G.H.(2002), Strength of Materials, Macmillan India Limited, New Delhi.
- ❖ Gere, J.M. and Timoshenko, S.P.(2004), Mechanics of Materials, CBS Publishers, New Delhi.
- ❖ Hibbeler, R.C. (2007), Mechanics of Materials, Pearson Education Limited, New Delhi.
- ❖ Merriman, M. (2010), Mechanics of Materials, John Wiley and Sons, New York, USA.
- ❖ Singh, J.P. (2000), A Textbook of Mechanics of Solids, Khanna Publishers, New Delhi.
- ❖ R.S Khurmi., "Strength of Materials", Dhanpat Rai and Sons., New Delhi.
- ❖ R.S Rajput., "Strength of Materials", Standard Publishers, Delhi.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Determine the strength parameter of material
- ❖ Determine shear force and bending moment
- ❖ Apply various methods of analysis of plane truss
- ❖ Analyze member subjected to torsion.

DCE 3003: SURVEYING – I

Introduction: To have ability to apply knowledge of mathematics science and engineering to understand the measurement techniques used in land surveying.

Objective: To understand the importance of surveying in the field of civil engineering and to study the basics of linear/angular measurements.

Credits: 2

Semester III

L-T-P: 2-0-0

Module No.	Contents	Teaching Hours
I	<p>Introduction: Basic concepts of surveying -objectives, Types of surveying, Unit of measurement and their types, Instruments used for taking these measurements, classification based on surveying instruments</p> <p>Chain Surveying: Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages, Obstacles in chain surveying, Direct and indirect ranging offsets and recording of field notes, Errors in chain surveying and their corrections</p> <p>Compass Surveying: Type of compass and their setting and use, Concept of direction (magnetic and true meridian), Bearing (Whole Circle bearing and Reduced Bearing), azimuths, magnetic dip and declination, Compass surveying, Local attraction- causes, detection, error and corrections.</p>	12
II	<p>Leveling: Leveling principles, Basic terms and definitions, Leveling instruments their working, advantages and disadvantages, Types of leveling staff, Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis, Temporary adjustment and permanent adjustment of dumpy level by two peg method, Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels, Level book and reduction of levels by Height of Instrument and Rise and Fall method, Arithmetic checks, problem on reduction of levels, fly leveling, check leveling and profile leveling (L-section and X-section), errors in leveling, permissible limits, reciprocal leveling, Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas.</p> <p>Plane Table Surveying: Purpose of plane table surveying, equipment used in plane table survey, setting of plane table, methods of plane table surveying, concepts of three point problem two point problems, errors in plane table surveying and corrections or precautions, testing and adjustment of plane table alidade.</p>	12

Reference Books/ Text Books / Case Studies:

- ❖ Schofield, W. and Breach, M., Engineering Surveying, Butterworth-Heinemann publisher (an imprint of Elsevier).
- ❖ Punmia, B.C., Jain, A.K., and Jain, A.K. (2005), Surveying and Levelling, Vol. 1 and 2, Standard Publishers, New Delhi.
- ❖ Duggal, S.K. (2009), Surveying, Vol. 1 and 2, Tata McGraw Hill Education Private Limited, Noida.
- ❖ Kanetkar, T.P. and Kulkarni, S.V. (2008), Surveying and Levelling, Vol. 1 and 2, Vidyarthi Griha Prakashan, Pune.
- ❖ Subramanian, R. (2007), Surveying and Levelling, Oxford University Press, New Delhi.
- ❖ Arora, K.R. (2010). Surveying, Vol. 1 and 2. Standard Book House, New Delhi.
- ❖ Ghilani, C.D. and Wolf, P.R. (2012). Elementary Surveying. Prentice Hall.
- ❖ Venkatramaiah, C. (2011), Text Book of Surveying, University Press, Hyderabad.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Carry out preliminary surveying in the field of civil engineering applications such as structural and highway engineering.
- ❖ Plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse

DCE 3104: BUILDING MATERIALS & CONSTRUCTION

Introduction: To understand different type of building material like bricks, stone, timber.

Objective: Students will learn and utilize basic principle used in construction field

Credits: 3

Semester III

L-T-P: 3-0-0

Module No.	Contents	Teaching Hours
I	<p>Building Stones : Classification of Rocks-Geological classification, Chemical Classification, Physical classification, Characteristics of stones, Queering of stone, common building stone and their uses, Methods of preservation,</p> <p>Brick : Introduction to bricks, Raw materials ingredient of good brick earth and their function, Manufacturing of bricks, Types of kiln, classification and specification of bricks as per BIS:1077, Lab and field testing of bricks, defect in bricks, special brick, Hollow brick, fly ash brick, interlocking cement concrete brick, paving brick.</p> <p>Tiles: Building tile and their classification and relevant test performed.</p> <p>Cement : Introduction, raw materials, flow diagram of manufacturing of cement, Bogue’s compound, Various types of Cements, differences between OPC and PPC, Fly Ash introduction and function, Testing of cement.</p> <p>Lime: Classification and types of lime and properties of lime.</p> <p>Aggregate: Introduction, types of aggregate, use of aggregate, recycled aggregate.</p> <p>Timber: Trees, exogenous structure of timber, Classification & Identification of timber, Properties of timber, defects in timber, factors affecting strength of timber, method of seasoning & preservation of timber, common types of timber used in India for building construction.</p> <p>Metal: Ferrous Metals- Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS, Commercial forms of ferrous, metals, Aluminum and Stainless Steel.</p> <p>Introduction: Definition of a building, classification of buildings based on occupancy, Different parts of a building.</p> <p>Paint: Glossary of technical terms, composition, types and uses of paint.</p> <p>Glass: Introduction and various classification of Glass used in construction.</p> <p>Plastic: Introduction , types of plastic used in construction, role of plastic in construction.</p> <p>Fiber : Introduction of fiber and its uses, carbon fiber</p> <p>Masonry: Brick Masonry- Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters, Bond – meaning and necessity; English, flemish bond and other types of bonds, Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), construction of stone masonry walls, Importance towards special care during execution of stone masonry work on dressing of stone, size and placing of bond and corner stones,</p>	18

	filling joints, proper packing of internal cavities of rubble masonry wall, raking of joints to receive finishes.	
II	<p>Arches and Lintels: Meaning and use of arches and lintels- Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoiers, Springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spindle, jambs, bearing, thickness of lintel, effective span, Arches- Types of Arches</p> <p>Damp Proofing and Water Proofing: Dampness and its ill effects on different material and civil engineering works.</p> <p>Floors: Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose, Types of floor finishes.</p> <p>Roofs: Types of roofs, concept of flat, pitched and arched roofs, Glossary of terms for pitched roofs - batten, eaves, fascia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts, False ceilings using gypsum, plaster boards, cellotex, fiber boards, Special emphasis on maintenance of slopes, overlaps of roofing materials, applicability and problems of wind ties, size of anchoring bolts</p> <p>Stairs: Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing, Classification of staircase on the basis of material – RCC, timber, steel, Aluminum, Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc., Various types of layout -straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair</p> <p>Surface Finishes: Introduction, mortar, types of mortar, defect of plastering, pointing and its type, hacking, grooving, bull point and chicken mass.</p> <p>Building Services: Introduction of sound and thermal insulation,</p>	18

Reference Books/ Text Books / Case Studies:

- ❖ Sharma, SK; and Mathur, GC; "Engineering Materials;" Delhi-Jalandhar, S. Chand and Co.
- ❖ Surendra Singh; "Engineering Materials;" New Delhi, Vikas Publishing House Pvt.
- ❖ Chowdhuri, N; "Engineering Materials;" Calcutta, Technical Publishers of India.
- ❖ Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
- ❖ Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.
- ❖ Rangwala, SC; "Building Construction"; Anand, Charotar Book Stall
- ❖ Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot

Intended outcomes: After completion of the course, students will be able to-

- ❖ Identify the properties of building material.
- ❖ Application of materials.

DCE 3081: CIVIL ENGINEERING DRAWINGS LAB-I

Object: To draw plan, elevation and section of load bearing and framed structure.

Credits: 2

Semester III

L-T-P: 0-0-4

List of Practical

Module No.	Contents	Teaching Hours
1	Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick plinth protection have to be shown in the drawing.	48
2	Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond	
3	Detailed drawing of basement, single wooden floor, double wooden floor.	
4	Elevation, sectional plan and sectional side elevation of flush door, glazed door, paneled door and window, Aluminum door and window with wire gauge shutter. Sketches of various joints of different members.	
5	Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.	
6	Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet	
7	Draw detailed plan, elevation and section of:	
8	a. Single flight R.C.C. stair case b. Dog legged wooden stair case	
9	Drawings of following floors of Cement concrete on ground and at first floor	
10	c. Conglomerate (Concrete Flooring) d. Bonded cement concrete flooring e. Terrazzo flooring f. Ceramic/vitrified tile flooring	
11	The heat/thermal insulation provisions. Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also. Draw atleast two drawings with CAD.	

Reference Books/ Text Books / Case Studies:

- ❖ Civil Engineering Drawing by RS Malik, Asia Publishing House
- ❖ Civil Engineering Drawing by V.B.Sikka. Katson Publishing, Ludhiana
- ❖ Civil Engineering Drawing by NS Kumar; IPH, New Delhi
- ❖ Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi
- ❖ Building Construction by Moorthy NRK
- ❖ Civil Engg Drawing by Layal
- ❖ Zaidi, SKA and Siddiqui, Suhail; Drawing and Design of Residential and Commercial Buildings, Standard Publishers and Distributors, Delhi.
- ❖ SP : 20
- ❖ National Building Code

Intended outcomes:

- ❖ Draw plan, elevation and section of various structures.

DCE 3182: FLUID MECHANICS LAB

Objective: To understand the flow measurement of pipe flow.

Credits: 2

Semester III

L-T-P: 0-1-2

List of Practical

Module No.	Contents	Teaching Hours
1	To verify Bernoulli's Theorem	24
2	To find out Venturimeter coefficient	
3	To determine coefficient of velocity (C_v), Coefficient of	
4	discharge (C_d)	
5	Coefficient of contraction (C_c) of an orifice and verify the relation	
6	between them	
6	To perform Reynolds's experiment	
	To verify loss of head in pipe flow due to	
	a. Sudden enlargement	
	b. Sudden contraction	
7	c. Sudden bend	
8	Demonstration of use of current meter and Pitot tube	
9	To determine coefficient of discharge of a rectangular	
10	notch/triangular notch.	
11	Determination of darcy' friction factor for a given pipe.	
12	Determination of Manning's constant or chezy's for given	
13	rectangular channel section.	
14	Study of a model of a Centrifugal pump.	
	Study of a model of a Reciprocating pump.	

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Measure discharge in pipes
- ❖ Determine the energy loss in conduits

DCE 3083: STRUCTURAL MECHANICS LAB

Objective: To determine the strength of material & modulus of elasticity.

Credits: 1

Semester III

L-T-P: 0-2

List of Practical

Module No.	Contents	Teaching Hours
1	To draw stress-strain curve for mild steel & HYSD brass & find out yield stress, ultimate stress, percentage of elongation using UTM.	24
2	Testing of HYSD Steel	
3	Determination of Young's modulus of elasticity for steel wire with searl's apparatus	
4	Determination of modulus of rupture of a concrete beam	
5	Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point	
6	Verification of forces in a framed structure.	
7	Determination of hardness of a metal plate by Rockwell hardness test machine	
8	Determination of modulus of rigidity of material by Torsion apparatus.	
9	To perform Impact test on Impact testing machine.	

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Hardness of metal.
- ❖ Modulus of rigidity
- ❖ Impact value of material

DCE 3184: SURVEYING LAB-I

Objective: To perform chain survey, compass survey and plane table survey.

Credits: 3

Semester III

L-T-P: 0-1-4

List of Practical

Module No.	Contents	Teaching Hours
1	Chain surveying: a. Ranging a line, chaining a line and recording in the field book, Taking offsets - perpendicular and Oblique (with a tape only). b. Chaining of a line involving reciprocal ranging c. Chaining a line involving obstacles to ranging d. Chain Survey of a small area.	48
2	Compass Surveying : Study of prismatic compass, Setting the compass and taking observations, Measuring angles between the lines meeting at a point	
3	Levelling: a. Study of dumpy level and levelling staff, Temporary adjustments of various levels, Taking staff readings on different stations from the single setting and finding differences of level between them.	
4	b. To find out difference of level between two distant points by shifting the instrument c. Longitudinal and cross sectioning of a road/railway/canal d. Setting a gradient by dumpy and auto-level	
5	Plane Table Surveying: a. Study of the plane table survey equipment, setting the plane table, marking the North direction. b. Plotting stations by intersection, radiation and resection method after orientation by different Methods. c. Traversing an area with a plane table.	
	Layout of Buildings by use of surveying instruments.	

Intended Outcome: After completion of the course, students will be able to-

- ❖ Use conventional surveying tools such as chain, plane table, compass and level.
- ❖ Apply the procedure involved in the field work

DCE 3085: BUILDING MATERIALS & CONSTRUCTION LAB

Objective: To perform test on building materials such as compressive strength and sieve analysis.

Credits: 1

Semester III

L-T-P: 0-0-2

List of Practical

Module No.	Contents	Teaching Hours
	CONSTRUCTION MATERIALS LABORATORY	
1	To determine the crushing strength of bricks	
2	To determine the water absorption of bricks and efflorescence of bricks	
3	To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail	
4	To determine fineness (by sieve analysis) of cement	
5	To conduct field test of cement.	
6	To determine initial and final setting times of cement	
7	To determine compressive strength of cement	
	BUILDING CONSTRUCTION LABORATORY	
1	Demonstration of tools and plants used in building construction	
2	To prepare Layout of a building: two rooms building with front verandah	
3	To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns	
4	Demonstration of following items of work at construction site by: <ul style="list-style-type: none"> a. Timbering of excavated trenching b. Damp proof courses laying c. Construction of masonry walls d. Laying of flooring on an already prepared lime concrete base e. Plastering and pointing exercise f. Constructing RCC work g. Pre-construction and post construction termite treatment of building and woodwork 	24

Intended outcome: After completion of the course, students will be able to-

- ❖ Perform test on materials used in construction.
- ❖ Apply the various conditions and effects

DCE 4001: CONCRETE TECHNOLOGY

Introduction: To understand the properties of ingredients of concrete, concrete mix design and procedure in concreting.

Objective-: To make the students make the familiar about the behavior of concrete and its fresh and hardened state and also its uses.

Credits: 3

Semester IV

L-T-P: 3-0-0

Module No.	Contents	Teaching Hours
I	<p>Introduction-: Concrete- Definition and uses of concrete.</p> <p>Ingredients of concrete-: Cement- Physical properties of cement, Classification of Cement.</p> <p>Aggregates- Classification of aggregate according to origin, size, shape and surface texture. Characteristics of aggregate (size, shape, surface texture, specific gravity, bulk density, water absorption and bulking of sand), Grading of aggregate: coarse aggregate, Fine Aggregate and all in aggregate, Fineness modulus, interpretation of grading chart.</p> <p>Water- Quality requirements as per IS: 456-2000.</p> <p>Water cement ratio-: Hydration of cement, Principle of water cement ratio law, Duff Abram's water cement ratio law and its limitations.</p> <p>Properties of concrete-: Workability, factors affecting workability, measurement of workability (Slump test, Compaction factor test and vee- bee consistometer test). Harshness, segregation, bleeding, strength, dimensional changes, durability, impermeability, creep.</p> <p>Concrete mix proportions-: Nominal concrete mix, Design concrete mix (IS 456-2000 code method), various grade of concrete.</p> <p>Difference between nominal and controlled concrete, Introduction to IS 10262-2009 code for controlled mix design.</p>	18
II	<p>Admixtures-: Introduction to admixture, Classification of admixture and their applications.</p> <p>Special Concrete-: Difficulties and precautions during concreting under special conditions, Cold weathering concrete, Hot weathering concrete, ready mix concrete.</p> <p>Concreting Operations:</p> <p>Storing of Cement- In a warehouse at site. Effect of storage on strength of cement, Determination of warehouse capacity for storage of Cement. Storing of Aggregate- at site, Batching- Batching of Cement, Batching of aggregate by: Volume, using gauge box (farma)</p>	18

	<p>selection of proper gauge box, Weight spring balances and batching machines, Measurement of water. Mixing- Hand mixing, Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers, Maintenance and care of machines.</p> <p>Transportation of concrete- Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.</p> <p>Placement of concrete- Checking of form work. Shuttering and precautions to be taken during placement.</p> <p>Compaction of concrete- Hand compaction, Machine compaction, Vibrators – Types, internal screed vibrators and form vibrators, & selection of suitable vibrators. Finishing concrete slabs - screeding, floating and trowelling. Curing of concrete- Objectives of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing, Duration for curing and removal of form work.</p> <p>Jointing- Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location.</p> <p>Defects in concrete:- Identification of and methods of repair, Importance and methods of non-destructive tests.</p>	
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Reference Books/ Text Books / Case Studies:

- ❖ Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi
- ❖ Krishnamurthy,KT;Rao,AKasundra and Khandekar,AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi.
- ❖ Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.
- ❖ Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi.
- ❖ Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London.
- ❖ Orchard; "Concrete Technology"; Vol I, II, and III
- ❖ Handoo, BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; SatyaPrakashan, New Delhi,
- ❖ Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers, Delhi.
- ❖ Gambhir, ML; "Concrete Technology";, MacMillan India Ltd., New Delhi.
- ❖ Siddique, R., "Special Structural Concretes", Galgotia Publishers Pvt. Ltd. Delhi.
- ❖ Birinder Singh, "Concrete Technology", Kaption Publications, Ludhiana.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Test on the concrete materials as per I.S code
- ❖ Determine the property of fresh and hardened concrete
- ❖ Ensure quality control while testing \ sampling and acceptance criteria.

DCE 4102: WATER SUPPLY & WASTE WATER ENGINEERING

Introduction: To understand the basic characteristics of water and its determination.

Objective: To make the students convergent with sources and its demand of water also knowledge about water treatment process.

Credits: 3

Semester IV

L-T-P: 3-0-0

Module No.	Contents	Teaching Hours
I	<p>Water Supply: Introduction: Quantity of Water: Water requirement- Rate of demand and variation in rate of demand, Per capita consumption as per BIS standards, Population Forecasting.</p> <p>Quality of Water: Physical, Chemical and bacteriological tests and their significance, Standard of potable water as per Indian Standard</p> <p>Water Treatment: Sedimentation - purpose, types of sedimentation tanks, Coagulations flocculation - Filtration - significance, types of filters, disinfection of water, forms of chlorination, break point chlorine, and residual chlorine. Flow diagram of different treatment units.</p> <p>Conveyance of Water: Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes, types of joints . Appurtenances-Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses, Distribution site- Requirement of distribution, layout of distribution pipes, Systems of water supply - Intermittent and continuous ,oncept of service reservoir Wastage of water - preventive measures, Leakage detection</p>	18
II	<p>Laying out Pipes: Setting out alignment of pipes, Laying of pipes. Handling and jointing of pipes, testing of pipe lines, back filling.</p> <p>Building Water Supply: Connections to water main (practical aspect only), Water supply fixtures and installations related to plumbing.</p> <p>Waste Water Engineering: Introduction: Purpose of sanitation, Collection and conveyance of sewage, Conservancy and water carriage systems, Surface drains-various types, suitability, Types of sewage- Domestic, industrials, storm water.</p> <p>Sewerage System: Types of sewerage systems, materials for sewers, joints,</p>	18

	<p>Appurtenance- . Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts</p> <p>Laying and Construction of Sewers: Setting out/alignment of sewers, Excavations, handling and jointing testing and back filling of sewers/pipes. Construction of surface mains and different sections required</p> <p>Sewage characteristics: Properties of sewage and IS standards for analysis of sewage Physical, chemical and bacteriological parameters. Sewerage Disposal: Disposal by dilution, Self-purification of stream, Disposal by land treatment, Nuisance due to disposal.</p> <p>Sewage Treatment: Meaning and principle of primary and secondary treatment , Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds, Activated Sludge Process</p> <p>Building Drainage: Different sanitary fittings and installations, Traps, seals, causes of breaking seals rain water harvesting during precautions.</p>	
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Reference Books/ Text Books / Case Studies:

- ❖ Duggal, KN; “Elements of Public Health Engineering”; S. Chand and Co. New Delhi.
- ❖ Rangwala, SC; “Water Supply and Sanitary Engineering”; Anand Charotar Book Stall
- ❖ Kshirsagar, SR; “Water Supply Engineering”; Roorkee Publishing House, Roorkee.
- ❖ Kshirsagar, SR; “Sewage and Sewage Treatment”; Roorkee, Roorkee Publishing House.
- ❖ Hussain, SK; “Text Book of Water Supply and Sanitary Engineering”; Oxford and IBH Publishing Co, New Delhi.
- ❖ Birdie, GS; “Water Supply and Sanitary Engineering”; Dhanpat Rai and Sons, Delhi.
- ❖ Garg, Santosh Kumar; “Water Supply Engineering”; Khanna Publishers, Delhi.
- ❖ Garg, Santosh Kumar; “Sewage and Waste Water Disposal Engineering”; Khanna Publishers, Delhi.
- ❖ Steel, EW; “Water Supply and Sewerage”; McGraw Hill.
- ❖ Duggal, Ajay K and Sharma, Sanjay, “A Laboratory Manual in Public Health Engineering”, Galgotra Publications, 2006, New Delhi.
- ❖ Gurjar, B.R. “Sludge Treatment & Disposal” Oxford and IBH Co Pvt Ltd New Delhi.
- ❖ Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya Prakashan Ltd., Delhi.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Identify the source of water and water demand.
- ❖ Apply the water treatment concepts and methods
- ❖ Apply water distribution process and operation and maintenance of water supply.

DCE 4004: SURVEYING- II

Introduction: To understand the basic and element of contours, types of setting curve on road.

Objective:- To get introduce to modern advance surveying techniques such as remote sensing, total station etc.

Credits: 2

Semester IV

L-T-P: 2-0-0

Module No.	Contents	Teaching Hours
I	<p>Contouring: Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors affecting 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.</p> <p>Theodolite Surveying: 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.</p> <p>Tachometric Surveying: Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry, examples of stadia tachometry.</p>	12
II	<p>Curves: 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- By linear measurements only offsets from the tangent, successive bisection of arcs, offsets from the chord produced by tangential angles using a theodolite.</p> <p>Transition Curve: Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; Ideal Transition Curve; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets</p>	12

	<p>only. Vertical curve- Setting out of a vertical curve.</p> <p>Modern Surveying equipment and techniques: EDM or Distomat, Planimeter, Total station, Introduction to remote sensing, GIS and GPS.</p> <p>Minor Instruments: Introduction and use of minor instruments like Clinometer, Pantograph, Abney Level etc. Use of planimeter for computing areas</p>	
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Reference Books/ Text Books / Case Studies:

- ❖ Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delhi
- ❖ Deshpande,RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,
- ❖ Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,
- ❖ Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan, Pune
- ❖ Kanetkar,TP; and Kulkarni, SV; "Surveying and Leveling-Vol.2"AVG Prakashan, Pune
- ❖ Punima,BC; "Surveying and Leveling ",Standard Publishers Distributors, Delhi
- ❖ Shahai, PB; "A Text Book of Surveying ", Oxford and IBH Publishing Co.
- ❖ Lilly Sant "Remote Sensing and Image Interpretation"
- ❖ Mahajan, Sanjay, "Surveying-II", Satya Prakashan, Delhi.

Intended outcomes: After completion of the course, students will be able to-

- ❖ Use various conventional instruments involved in surveying with respect to utility and precision.
- ❖ Undertake plotting and measurement in civil engineering.

DCE 4105: DESIGN OF REINFORCED CONCRETE STRUCTURES

Introduction: To understand the concept of working stress and limit state methods for designing of structure.

Objective: To make the students knowledgeable about limit state design for flexure, shear torsion and anchorage.

Credits: 4

Semester IV

L-T-P: 3-1-0

Module No.	Contents	Teaching Hours
I	<p>Introduction: Concept of Reinforced Cement Concrete (RCC), Reinforcement Materials- Suitability of steel as reinforcing material, Properties of mild steel and HYSD steel, Loading on structures as per IS: 875,</p> <p>Methods of RCC design: Working stress method, Limit state method.</p> <p>Singly Reinforced Beam (Working stress method): Basic assumptions and stress strain curve, neutral axis, balanced, under- reinforcement and over reinforced beams, Moment of resistance for singly reinforced beam. Design of singly reinforced beam including sketches showing reinforcement details.</p> <p>Shear and Development Length: Shear as per IS: 456-2000 by working stress method. Shear strength of concrete without shear reinforcement, Maximum shear stress and Shear reinforcement.</p> <p>Concept of Limit State Method: Definitions and assumptions made in limit state of collapse (flexure), Partial factor of safety for materials, Partial factor of Safety for loads, Design loads, Stress block, parameters. Singly Reinforced beam: Theory and design of singly reinforced beam by Limit State Method.</p> <p>Doubly Reinforced Beams: Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method. Behavior of T beam, inverted T beam, isolated T beam and 'L' beams</p>	24
II	<p>One Way Slab: Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method.</p> <p>Two Way Slab: Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement</p>	24

	<p>details (plan and two sections),</p> <p>Axially Loaded Column: Definition and classification of columns, Effective length of column, Specifications for longitudinal and lateral reinforcement, Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement (sectional elevation and plan).</p> <p>Prestressed Concrete: Concept of pre-stressed concrete, Methods of pre-stressing- pre-tensioning and post tensioning, Advantages and disadvantages of prestressing, Losses in pre-stress.</p> <p>Footing: Isolated, wall footing, column footing.</p>	
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Reference Books/ Text Books / Case Studies:

- ❖ Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi.
- ❖ Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
- ❖ Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
- ❖ Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
- ❖ Singh Harbhajan "Design of Reinforced Concrete Structure Design" Abhishek Publishers Ltd., Chandigarh
- ❖ Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi.
- ❖ Singh Harbhajan, Limit Stat of RCC Design"; Abhishek Publishers Ltd.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Apply the fundamental concepts of working stress and limit state method.
- ❖ Use IS code of practice for the design of concrete elements.

DCE 4081: CIVIL ENGINEERING DRAWINGS LAB- II

Objective: To draw plan, elevation and section of water supply schemes and irrigation channels.

Credits: 3

Semester IV

L-T-P: 0-0-6

List of Practical

Module No.	Contents	Teaching Hours
1	WATER SUPPLY AND WASTE WATER ENGINEERING DRAWING Drains and Sewers:	36
2	a. Cross section of standard types of open drains (circular, v-shaped and μ -shaped) with their foundations b. Cross section of earthen ware and RCC sewer pipes c. Cross sections of masonry sewers (circular and egg shaped)	
3	Traps, manholes and inspection chamber: a. Detailed section of floor trap and gully trap b. Detailed plan and section of an inspection chamber Detailed plan and section of a manhole	
4	Septic Tank and Soak Pit: Detailed plan and cross sections of a domestic septic tank with soak pit for 10 and 50 users	
5	Bath room and W.C connections: a. 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 b. Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers	
6	Draw sectional elevation of a two storied building showing details of one pipe and two pipes systems with sanitation system.	
7	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. Detailed Layout Plan of Sewage Treatment Plant for a Residential area and Effluent Treatment Plant for an industrial unit.	
1	IRRIGATION ENGINEERING DRAWING: Typical cross-section of a channel	36
2	a. L-section of a channel for given data b. Typical cross section of an unlined and lined channel in cutting, partly cutting and partly filling and fully in filling with given design data.	
3	Layout plan of a canal head works.	
4	Draw the typical L-section of a weir Draw the X-section of an Earthen Dam a. Homogeneous b. Zoned type c. Diaphragm type	
5	Cross section of a tube well Layout and cross section of rain water harvesting system.	

Reference Books/ Text Books / Case Studies:

- ❖ Civil Engineering Drawing by RS Malik, Asia Publishing House
- ❖ Civil Engineering Drawing by V.B.Sikka. Katson Publishing, Ludhiana
- ❖ Civil Engineering Drawing by NS Kumar; IPH, New Delhi
- ❖ Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi
- ❖ Building Construction by Moorthy NRK
- ❖ Civil Engg Drawing by Layal
- ❖ Zaidi,SKA and Siddiqui, Suhail; Drawing and Design of Residential and Commercial Buildings, Standard Publishers and Distributors, Delhi.
- ❖ SP : 20
- ❖ National Building Code

Intended Outcome: After completion of the course, students will be able to-

- ❖ Draw plan elevation, plan and sections of various structure.
- ❖ Draw Plan and sections for various sewer lines

DCE 4082: CONCRETE TECHNOLOGY LAB

Objective: Determine the properties & strength of concrete.

Credits: 1

Semester IV

L-T-P: 0-0-2

List of Practical

Module No.	Contents	Teaching Hours
1	To determine the physical properties of cement as per IS Codes	24
2	To determine flakiness and elongation index of coarse aggregates	
3	To determine silt in fine aggregate	
4	Determination of specific gravity and water absorption of aggregates	
5	Determination of bulk density and voids of aggregates	
6	To determine surface moisture in fine aggregate by displacement method	
7		
8	Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)	
9	To determine necessary adjustment for bulking of fine aggregate	
10	To determine workability by slump test:	
11	To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump	
12	Compaction factor test for workability	
13	Nondestructive test on concrete by: <ul style="list-style-type: none"> a. Rebound Hammer Test b. Ultrasonic Pulse Velocity Test Tests for compressive strength of concrete cubes for different grades of concrete	

Intended outcome: After completion of the course, students will be able to-

- ❖ Calculate Strength of concrete.
- ❖ Properties of favorable concrete.

DCE 4083: WATER SUPPLY AND WASTE WATER ENGINEERING LAB

Objective: To quantify the water and waste water pollutant and the concentration of pollutants

Credits: 1

Semester IV

L-T-P: 0-0-2

List of Practical

Module No.	Contents	Teaching Hours
1	To determine turbidity of water sample	24
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	

Intended Outcome:

- ❖ Quantify the pollutant concentration in water and waste water
- ❖ Recommend the treatment required for water and waste water

DCE 4184: SURVEYING LAB-II

Object: Determine the contour plan and horizontal and vertical angles.

Credits: 4

Semester IV

L-T-P: 0-1-6

List of Practical

Module No.	Contents	Teaching Hours
	Contouring: <ol style="list-style-type: none"> Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer Preparing a contour plan by method of squares Preparing a contour plan of a Road/Railway track/Canal by taking cross sections. 	12
	Theodolite: <ol style="list-style-type: none"> Taking out the Theodolite, mounting on the tripod and placing it back in the box Study of a transit vernier theodolite; temporary adjustments of theodolite Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods Measurement of vertical angles and use of tachometric tables Measurement of magnetic bearing of a line Running a closed traverse with a theodolite (at least five sides) and its plotting Height of objects with and without accessible bases. 	28
	Curves: <ol style="list-style-type: none"> Setting out of a simple circular curve with given data by the following methods <ol style="list-style-type: none"> Offsets from the chords produced One theodolite method IV 	12
	Minor instruments: <ol style="list-style-type: none"> Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc. Use of planimeter for computing areas Demonstration of digital instruments through field visits to Survey of India and other government agencies. 	12
	Total Station (only demonstrations).	8

Intended Outcome: After completion of the course, students will be able to-

- ❖ Use the theodolite along with chain/tape, compass on the field
- ❖ Plan a survey taking accurate measurement, field booking, plotting and adjustment of errors.

DCE 5101: ESTIMATION & COSTING

Introduction: To study the defects arising in any of the engineering products.

Objective: To know the importance of preparing the types of estimates under different conditions.

Credits: 03

Semester VI

L-T-P: 3-0-0

Module No.	Content	Lab Hours
I	<p>Introduction: Introduction and its importance, quantity surveying and duties of quantity surveyor.</p> <p>Technical Terms: Super built area, Built up area, plinth area, floor area, floor area ratio, carpet area, circulation area, building coverage area.</p> <p>Types of estimates: Preliminary estimates- Plinth area estimate, Cubic rate estimate, Estimate per unit base Detailed estimates- revised estimate, supplementary estimate, and cube rate estimate.</p> <p>Measurement: Units of measurement for various items of work as per BIS: 1200 Rules for measurements.</p> <p>Unit conversions: Hectare, acre, square, meter, square feet, square yard.</p> <p>Methods of calculation of quantities: Centre line method, long wall and short wall method. Preparation of Detailed and Abstract Estimates from Drawings.</p> <p>Calculation of quantities of material for- Cement mortars of different proportion, Cement plaster of different proportion, Brick masonry in cement mortar, Cement concrete of different grade, Cement concrete flooring, Terrazzo flooring, and Stone masonry</p>	24
II	<p>Analysis of Rates: Introduction and factors affecting the analysis of rate, Current market rate materials, labor, tools and equipment used. labor out turn for various items of work, contractor profit, schedule of rate, Analysis of rate for all the (above) materials for various component beam, column, slab, footing, staircase, retaining wall, septic tank, roadway, railway, sewer line drain, canal, embankment and cutting, RCC work including bar bending schedule and PCC work etc.</p> <p>Earth Work: Calculation using mid sectional area, mean sectional area and prismatic formula.</p> <p>Public Work Department and contract management: Introduction of P.W.D Department, Hierarchy key of department, role of various civil engineer (CE, SE, EE, AE, JE.), Introduction to contract system, contractor and its qualities, contract document, types of contract earnest money and security money. Tender form, tender document, notices invite tender, opening and submission of tender.</p>	24

	<p>Valuation: Definition and valuation of tender. technical terms- Book Value, salvage value, assessed value, scrap value, distress value, market value, annuity, capitalized value, gross income, net income, outgoing, free hold property, lease hold property, capitalized value, year's purchase, sinking fund. Principal of valuation, methods of valuation, direct comparison, valuation base on profit, depreciation method of valuation etc.</p> <p>Depreciation: Definition, determination, method- Sinking fund, straight line, constant percentage, quantity survey.</p>	
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Text Book/ Reference Books:

- ❖ Rangwala, S.C., Rangwala, K.S., and Rangwala K.K. (2009), Estimating, Costing, and Valuation (Professional Practice), Charotar Publishing House Pvt. Ltd., Anand, Gujrat.
- ❖ Seetharaman, S. (2012), Construction Engineering and Management, Umesh Publishers, Delhi.
- ❖ Gahlot, P.S. and Dhir, B.M. (2007), Construction Planning and Management, New Age International (P) Ltd. Publishers, New Delhi.
- ❖ Arora, S.P. and Bindra, S.P. (2005), A Text Book of Building Construction Including Engineering
- ❖ Materials, Dhanpat Rai Publications (P) Ltd., New Delhi.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Apply different types of estimates at different situations
- ❖ Carry out analysis of rates and bill preparation at different locations.
- ❖ Carry out valuation of assets

DCE 5102: TRANSPORTATION ENGINEERING-I

Introduction: To learn about the geometric design of highways and construction of different types of road pavements.

Objective: To make students understand about the transportation and characteristics of road transport.

Credits: 03

Semester V

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Introduction: Importance of Highway transportation, functions of IRC, CRRI, & MOST, classification of roads organization of a state highway department</p> <p>Road Geometrics: Glossary of terms used in geo-metrics and their importance: Right of way, formation width, road margin, road shoulder, carriageway, side slopes, kerbs, formation levels, camber and gradient Design and average running speed, stopping and passing sight distance, horizontal and vertical curves including transition curves and super elevation. Methods of providing super elevation sketch of typical cross-sections in cutting and filling on straight alignment and at a curve.</p> <p>Highway Surveys and Plan: Designation of a topographic map, reading the data given on a topographic map, basic considerations governing alignment for a road in plain and hilly area Highway location: Marking of alignment, importance of various stages.</p> <p>Road Material: Different types of road materials in use, soil, aggregate, binders function of soil as highway sub grade</p> <p>California Bearing Ratio: Method of finding CBR value and its significance Testing aggregates: Los Angeles Abrasion test, impact test, crushing strength test, water absorption test and soundness test Aggregates. Availability of road aggregates in India, requirements of road aggregates as per IRC specifications</p> <p>Binders: Common binders, cement, bitumen and tar, properties as per IS specifications, penetration and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers</p>	18
II	<p>Road Pavements: Flexible and rigid pavement, their merits and demerits, typical cross- sections, functions of various components, Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profiles of embankment, construction of embankment, compaction, stabilization, preparation of sub grade, 1 methods of checking</p>	18

	<p>camber, gradient and alignment as per recommendations of IRC, equipment used for sub grade preparation.</p> <p>Flexible pavements: Sub base necessity and purpose, stabilized sub base: purpose of stabilization, types of stabilization, base Course: Preparation of base course: prime coat, tack coat Surfacing</p> <p>Rigid Pavements: Construction of concrete roads as per IRC specifications: Form laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.</p> <p>Hill Roads : Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cutting and partly in filling problems of hill areas Landslides: Causes, prevention and control measures drainage Soil erosion etc.</p> <p>Road Drainage: Necessity of road drainage work, cross drainage works Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surfacedrainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections</p> <p>Road Maintenance: Common types of road failures of flexible pavements: Pot hole, cracks, rutting, corrugation, fatty surface upheaval - their causes and remedies Maintenance of bituminous road such as seal- coat, patch-work and resurfacing Maintenance of concrete roads- filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices</p> <p>Construction Equipment: Hot mix plant Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline Asphalt mixer and tar boilers Road pavers</p>	
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Text Books/ Reference Books:

- ❖ Khanna, S.K. and Justo, C.E.G. (2011), Highway Engineering, Nem Chand and Brothers, Roorkee.
- ❖ Kadiyali, L.R. and Lall, N.B. (2009), Highway Engineering, Khanna Publishers, New Delhi.
- ❖ Kadiyali, L.R.(2011), Traffic Engineering and Transportation Planning, Khanna Publishers, New Delhi.
- ❖ Chakroborty, P. and Das, A. (2009), Principles of Transportation Engineering, PHI Learning Publications, New Delhi.

- ❖ Papacostas, C.S. and Prevedouros, P.D. (2009), Transportation Engineering and Planning, PHI Learning Publications, New Delhi.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Carryout surveys involved in planning and highway alignment.
- ❖ Design cross-section elements, sight distance, horizontal and vertical alignment
- ❖ Determine the characteristic of pavement material

DCE 5103: SOIL MECHANICS

Introduction: To learn soil behavior in terms of physical and engineering property.

Objective: Students will be able to solve any practical problem related to soil stress estimation, permeability and seepage including flow net diagram.

Credits: 03

Semester V

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Introduction: Soil formation, Transport and deposit of soil, Soil composition, definitions, phase relationships, Index properties, Particle size analysis, Shape and size, Grain size distribution Curves, Relative density, Consistency of soils, Determination of important physical and index properties of soils, soil classification systems with specific reference to Unified soil classification and IS soil classification systems, Field identification tests.</p> <p>Soil Structure: Soil structure, single grained structure, honeycomb structure, flocculent and dispersed structures, structure of composite soils. Role of soil structure on the behavior of soils.</p> <p>Soil-Water Relations: Soil-water systems, Capillarity, Geostatic stresses, Effective and neutral stress, Capillary flow, Darcy's law, Permeability, Factors affecting permeability, Determination of permeability in the Laboratory and in the field, Piping, Quick sand condition, Seepage, Governing differential equation for flow through soils.</p>	18
II	<p>Soil-Water Relations: Different kinds of flow: steady state and transient flow, Graphical method of solving steady state flow equation (Laplace Equation): Flow nets and their uses, Flow through homogeneous earth dams: Two dimensional cases, Design of drainage filters.</p> <p>Compaction: General Principles, Moisture- Density Relationship, Optimum Moisture Content, Relevant Laboratory and Field Tests, Factors Affecting Compaction, Field Compaction, Compaction Techniques.</p> <p>Compressibility and Consolidation: Fundamentals, 1-D Consolidation, Normally and Over Consolidated Clays, Void Ratio- Pressure Relationships, Determination of Pre-Consolidation Pressure, Compressibility Characteristics, Terzaghi's One Dimensional Consolidation Theory and Coefficient of Consolidation, Time Rate of Consolidation, Determination of</p>	18

	<p>Coefficient of Consolidation in the Laboratory: Curve Fitting Techniques, Primary and Secondary Consolidation and Settlement, Settlement Analysis, Vertical Sand Drains Shear Strength of Soil: Mohr-Coulomb Failure Criterion, Direct Shear Test, Unconfined Compression Test, triaxial Tests Unconsolidated undrained, Consolidated Drained and Consolidated Undrained Tests, Vane Shear Test, Shear Strength of Clays.</p>	
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Text Book/ Reference Books

- ❖ Arora, K.R. (2009), “Soil Mechanics & Foundation Engineering”, Standard Publishers Distributors, New Delhi.
- ❖ V.N.S. (2010), “Soil Mechanics and Foundation Engineering”, Marcel Dekker Publications, New Delhi.
- ❖ Venkataramaiah, C. (2006), “Geotechnical Engineering”, New Age Publications, New Delhi.
- ❖ Ranjan, G. and Rao, A.S.R. (2000), “Basic and Applied Soil Mechanics”, New Age Publication, New Delhi.

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Carryout soil classification
- ❖ Solve three phase system problems
- ❖ Solve any practical problem related to the soil stresses estimation, permeability and seepage including flow net diagram.

DCE 5104: EARTHQUAKE ENGINEERING

Introduction: Earthquake is the branch of engineering in which we study the vibrations induced in the earth's crust due internal and external causes and their effects.

Objective: To introduce the basics of earthquake engineering and introduce the engineering seismology and structural irregularities.

Credits: 03

Semester V

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Rocks : Their origin, structure, Texture and classification of igneous sedimentary and metamorphic rocks.</p> <p>Rock deformation: Folds, Faults, joints unconformity and their classification, causes and relation to engineering. Behavior of rock masses.</p> <p>Landslides: - Causes classification and preventive measures of landslides.</p> <p>Seismic Design Parameters:- Introduction to Earthquakes, Causes of Earthquakes, Earth structure, Epicenter, Hypocenter, seismic waves and its classification.</p> <p>Seismic region: - Seismic zones in India, Intensity and isoseismic of an earthquake, Magnitude and energy of earthquake Performance of buildings under past earthquakes.</p>	18
II	<p>Introduction to provisions of IS: 1893:2002</p> <p>Introduction to ductile detailing provision of IS: 13920 for Reinforced Concrete Building</p> <p>Introduction to IS: 4326 for construction of earthquake resistant masonry building</p> <p>Special construction methodologies, tips and precautions to be observed while planning, designing and construction of earthquake resistant building</p> <p>Disaster Management: Disaster rescue, Psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casualty machining, electric discharge machining</p>	18

Reference Books :

- ❖ J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
- ❖ **IS: 1983. (1984)**, Criterion for Earthquake Resistant Design, Bureau of Indian Standards, New Delhi.
- ❖ **Paz, M.** (1997), Structural Dynamics - Theory and Computation, Springer, New York, USA.
- ❖ **Chopra, A.K.** (2004), Dynamics of Structures, Pearson Education, New Delhi.
- ❖ **Duggal, S.K.** (2008), Earthquake Resistant of Design of Structures, Oxford University Press, New Delhi.

Intended outcomes: After completion of the course, students will be able to-

- ❖ Identify the minerals
- ❖ Source and Causes of earthquake.
- ❖ Site selection for heavy construction.

DCE 5181: STRUCTURAL DRAWING LAB.

Objective: To draw plan, elevation and section of load bearing and framed structure and prepare detailed working drawing of doors & windows.

Credits: 03

Semester V

L-T-P: 0-1-4

List of Practical

Module No.	Content	Lab Hours
1	Details of reinforcement in a simply supported RCC beam (singly reinforced and doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.	72
2	Details of reinforcement for a RCC square and circular column with isolated square footing	
3	Details of reinforcement for a cantilever beam with given data regarding the size of the beam and the reinforcement NOTE: Exercises on bar bending schedules for each of the three above items will be prepared	
4	Details of reinforcement in plan and section for a simply supported RCC one way slab with intermediate support and two-way slabs from the given data. Bar bending schedule should be prepared	
5	Details of reinforcement in a two storey RCC internal and corner Column. In this, the details of reinforcement at the junction with beams must be shown from the given design data	
6	Details of reinforcement of the junction of a secondary beam with the main beam with the given data	

Intended outcome: After completion of the course, students will be able to-

- ❖ draw plan, elevation and section of any structure
- ❖ Apply the principle of planning and bylaws used for building planning.

DCE 5182: TRANSPORTATION ENGINEERING LAB

OBJECTIVE: Determine the properties of material used in highway construction

Credits: 01

Semester V

L-T-P: 0-0-2

List of Practical

Module No.	Content	Lab Hours
1	Determination of the California bearing ratio (CBR) for the sub-grade Soil-WAP to calculate area of the circle.	24
2	Determination of penetration value of bitumen.	
3	Determination of softening point of bitumen	
4	Determination of impact value and crushing value of the road Aggregate-WAP to call a function by reference.	
5	Determination of abrasion value (Los Angeles') of road aggregate	
6	Determination of ductility of bitumen.	
7	Determination of viscosity of tar/bitumen.	
8	To determine the stripping value of stone aggregate.	
9	To determine the specific gravity and water absorption of stone Aggregates.	
10	Dowry Abrasion test for stone aggregate.	
11	Flash and fire points test on bitumen	

Intended outcome:

- ❖ Determine the strength of aggregate.
- ❖ Perform the test on bitumen.

DCE 5183: SOIL MECHANICS LAB.

Objective: Determination of properties & classification of soil

Credits: 02

Semester V

L–T–P: 0–1–2

LIST OF PRACTICAL

Module No.	Content	Lab Hours
1	Determination of water content and specific gravity of soil by specific gravity bottle and pycnometer.	24
2	Determination of grain size distribution of soil. a. Sieve test. b. Hydrometer test.	
3	Determination of Atterberg limits of soil. a. Liquid limit. b. Plastic limit. c. Shrinkage limit.	
4	Determination of optimum moisture content and the maximum dry density. a. Proctor compaction test. b. Modified proctor compaction test. c. Use of proctor penetration needle.	
5	Determination of coefficient of permeability of soil. a. Constant head permeameter. b. Falling head permeameter.	
6	Measurement of soil compaction in the field. a. Core cutter method. b. Sand replacement method.	
7	Determination of relative density of granular soil.	
8	Determination of shear strength parameters of soil. a. Shear box test. b. Tri-axial compression test.	
9	Vane shear test.	

Intended outcome: After completion of the course, students will be able to-

- ❖ Determine the Atterberg limits of soil.
- ❖ Determination of moisture content
- ❖ Determination of Compaction of soil

DCE 5084: CADD LAB I

Objective: To learn the fundamental of computer aided drafting.

Credits: 2

Semester V

L-T-P: 0-0-4

Module No.	Content	Teaching Hours
1.	Introduction and use of AutoCAD	
2.	To study draw tool bar commands. To draw objects using modify commands.	
3.	To study uses of layers in AutoCAD and its importance in AutoCAD.	
4.	To draw the layout of the 1 BHK flat using different commands.	
5.	To draw the layout of the footing of foundation.	
6.	To draw the plan of a septic tank with the proper dimensioning.	
7.	Develop plan, elevation, section of single storey building by using	
8.	AutoCAD	
9.	Development of 3D view of building Development of various layouts like electrical, sanitary, water filling Using layers concept.	

Intended Outcome: After completion of the course, students will be able to-

- ❖ Implement computer aided drafting.

DCE 5085: SEMINAR

Objective: To train the students to appreciate practical difficulties in surveying on the field.

Credits: 01

Semester V
LIST OF PRACTICAL

L-T-P: 0-0-2

Module No.	Content	Teaching Hours
1	Purpose To impart intensive training in the use of surveying instruments	24
2	To train the students to appreciate practical difficulties in surveying on the field	
3	Making the students conversant with the camp life	
4	Training the students to communicate with the local population	
5	Providing an opportunity for the students to develop team spirit	
6	To train the students for self management	
1	Task: To draw the profile and cross-section of a road using profile levelling and cross-sectioning	
2	To draw a topographic Plan of earth surface and its earthwork calculation.	
	Sub Tasks:	
1	Reconnaissance of the area and fixing control stations	
2	Traversing for the establishment of the control stations	
3	Adjusting and plotting the traverse (office work)	
4	Carrying the BM from any available reference BM to the site of work	
5	Planimeter detailing and contouring	
6	Fair plotting of the contours and other details (office work)	
7	Finalisation of the group sheet (office work)	

Intended Outcome: After completion of the course, students will be able to-

- To draw the profile and cross- section of a road.
- To draw a topographic plan of earth surface ant its earthwork calculation

DCE 6101: DESIGN OF STEEL STRUCTURES

Introduction -: To learn IS 800-2007 codes of practice for design of compression, tension and flexural members using various cross-section.

Objective-: To Provide knowledge about the behavior and the design of compression and tension member using simple and built-up section.

Credits: 03

Semester V

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Structural Steel Connections: Properties and designation of structural steel as per BIS Codes, Riveted connections, types of rivets, permissible stresses in rivets as per BIS:800, types of riveted joints, specifications as per BIS 800 for riveted joints, design of riveted joints for axially loaded members, testing and inspection of riveted joints as per BIS:800</p> <p>Welded connections: Types of welds, permissible stresses in welds, types of welded connections, design of butt and fillet welded connections subjected to axial loads, testing and inspection of welded joints as per BIS:800</p> <p>Tension Members: Permissible stresses in tension for steel, design of tension members as per BIS:800 (flats, angles and tee sections only)</p>	18
II	<p>Compression Members: Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800, strength of columns of single and built up sections with the help of table of permissible Compressive stresses. IS specifications for design of compression members, design of angle, struts and axially loaded columns (no built up columns); use of tacking rivets.</p> <p>Beams: BIS specifications for the design of simply supported steel beams including design of base plate at the ends (laterally restrained beams only), structural behavior, deflected shapes and function of various elements of a plate girder and free hand sketching of a plate girder and its elements.</p> <p>Roof Truss: Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering, joint details of roof trusses, loading for roof truss, weight of roof truss, wind loads, snow loads, combination of loads, design of various elements of truss</p>	18

Reference Books/Text Books:

- 1 Duggal, S.K. (2010), Limit State Design of Steel Structures, Tata McGraw Hill, New Delhi
- 2 Sai Ram, K.S. (2010), Design of Steel Structures, Pearson Publishers, New Delhi.
- 3 Subramanian, N. (2011), Design of Steel Structures, Oxford University Press, New Delhi.
- 4 Englekirk, R.E. (1994), Steel Structures: Controlling Behavior through Design, John Wiley and Sons Publishers, New Delhi.
- 5 Bhavikatti, S.S. (2009), Design of Steel Structures by Limit State Method as per IS: 800-2007, I.K. International Pvt. Ltd., New Delhi.

DCE 6102: TRANSPORTATION ENGINEERING II

Introduction: Study of various components of railway, airport and material used.

Objective: To know about the basics and design of various components in railway, airport engineering.

Credits: 03

Semester VI

L–T–P: 3–0–0

Module	Content	hours
I	<p>Introduction to railway: Brief history of railways, modes of transportation, advantage of railways, administrative setup Indian railways and its salient features</p> <p>Rail gauge: Definition, types, factors affecting the gauge, practice in various countries and India, uniformity of gauge, unigauge project of Indian railways, rails ,types of rails, permanent way formation, requirements, sections in embankment and cutting (single/double track), coning of wheels, defect in rails, welding of rails, wear of rails, hogged rails, buckling of rails. Creep, - Definition, causes, effects and remedies.</p> <p>Sleepers: Functions, types, requirements of an ideal material forsleepers, brief idea of timber, concrete and pre stress sleepers.</p> <p>Ballast: Function of ballast, characteristics of good ballast, and types of ballast, size and quantity of ballast.</p> <p>Fastening of rails: Rail joints, types of rail joints, fish plates, spikes, bearing plates, bolts, keys, anti-creepers.</p> <p>Track geometrics: Railway alignment,- vertical alignment,- gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances.</p>	18
	<p>Points and Crossings: Necessity and details of arrangement; sketch of a turnout definition of stock rail, tongue rail, check rail, lead rail, wing rail, point rail, splice rail, stretcher bar, throw of switch, heel of switch, nose of crossing, angle of crossing, turnout and its component parts, points or switches, crossing, types of crossing, crossover.</p>	

II	<p>Stations and Yards: Stations and station yards, classification and functioning of stations and station yards.</p> <p><i>NOTE: The study of the subject must be supplemented by a visit to a nearby railway station</i></p> <p>Signaling and Interlocking: Object of Signaling, Classification of Signals, method of train working, absolute block system, Interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement.</p> <p>Introduction to Airport Engineering: Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway and geometric design. Airport drainage management, Visual aids and air traffic control, Airport marking, runway marking, Runway lighting, Helipads.</p> <p>Water Transport: Harbors and ports, Types of Harbors; Harbors-layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses, Inland waterway, Development in India. Advantage of Inland water.</p>	18
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Text Book/ Reference Books:

- ❖ Arora, S.P. and Saxena, S.C. (2006), Railway Engineering, Dhanpat Rai Publications, New Delhi.
- ❖ Essentials of Bridge Engineering by D J Victor
- ❖ [Chandra](#), S. and [Agarwal](#), M.M. (2008), Railway Engineering, Oxford University Press, New Delhi.
- ❖ Khanna, S.K., Arora, M.G., and Jain, S.S. (1994), Airport Planning and Design, Nem Chand and Bros, Roorkee.
- ❖ Limit State Design of Steel Structures by S K Duggal
- ❖ A Course in Docks and Harbour Engineering: Dhanpat Rai Publishing Co.

Intended Outcomes:

After completion of the course, students will be able to-

- ❖ Carry out the surveys for railway, tunnels& bridges.
- ❖ Demonstrate the fundamental of intelligent transport systems.

DCE 6103: IRRIGATION ENGINEERING

Introduction :- To understand the basic concept of irrigation and adequate use of water in irrigation.

Objective:- To develop skills of students in modeling of flood flow, hydrology and understanding water resource system.

Credits: 3

Semester IV

L-T-P: 3-0-0

Module No.	Contents	Teaching Hours
1	<p>Introduction: Definition of irrigation, Necessity of irrigation, History of development of irrigation in India. Major, medium and minor irrigation projects.</p> <p>Water Requirement of Crops: Principal crops in India and their water requirements, Crop seasons – Kharif and Rabi, Soil water, soil crop and water relationships, duty, delta and base period, their relationship, Gross commanded area (GCA),cultivable commanded area (CCA), intensity of irrigation, irrigable area.</p> <p>Hydrological Cycle Catchment Area and Run-off: Rainfall, definition rain-gauges automatic and non-automatic, methods of estimating average rainfall (Arithmetic system); catchment area runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.</p> <p>Methods of Irrigation: Flow irrigation -its advantages and limitations, Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages, Sprinkler irrigation conditions favorable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts, Drip irrigation, suitability of drip irrigation, layout, component parts, advantages.</p> <p>Canals: Classification, appurtenances of a canal and their functions, sketches of different canal cross-sections (unlined), Various types of canal lining-their relative advantages and disadvantages, sketches of different lined canal x-sections, Breaches and their control, Maintenance of lined and unlined canals,</p>	18

2	<p>Tube Well Irrigation: Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation, Tube wells and 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, Types of tube wells, cavity, strainer and slotted type, Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance, Water Harvesting Techniques- Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.</p> <p>Dams: 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, Concept of small and micro dams, Concept of spillways and energy dissipaters.</p> <p>Canal Head Works and Regulatory Works: Definition, object, general layout, functions of different parts of head works. Difference between weir and barrage. Cross Drainage Works: Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet, pipe crossing, Sketches of the above cross drainage works.</p> <p>Hydraulic Structures: Falls, Cross and head regulators, Outlets, Canal Escapes – general sketch.</p> <p>River Training Works: Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off.</p> <p>Water Logging and Drainage and Ground Water Re-charge: Definition of water logging – its causes and effects, detection, prevention and remedies, Reclamation of soil, Surface and sub-surface drains and their layout, Concept and various techniques used for ground water re-charge.</p>	18
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Reference Books/ Text 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.
- 3-**Punmia, BC; and Pande Brij Bansi Lal**, 'Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi.
- 4-**Sharma, RK**; 'Text Book of Irrigation Engineering and Hydraulics Structures', , Oxford and IBH Publishing Company, New Delhi.
- 5-**Sharma, SK**; 'Principles and Practice of Irrigation Engineering', Prentice Hall of India Pvt. Ltd., New Delhi.
- 6-**Varshney RS, Gupta SC, Gupta RL** at all. "Theory and Design of Irrigation Structures", Vol. I and II.
- 7-**Saharsabudhe SR**, "Irrigation Engineering and Hydraulic Structures".
Priyani BB, 'The Fundamental Principles of Irrigation and Water Power.

DCE 6104: CONSTRUCTION MANAGEMENT AND ACCOUNTS

Introduction: Planning, organizing & controlling of any work towards construction.

Objective: To enhance the understanding of project management techniques

Credits: 04

Semester VI

L-T-P: 4-0-0

Module No.	Content	Teaching Hours
I	<p>CONSTRUCTION MANAGEMENT: Introduction: Significance of construction management, Main objectives of construction management, Functions of construction management, planning, organizing, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job. Classification of construction into light, heavy and industrial construction, Stages in construction from conception to completion, The construction team: owner, engineer and contractors, their functions and inter-relationship, Resources for construction industry: Men, machines, materials and money</p> <p>Construction Planning: Importance of construction planning, Developing work break down structure for construction works, Stages of construction planning, Scheduling construction works by bar charts: Preparation of bar charts for simple construction work, Preparation of schedules for labour, materials, machinery and finances for small works, Limitations of bar charts</p> <p>Scheduling by network techniques: Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology, Developing CPM networks, Analysis of CPM networks, determining completion time, identifying critical activities and critical path, floats etc.</p>	18
II	<p>Organization: Types of organizations: Line, line and staff, functional and their Characteristics, Principles of organization: Span of control, Delegation of authority, Ultimate responsibility, Unity of command, Job definition</p> <p>Site Organization: Factors influencing selection and design of temporary services for a construction, Principle of storing and stacking materials at site, Location of equipment, Preparation of actual job layout for a building, Organizing labour at site</p> <p>Construction Labour: Conditions of construction workers in India, wages paid to workers, Trade Unions connected with construction industry</p> <p>Control of Progress: Methods of recording progress, Analysis of progress, Taking corrective actions keeping head office informed, Cost time optimization for simple jobs - Direct and indirect cost, variation with</p>	18

	<p>time, cost optimization</p> <p>Inspection and Quality Control: Need for inspection and quality control, Principles of inspection, Major items in construction job requiring quality control, Stages of inspection and quality control for: Earth work, Masonry, RCC, Sanitary and water supply services, Electrical services</p> <p>Accidents and Safety in Construction: Accidents – causes, Safety measures, Safety campaign</p>	
<p>III</p>	<p>CONSTRUCTION EQUIPMENT:</p> <p>Construction Economy: Factors affecting the selection of construction equipment, rolling resistance, effect of grade on required tractive effort, effect of altitude and temperature on the performance of internal combustion engines, drawbar pull, rim pull, and acceleration</p> <p>Earth Moving Equipment: Crawler and wheel tractors: their functions, types and specifications, grad ability; bull dozers and their use, tractors pulled scrapers, their sizes and output; effect of grade and rolling resistance on the output of tractor pulled scrapers, earth loaders, placing and compacting earth fills. Power shovels: Functions, selection, sizes, shovel dimensions and clearances, output; Draglines: Functions, types, sizes, output; clamshells; safe lifting capacities and working ranges of cranes; hoes, trenching machines: types and production rates</p> <p>ACCOUNTS:</p> <p>PUBLIC WORK ACCOUNTS: Introduction, accounts, work- major, repair, administrative approval – expenditure, Technical sanction, allotment of funds, bill, contractor ledger, Running and final account bills complete, completion certificate & report, hand receipt, establishment- permanent, temporary- a quitance roll. WC, Establishment, MR labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, direct material, road metal return, account of stock, misc. P.W. advances T & P – verification, survey, returns, account-expenditure & revenue head, remittance and deposit head, cash book, imprest account, temp advance, treasury challan.</p>	<p>16</p>

Text Book/ Reference Books:

- ❖ PERT & CPM Principles and Applications” L.S. Srinath, E.W.P. Ltd., New Delhi.
- ❖ Network Analysis Techniques” S.K. Bhatnagar, Willey Eastern Ltd.
- ❖ Construction Technology by Sarkar, Oxford.
- ❖ Construction Planning”, Equipment and Methods. : R.L. Peurify. T.M.H.,

Intended outcomes: After completion of the course, students will be able to-

- ❖ Apply various project management techniques.
- ❖ Implement roles of team players

DCE 6005: REPAIR AND MAINTENANCE OF BUILDINGS

Introduction: Study of maintenance & causes of deterioration of any project.

Object: To have adequate knowledge of maintenance of any project.

Credits: 3

Semester VI

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Need for Maintenance Importance and significance of repair and maintenance of buildings Meaning of maintenance Objectives of maintenance Factors influencing the repair and maintenance</p> <p>Agencies Causing Deterioration (Sources, Causes, Effects) Definition of deterioration/decay, Factors causing deterioration, their classification Human factors causing deterioration, Chemical factors causing deterioration Environmental conditions causing deterioration Miscellaneous factors, Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics</p> <p>Maintenance Management (Principles, inspections, Practices) Importance of maintenance management Organizational structure for maintenance Building inspections and reports Maintenance budgets and estimates Specifications for maintenance jobs</p>	18
II	<p>Investigation and Diagnosis of Defects Systematic approach/procedure of investigation Objectives of investigation of building defects Sequence of detailed steps for diagnosis of building defects/problems Various tests for correct diagnosis of building defects Various tests on materials for investigating defects List non-destructive tests on building elements and materials to evaluate the condition of the building and study of three most commonly used tests</p> <p>Defects and their root causes Define defects in buildings Describe importance and classification of defects Main causes of building defects, List three main defects and their main causes in various building elements, Foundations, basements and DPC Walls Column and Beams</p>	18

	<p>Roof and Terraces Joinery Decorative and protective finishes Services Defects caused by dampness</p> <p>Materials for Repair, maintenance and protection</p> <ul style="list-style-type: none"> Basic characteristics of repair materials Compatibility aspects of repair materials List various types of repair materials State characteristics of: <ul style="list-style-type: none"> Anti corrosion coatings Adhesives/bonding aids Repair mortars Curing compounds Joints sealants Waterproofing systems for roofs Protective coatings Selection procedure of repair materials for specific job 	
<p>III</p>	<p>Remedial Measures for Building Defects</p> <ul style="list-style-type: none"> Preventive maintenance considerations Precautions during repair and maintenance Surface preparation for repair Crack repair methods Epoxy injection Grooving and sealing Stitching Adding reinforcement and grouting Flexible sealing by sealant Repair of surface defects of concrete Bug holes Form tie holes Honey comb and larger voids Repair of corrosion in RCC elements Steps in repairing Prevention of corrosion in reinforcement Material placement techniques with sketches Pneumatically applied (The gunite techniques) Open top placement Pouring from the top to repair bottom face Birds month Dry packing Form and pump Preplaced – aggregate concrete Trowel applied method Repair of DPC against Rising Dampness Physical methods Electrical methods Chemical methods Repair of walls Repair of mortar joints against leakage 	<p>12</p>

	<p>Efflorescence removal</p> <p>Waterproofing of wet areas and roofs</p> <p>Water proofing of wet areas</p> <p>Water proofing of flat RCC roofs</p> <p>Various water proofing systems and their characteristics</p> <p>Repair of joints in buildings</p> <p>Sealing of joints</p> <p>Types of sealant and their characteristics</p> <p>Repair and maintenance of public health Services</p> <p>Low pressure</p> <p>Cisterns defects, blocked drains, damaged china ware</p> <p>Maintenance of GI Pipes</p> <p>Repair of traps</p> <p>Repair of overhead and underground water tanks</p>	
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References books:

- ❖ Nayak, BS; "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi
- ❖ Ransom, WH; "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span
- ❖ Hutchinson, BD; etc, "Maintenance and Repair of Buildings", Published by Newness -Butterworth

Intended Outcomes: After completion of the course, students will be able to-

- ❖ Materials for repair & maintenance
- ❖ Precautions for damaging the buildings to reduce the repair.

DCE 6181: SURVEYING LAB III

Object: To get introduced to modern advanced surveyed technique involved total station

Credits: 3

Semester VI

L-T-P: 0-1-4

List of Practical

Module No.	Contents	Teaching Hours
1	Review of Surveying Instrument.	24
2	Layout of Buildings by use of surveying instruments.	
3	Demonstration of total Station.	
4	To Perform different surveying works with the help of Total Station.	

Intended Outcome:

- ❖ Apply geometric and trigonometric principle of basic survey calculations.
- ❖ Employ drawing techniques in the development of a topographic map.

DCE 6083: CAD LAB-II

Object: To learn the software develop skills for structure design

Credits: 2

Semester VI

L-T-P: 0-0-4

Module No.	Content	Teaching Hours
1.	To create plane frame models.	48
2.	To create suitable structural model with column and beam for given data.	
3.	To assign different properties to the created frames such as loads, thickness and cross-sections.	
4.	To create a system of load which are exerted any frame and its behavior due to load.	
5.	To create and study G+5 model and analysis of different loads.	
6.	To create a rectangular water tank and analysis its properties with hydro static force.	

Intended Outcome:

- ❖ Apply the software skills in the design of infrastructure
- ❖ Apply computing skills to geotechnical engineering.