

**Invertis Institute of Engineering & Technology**  
**INVERTIS UNIVERSITY**  
Invertis Village, Bareilly-Lucknow NH-24, Bareilly

**Scheme of Instruction & Syllabi**  
**of**  
**Diploma in Civil Engineering**  
**(Three Year Diploma Course)**  
**II Year**

(Effective Session 2017-2018)

**STUDY AND EVALUATION SCHEME**  
**Diploma in Civil Engineering**  
**(Effective from session 2017-18)**  
**YEAR II, SEMESTER III**

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
<b>THEORY</b>												
1	DCE301	Surveying – I	3	1	0	20	10	10	40	60	100	4
2	DCE302	Building Construction – I	3	1	0	20	10	10	40	60	100	4
3	DCE303	Building Materials	3	1	0	20	10	10	40	60	100	4
4	DCE304	Strength of Materials	3	1	0	20	10	10	40	60	100	4
5	DCE305	Hydraulics	3	1	0	20	10	10	40	60	100	4
<b>PRACTICAL/TRAINING/PROJECT</b>												
6	DCE351	Surveying Lab – I	0	0	6	-	-	-	50	50	100	2
7	DCE352	Building Construction Lab	0	0	3	-	-	-	50	50	100	2
8	DCE354	Strength of Materials Lab	0	0	3	-	-	-	50	50	100	2
9	DCE355	Hydraulics Lab	0	0	3	-	-	-	50	50	100	2
10	GP301	General Proficiency	-	-	-	-	-	-	50	-	50	1
		<b>TOTAL</b>	<b>15</b>	<b>5</b>	<b>15</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>450</b>	<b>500</b>	<b>950</b>	<b>29</b>
<b>L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks</b>												

**STUDY AND EVALUATION SCHEME**  
**Diploma in Civil Engineering**  
**(Effective from session 2017-18)**  
**YEAR II, SEMESTER IV**

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
<b>THEORY</b>												
1	DCE401	Soil Mechanics & Foundation Engineering	3	1	0	20	10	10	40	60	100	4
2	DCE402	Public health Engineering-I	3	1	0	20	10	10	40	60	100	4
3	DCE403	Concrete Technology	3	1	0	20	10	10	40	60	100	4
4	DCE404	Irrigation Engineering	3	1	0	20	10	10	40	60	100	4
5	DCE405	Building Construction – II	3	1	0	20	10	10	40	60	100	4
<b>PRACTICAL/TRAINING/PROJECT</b>												
6	DCE451	Soil Mechanics & Foundation lab	0	0	4	-	-	-	50	50	100	2
7	DCE452	Public health Engineering lab	0	0	2	-	-	-	50	50	100	2
8	DCE453	Concrete Technology lab	0	0	4	-	-	-	50	50	100	2
9	DCE454	Civil Engineering Drawing – I	2	0	6							2
10	GP401	General Proficiency	-	-	-	-	-	-	50	-	50	1
		<b>TOTAL</b>	<b>17</b>	<b>5</b>	<b>16</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>450</b>	<b>500</b>	<b>950</b>	<b>29</b>
<b>L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks</b>												

(Effective Session 2017-2018)

**SURVEYING – I**  
**Third Semester**

L	T	P	C
3	1	-	4

**Course Code: DCE301**

**Course Contents:**

**Unit I**

**Introduction**

Concept of surveying, purpose of surveying, Measurements: linear and angular, units of measurement, instruments used for taking these measurements. Classification of survey based on instruments. Basic principles of surveying.

**Chain Surveying**

Purpose of chain surveying, Principles of chain surveying, Equipment used in chain surveying Viz. Chains, tapes, ranging rods, arrows, pegs, cross staffs, Indian optical square their construction and uses.

Different operations in chain surveying: Ranging (direct/indirect), Offset (perpendicular/oblique) Chaining (flat and sloping ground) Conducting chain survey over an area. Recording the field data, plotting the chain survey, conventional sign.

(a) Errors in chain surveying.

(b) Correction for erroneous length of chain, simple problems.

**Unit II**

**Compass Surveying- I**

Purpose of compass surveying. Construction and working of prismatic compass. Use of prismatic Compass, Method of setting and taking observations. Concept of following:

(a) Meridian – Magnetic, true and arbitrary.

(b) Bearing – Magnetic, True and Arbitrary.

(c) Whole circle Bearing and Reduced Bearing.

(d) Fore and Back bearing.

**Unit III**

**Compass Surveying- II**

Local attraction – causes, detection, errors and correction. Problems on local attraction, magnetic declination and calculation of included angles in a compass traverse. Concept of a traverse – Open and closed traverse . Traversing with a prismatic compass. Checks for an open and closed traverse. Plotting of a traverse – by angles. Concept of closing error. Adjustment of traverse graphically. Errors in compass surveying. Use of surveyor's compass and its construction details, comparison with prismatic compass.

**Unit IV**

**Leveling- I**

Purpose of leveling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks, principle and construction of dumpy and I.O.P. (Tilting) levels. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis. Leveling staff. (i) single piece (ii) Folding (iii) top with pattern. Temporary adjustment: setting up and leveling, adjusting for parallax of Dumpy and I.O.P. level.

**Unit V Leveling-**

**II**

Differential leveling concept of back sight, fore sight, intermediate sight, station, change point, height of instrument. Level book and reduction of levels by (a) Height of collimation method and (b) Rise and fall method. Arithmetic checks. Problem on reduction of levels. Fly leveling and profile leveling (L-section and X-section) Errors in leveling, and precautions to minimize them. Reciprocal leveling. Concept of curvature and refraction. Numerical problems. Concept and use of Automatic level.

**Text Books:-**

1. Arora K.R., *Surveying Vol. I & II*, Standard Book House, Delhi.
2. Kanetkar T.P., *Surveying & Levelling Vol. I & II*, Pune Vidyarthi Griha Prakashan, Pune.
3. Basak P.N., *Surveying & Leveling*, Tata McGraw – Hill Publishing Co. Ltd., Delhi.
4. Agarwal G.D., *Surveying Vol. I & II*, Unitech Publishers, Lucknow.
5. Punmia B.C., *Surveying Vol. I & II*, Laxmi Publications (P) Ltd. New Delhi.

**Reference Books:-**

1. Duggal S.K., *Surveying Vol. I & II*, New Age International Publishers New Delhi.
2. Chandra A.M., *Surveying Problem Solving with Theory & Objective Type Questions*, New Age International Publishers New Delhi.

**STRENGTH OF MATERIALS****Third Semester****Course Code: DCE304**

L	T	P	C
4	-	-	4

**Course****Contents: Unit I****Bending Moment and Shear Force:**

Concept of a beam and supports (Hinged, Roller and Fixed). Types of Beams: Simply supported, cantilever, fixed, overhang and continuous beams. Types of loads (distributed and point). Concept of Bending Moment & Shear Force. Sign conventions. Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed and concentrated loads. Point of maximum B.M. and contra flexure.

**Unit II****Bending Stresses:**

Assumptions of theory of simple bending. Derivation of the equation.  $M/I = F/Y = E/R$ . Concept of centroid and second moment of area, Radius of gyration, Theorems of parallel and perpendicular axes, Second Moment of area for

sections: rectangle, triangle, circle, trapezium, angle, Tee, I, Channel and compound sections. Moment of resistance, section modulus and permissible bending stresses, Bending stresses in circular rectangular, I,T and L section. Comparison of strength of the above sections.

**Unit III****Combined Direct & Bending Stresses and strain Energy**

Concentric and eccentric loads, eccentricity, effect of eccentric load on the section, middle third rule; stresses due to eccentric loads. Examples in the case of short columns, chimneys and dams.

**Unit IV****Slopes and Deflections of Beams:**

Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and deflection for the following standard cases.

(1) Cantilever having point load at the free end., Cantilever with uniformly distributed load over the entire span.

(2) Simply supported beam with point load at centre of the span.

Simply supported beam with U.D. load over entire span.

**NOTE:** All examples will be for constant moment of inertia without derivation of formula.

**Unit V****Columns & Struts:**

Definition of long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse Load, End conditions of column. Application of Euler's and Rankine's formula (no derivation), simple numerical

problems based on Euler's and Rankine's formulae.

**Text Books:-**

1. Rajput R. K., *Strength of Materials*, S.Chand& Co. Ltd., Delhi.
2. Kapoor J.K., *Strength of Materials*, Asian Publication, Muzaffarnagar.
3. Punmia B.C., *Strength of Materials*, Laxmi Publication, Delhi.
4. Ratan S.S ,*Strength of Materials* , TMH Publication , Delhi

**Reference Books:-**

1. Ramamarutham S., *Strength of Materials*, DhanpatRai& Sons, Delhi.

## **BUILDING CONSTRUCTION – I**

### **Third Semester**

<b>Course Code: DCE302</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

**Course**

**Contents: Unit I**

**Introduction:** Definition of a building, classification of building based on occupancy. Different parts of a building. Orientation of buildings. Site selection.

Walls, Purpose of walls: Classification of walls – Load Bearing and Non Load Bearing wall. Classification of walls as per materials of construction, brick, stone. Brick masonry – Definition of terms; mortar, bond, facing, backing, hearting, column, pillar, jambs, reveals, soffit, plinth, plinth masonry, Brick: header, stretcher, bat, queen closer, king closer, frog and quoin.

**Unit II**

- (a) Bond – Meaning and necessity: Types of bond and their suitability (English, Flemish, Header and Stretcher) 1, 1-1/2 and 2 Brick thick walls in English Bond. Sketches for 1, 1-1/2 and 2 brick square pillars in English Bond.
- (b) Construction of Brick walls – Method of laying bricks in walls, precautions observed in the Construction of walls.

**Unit III**

**Stone Masonry**

- (a) **Glossary of terms** – Natural bed of a surface, bedding planes, string course, corbel, cornice, block – in course, grouting, moldings, templates, throttling, throating stones, parapet and coping.
- (b) **Types of Stone Masonry:** Rubble Masonry; random and coursed, Ashlar Masonry, principles to be observed in construction of stone masonry walls. Partition walls: Constructional details, suitability and uses of brick and wooden partition walls.

**Unit IV**

Mortars – preparation, use and average strength of cement, lime, lime surkhi and mud mortar. Scaffolding: Constructional details and suitability of mason's Brick Layers and Tubular scaffolding. Shoring & underpinning: Types and uses.

**Arches and Lintels:** Meaning and use of Arches and Lintels. Glossary of terms used in Arches and Lintels – Abutment, Pier, Intrados, Soffit Extrados, Voussoirs, Springer, Springing line, Crown, Key stone, Span, Rise, Haunch, Spandrel, Jambs, Bearing thickness of lintel, effective span.

**Arches:** Brick arches and their construction

**Unit V**

**Doors and Windows:** Glossary of terms, used in Doors and windows.

Doors – Name; uses and sketches of; Ledged and Battened Doors; Framed and Paneled doors, glazed and paneled doors, flush doors, Door frames, Windows – Name, uses and sketches of fully glazed windows and ventilators, window frames.

**Text Books:-**

1. Kumar Susheel, *Building Construction*, Standard Publishers Distributers, Delhi.
2. Singh Gurcharn, *Building Construction*, Standard Publishers, Delhi.
3. Gupta D.V., *Building Construction*, Asian Publishers, Muzaffarnagar.

**Reference Books:-**

1. Punmia B.C., *Building Construction*, Laxmi Publication (P) Ltd., Delhi.
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# HYDRAULICS

## Third Semester

L	T	P	C
4	1	-	5

Course Code: DCE305

### Course

#### Contents: Unit I

Properties of Fluids: **Fluids:** Real fluid, ideal fluid., Fluid Mechanics, Hydraulics, Hydrostatic Pressure: Pressure, intensity of pressure, pressure head, Pascal's law and its applications. Total pressure, resultant pressure, and centre of pressure. Total pressure and centre of pressure on vertical and inclined plane surfaces: Rectangular.

#### Unit II

**Measurement of Pressure:** Use of simple manometer, differential manometer. Measurement of pressure by manometers. Fundamental 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 theorems). Venturimeter (horizontal).

#### Unit III

**Orifice:** Definition of Orifice, and types of Orifices, Hydraulic Coefficients. Large vertical orifices. Free, drowned and partially drowned orifice.

**Flow through Pipes:** Definition, laminar and turbulent flow explained through Reynold's Experiment. Reynolds Number, critical velocity and velocity distribution. Head Losses in pipe lines due to friction, sudden expansion and sudden contraction entrance and exit (No derivation of formula). Hydraulic gradient line and total energy line.

#### Unit IV

##### Flow through open channels:

Definition of a channel, uniform flow and open channel flow. Discharge through channels using, (i) Chezy's formula (no derivation) (ii) Manning's formula

**Most economical sections:** (i) Rectangular (ii) Trapezoidal

#### Unit V

**Flow Measurements:** Measurement of velocity by Pitot tube, Measurement of Discharge by a Notch, Difference between notches and orifices. Discharge formulae for rectangular notches and conditions for their use. (with derivation) Measurement of discharge by weirs. Difference between notch, weir. Discharge formula for free, drowned, and broad crested weir with and without end contractions; velocity of approach and condition of their use.

#### Text Books:-

1. Bansal R.K., *Fluid Mechanics & Hydraulic Machines*, Laxmi Publication (P) Ltd., New Delhi.
2. Vijay Gupta & Gupta S.K., *Fluid Mechanics*, New Age International Publishers, New Delhi.
3. Jagdish Lal, *Hydraulics & Hydraulic Machines*, Metropolitan Book Depot, Delhi.
4. Modi P.N., *Fluid Mechanics*, New Age International Publishers, New Delhi.

#### Reference Books:-

1. Garde R.J., *Fluid Mechanics*, New Age International Publishers, New Delhi.
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# BUILDING MATERIAL

## Third Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Code: DCE303**

### Course

#### Contents: Unit I

**Building Stone:** Classification of Rocks: - Geological and physical classification.

**Quarrying:-**Basic Principles involved, Methods of quarrying, Blasting, where used Principles of ballasting, Line of least resistance, Drilling of holes (Manually and mechanically), charging, tamping, Fugues and detonators, safety precaution, common explosives – only Name and their use.

**Wedging:-**Where used, Tools required and operation of wedging.

**Availability, Characteristics and uses of the following stone:-**

Granite, Sand stone, Lime stone, Slate and marble, Availability of different stones in the state.

### Unit II

**Bricks & clay Products:-**Raw material for manufacture, Properties of good brick making earth. Manufacture of bricks, Preparation of clay-Manually/Mechanically.

**Molding:** hand molding and machine molding, drying of bricks, Burning of bricks, Types of Kilns, Bull's Trench Kiln and Hoffman's kiln, Process of burning, Size of standard Bricks, classification of brick as per I.S.

### Unit III

**Lime and Cement:- Lime:-** Natural sources of lime, Definition of Quick, fat, hydraulic, hydrated lime, calcinations, slaking, manufacture of lime, process of setting and hardening action of lime field test of lime, pozzolonic material types, properties and uses.

**Cement:** Natural and artificial cement, Raw materials, manufacture of ordinary Portland cement, Flow diagram for dry and wet process, setting and hardening of cement. Types of cement, Properties of cement, Test of cement as per Indian standard.

### Unit IV

**Timber, Paints and Insulating Materials Timber:-** Classification of Trees,- Cross Section of an Exogenous tree and explanation of terms, identification of different types of timber, teak, Chirr, Shisham, Sal, Mango, deodar, kail etc., Seasoning of Timber – Purpose, Types of seasoning, water, Air, Kiln, Chemical & solar Kiln seasoning.

**Defects in Timber:-** Decay in Timber, Preservation of timber, Method of treatment, Properties of good timber, common structural timber in India, Plywood, Veneers, Manufacture of plywood & its uses, Laminated Boards, Block Boards, Fiber Boards, Plastic Coated finishes, Water & fire resistant Plywood, PVC Boards.

**Paints:-**Cement paints their properties and uses, Varnish & polish, Lacquers' and enamels their properties uses and trade names.

### Unit -V

**Glass, Plastic and water Proofing Materials Glass:-**Types of glasses and their properties: Sheet, plate frosted, wired fiber and bullet resisting glass colored glass and their use.

**Plastic:-** Properties and uses of plastic, use of plastic in civil engineering, Plastic Pipes, Taps, Valves, Polythene sheets. Water Proofing Materials.

### Text Books:-

1. Gurcharan Singh, *Building Materials*, Standard Publishers Distributors, Delhi.

### Reference Books:-

1. Rangwala S.C., *Engineering Materials*, Charotar Publishing House Pvt. Ltd., Adand.
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## Surveying Lab-1 Third Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-	-	6	3

**Course Code: DCE 351**

### Chain surveying

- Ex. (i)** (a) Ranging a line.  
(b) Chaining a line and recording in the field book.
- Ex. (ii)** Taking offsets and setting out right angles with cross staff and Indian optical square.
- Ex. (iii)** Chain survey of a small area.

### Compass survey

- Ex. (iv)** (a) Setting the compass and taking observations .  
(b) Measuring angle between the lines meeting at a point by prismatic compass.
- Ex. (v)** Traversing with the prismatic compass and chaining of a closed traverse.  
(Recording and plotting by included angles).
- Ex. (vi)** Determination of local attraction at a station by taking fore and back bearing.

### Leveling:

- Ex. (vii)** To find difference of level between two distant points by taking staff reading on different stations from the single setting of Dumpy level/Automatic level.
- Ex. (viii)** To find difference of level between two points by taking at least four change points
- Ex. (ix)** Longitudinal sectioning of a road.
- Ex. (x)** Cross- sectioning of a road.

## STRENGTH OF MATERIALS LAB Third Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-	-	3	2

**Course Code: DCE 354**

1. Determination of shear force at different sections on a simply supported beam under point loads.
2. Determination of bending moment at different sections on a simply supported beam under point and uniformly distributed loads.
3. Determination of yield stress, ultimate stress, percentage elongation, plot the stress strain diagram and compute. the value of Young's Modulus of mild steel.
4. Determination of the maximum deflection and Young's Modulus. of elasticity by deflection apparatus.
5. Determination of modulus of rigidity of material by Torsion apparatus.
6. Determination of hardness of a metal plate by Rock Well Brinellhardness testing machine.
7. To perform impact test on Izod Impact testing machine.

## BUILDING CONSTRUCTION LAB

Third Semester

L	T	P	C
-	-	3	2

Course Code: DCE 352

### LIST OF PRACTICALS:

1. To conduct field tests of cement.
2. To determine normal consistency of cement.
3. To determine setting time (initial and final) of cement.
4. To determine fineness of given sample of cement.
5. To determine compressive strength of bricks.
6. To determine water absorption of bricks
7. To Layout of a building.
8. To construct brick bonds (English and Flemish bonds) in one, one and half and two brick thick (a) walls. L. (b) Column.
9. Visit to construction site for showing the following item of works and to write specific report about the works seen.
  - (a) Construction of Masonry Walls.
  - (b) Flooring: Laying of flooring on an already prepared lime concrete base.
  - (c) Plastering of wall.
  - (d) White & colour washing.

## HYDRAULICS LAB

Third Semester

L	T	P	C
-	-	3	2

Course Code: DCE 355

- (i) To verify Bernoullis Theorem.
- (ii) To find out venturimeter coefficient.
- (iii) To determine coef. of velocity ( $C_v$ ), Coef. of discharge( $C_d$ ) Coef. of contraction ( $C_c$ ) and verify the relation between them.
- (iv) To perform Reynold's Experiment.
- (v) To determine Darcy's coefficient of friction for flow through pipes.
- (vi) To verify loss of head due to:
  - (a) Sudden enlargement
  - (b) Sudden Contraction

# SOIL MECHANICS AND FOUNDATION ENGINEERING

## Fourth Semester

<b>Course Code: DCE 401</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

### Course Contents:

#### Unit I

**Introduction:-** Definition of soil Mechanics and foundation engineering. Soil formation – different kinds of soils and soil structures.

**Fundamental definitions & their relationships:-** Graphical representation of soil as a three phase system. Definitions of moisture content, unit weight of soil mass such as bulk density, saturated density and dry density, specific gravity, mass specific gravity, void ratio, porosity and degree of saturation. Relationships between various terms stated above. Consistency limits Liquid limit, Plastic limit, Shrinkage limit, Plasticity index, Consistency index. Grain size analysis by Sieve.

#### Unit II

**Classification of soils:-** Particle size classification – I.S. Textural classification chart, brief description of plasticity chart. I.S. soil classification.

**Permeability of soils:-** Definition of permeability. Interpretation of Darcy's law, definition of discharge, velocity and seepage velocity and coefficient of percolation. Factors affecting permeability. Laboratory methods of falling head and constant head.

#### Unit III

**Compaction:-** Definition of Compaction. Standard & modified Procter compaction test. Different methods of compaction.

Brief description of field compaction methods. Compacting equipments. Indian Standards.

**Consolidation:-** Definition of consolidation. Difference between consolidation and compaction.

#### Unit IV

**Shear strength:-** Definition of shear strength. Definition of Cohesive (c) & non cohesive (Phy.) soil. Coulomb's equation. Shear box and unconfined compression tests.

**Earth pressure and earth retaining structures :-** Definition of earth pressure, active and passive earth pressures, terms and symbols relating to a retaining wall.

Relation between movement of wall and earth pressure.  $K_a$  and  $K_b$  by Rankin's Method. Simple earth pressure calculations without surcharge.

#### Unit V

**Shallow and deep Foundation:-** Definitions of shallow and deep foundations.

Types of shallow and deep foundations. Application of Terzaghi's bearing capacity formulae for different types of foundations. Factors affecting depth of shallow foundation. Classification of piles. Plate bearing tests for shallow foundations.

### Text Books:-

1. Dr. Alam Singh, *Basic Soil Mechanics & Foundations*, C.B.S. Publishers & Distributors, New Delhi.
2. Minocha & Diwedi, *Soil Mechanics*, B. Bharat Prakashan, Meerut.
3. Gadi S.K., *Soil Mechanics*, B. Tech Publishers, Lucknow.
4. Sharma S.K., *Soil Mechanics*, Asian Publishers, Muzaffarnagar.
5. Arora K.R. *Soil Mechanics & Foundation engineering*, Rajshree Publishers, Delhi.

### Reference Books:-

1. Punmia B.C., *Soil Mechanics & Foundation Engineering*, Laxmi Publication Pvt. Ltd., New Delhi

**PUBLIC HEALTH ENGINEERING – I**  
**Fourth Semester**

L	T	P	C
3	1	-	4

**Course Code: DCE 402**

**Course Contents:**

**Unit I**

**(A) Water Supply Engineering**

**Introduction:-**Necessity and brief description of water supply system. Water requirement: Per capita consumption for domestic, industrial, public and firefighting uses as per IS standards. Consumption, demand and its variation.

**Sources of Water:-**Surface water sources : Rivers, canal, impounding reservoir and lakes, their quality of water and suitability.

**Unit II**

**Water Treatment:-**Suspended, colloidal and dissolved impurities. Physical, chemical and bacteriological tests and their significance. Minimum standards required for drinking water, Principles of Sedimentation, Coagulation, Flocculation, Filtration, Disinfection (Chlorination) including Jar Test, Break point chlorination, Residual chlorine. Flow diagram of different treatment units. Function, constructional details, working and operation of

(i) Aeration fountain (ii) Mixer (iii) Flocculate (iv) Clarifier (v) Slow and rapid sand filter (vi) Chlorination chamber (viii) Water softening (ix) Removal of Iron and Magnesia. Chemicals required for water treatment, their uses, and feeding devices. Simple design of sedimentation tank, and filters.

**Unit III**

**Water Distribution**

(i) **Pipes:-**Different types of Pipes:- Cast iron, steel, plastic, (PVC, LDPE, HDPE), asbestos cement, concrete, plastic and GI pipes. Details of their sizes, joints and uses.

(ii) **Appurtenances:-**Sluice (Gate and spindle), air, reflux, scour and safety valves, fire hydrants, their working and uses.

(iii) **Storage:** Necessity, types of storing tanks: G.I. Sheet Tank, P.V.C. tank, over head tanks.

**Unit IV**

**Laying of Pipes:** Setting out alignment of pipe line. Excavation in different types of soils and precautions taken. Precautions taken for traffic control, bedding for pipe line. handling, lowering, laying and jointing of pipes, testing of pipe lines and back filling. Use of boning rods.

**Unit V**

**Building Water Supply (i)** General layout of water supply arrangement for a building (single and multistoried) as per IS Code of practice. Water supply fixtures and their installation. Tapping of water mains. (ii) Hot and Cold Water supply in buildings. Use of Solar water heaters.

**Text Books:-**

1. Rangwala S.C, *Water Supply & Sanitary Engineering*, Charotar Publishing House (P) Ltd., Anand.
2. Gurcharan Singh, *Water Supply & Sanitary Engineering*, Standard Publishers Distributors, Delhi.
3. Garg S.K., *Water Supply Engineering*, Khanna Publishers, Delhi.
4. Gupta D.V., *Water Supply & Sanitary Engineering*, Asian Publishers, Muzaffarnagar.

**Reference Books:-**

1. Modi P.N., *Water Supply Engineering*, Standard Book House, Delhi.
2. S.k.gerg, *Water Supply Engineering*,

# CONCRETE TECHNOLOGY

## Fourth Semester

<b>Course Code: DCE 403</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

### Course

#### Contents: Unit I

**Introduction:-** Definition of concrete. Brief introduction to properties of concrete. Advantages of concrete. Uses of concrete in comparison to other building materials.

**Ingredients of Concrete: (i) Cement:-** The chemical ingredients causing changes in properties, and special precautions in use of the following types of cement: Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, quick setting, white and coloured cements. **(ii) Aggregates:-** Classification of aggregates according to source, size and shape. Characteristics of aggregates particle size and shape, surface texture; specific gravity of aggregate; bulk density, water absorption surface moisture, bulking of sand and deleterious materials in the aggregate. Grading of Aggregate:- Coarse aggregate, fine aggregate.

#### Unit II

**Water Cement Ratio:-** Hydration of cement, Effect of various W/C ratios on the physical structure of hydrated cement, water cement ratio law and conditions under which the law is valid; internal moisture, temperature, age, and size of specimen. Definition of cube strength of concrete. Relations between water cement ratio and strength of concrete. Use of CBRI chart.

**Workability:** Definition, of workability. Concept of: Internal friction,, Segregation, Harshness. Factors affecting workability; water content, shape, size and percentage of fineness passing 300 mic. Measurement of workability slump test, compaction factor test. Recommended slumps for placement in various conditions. Vee-Bee Consistometer.

#### Unit III

**Proportioning for Ordinary Concrete:** Object of mix design, Strength required for various grades as per IS 456, Preliminary test, cube test. Proportioning for ordinary mix as prescribed by IS and its interpretation. Adjustment on site

for: Bulking, water content, Absorption, Workability Design data for moisture, bulking, absorption and suitable fine aggregate and coarse aggregate ratio. Difference between ordinary and controlled concrete.

**Form Work: (i)** Concept of factors affecting the design of form work (shuttering and staging) **(ii)** Materials used for form work. **(iii)** Sketches of form work for column, beams slabs. **(iv)** Stripping time for form work as per IS (No problems on the design of form work). **(v)** Removal of formwork. **(vi)** Precautions to be taken before, during and after RCC Construction. **(vii)** Special type of formwork.

#### Unit IV

**Concrete Operations:- (i) Storing Cement:-** (a) Storing of cement in the warehouse., (b) Storing of cement at site., (c) Effect of storage on strength of cement.

**Aggregate:-** Storing of aggregate on site for maintaining uniformity of moisture and cleanliness.

**(ii) Batching:-** (a) Batching of cement., (b) Batching of aggregate: Batching by volume, using gauge box, selection of proper gauge box, Batching by weight-spring balances and by batching machines., (c) Measurement of water.

**(iii) Mixing (a)** Hand mixing **(b)** Machine mixing-types of mixer, capacities of mixers, choosing appropriate size of mixers, operation of mixers, mixing of water.

#### **(iv) Compaction:**

**(a)** Hand compaction. **(b)** Machine compaction-types of vibrators (internal screed vibrators and form vibrators) immersion vibrations. Suitability of concrete mixes.

**(v)** Finishing concrete slabs-screeding, floating, and trowelling.

**(vi) Curing:-** Object of curing, Method of curing, shading concrete works, covering surfaces with hessian, gunnybags, sprinkling of water, ponding method and membrane curing, steam curing. Recommended duration for Curing.

## Unit V

**Properties of Concrete: (i) Properties in plastic stage:-**(a) Workability, (b) Segregation., (c) Bleeding. **(ii) Properties of hardened concrete:-**(a) Strength. Characteristic strength, (b) Durability, (c) Impermeability.,(d)Dimensional changes. **(iii) Admixture (uses and effect):-** (a) Accelerators and retarders., (b) Air entraining agents., (c) Water reducing and set controlling agents.

**Quality Control at site:-**Control tests on cement, aggregate water and concrete. Concept of quality control.

### Text Books:-

1. Neville A.M., *Concrete Technology*, Standard Publishers Distributors, Delhi.
2. Kulkarni P.D., *Textbook of Concrete Technology*, New Age International Publishers, Delhi.
3. Santhakumar A.R., *Concrete Technology*, Oxford University Press, Mumbai.

### Reference Books:-

1. Ramachandran V.S., *Concrete Admixtures Handbook*, Standard Publishers Distributors, Delhi.
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# IRRIGATION ENGINEERING

## Fourth Semester

L	T	P	C
3	1	-	4

**Course Code: DCE 404**

### Course Contents:

#### Unit I

**Introduction:** Definition of irrigation. Necessity of irrigation, Types of irrigation, Sources of irrigation water.

**2. Rain Fall & Run – Off:** Definition of rainfall & run-off, catchment area, Dickens's & Ryve's formulae, Types of rain gauges - Automatic & Non – automatic.

**Water Requirement of Crops:-** Definition of crop season, Duty, Delta and Base Period, their relationship, Gross command area, culturable command area Intensity of Irrigation, Irrigable area Water requirement of different crops-Kharif and Rabi.

#### Unit II

**Lift Irrigation:-**Types of Wells - shallow & deep well, aquifer types, ground water flow, construction of openwells and tube wells. Yield of an open/tube well and problems Methods of lifting water - manual and mechanical devices, use of wind mills.

**Flow Irrigation:-** Irrigation canals, Perennial Irrigation, Different Parts of irrigation canals and their functions, Sketches of different canal cross-sections, Classification of canals according to their alignment, Design of irrigation canals – Chezy's formula, Manning's formula, Kennedy's and Lacey's silt theory and equations, comparison of above, theory's. critical velocity ratio. Use of Garret's and Lacey's charts, Various types of canal lining - Advantages & Disadvantages.

#### Unit III

**Canal Head Works:-** Definition, object, general layout, functions of different parts, Difference between Weir and Barrage.

**7. Regulatory Works:-**Functions and explanation of terms used, Cross and Head regulators, Falls, Energy dissipaters, Outlets-Different types, Escapes.

#### Unit IV

**Cross Drainage Works:-**Functions and necessity of the following types:- Aquaduct, Siphon, Super passage, Level crossing, inlet and outlet., Constructional details of the above.

**Dams types:-** Earthen, causes of failure, masonry & concrete dams, Cross-section of gravity dam., Spillways causes of failure of Earthen dams.

#### Unit V

**Water Logging and Drainage:-**Definition, causes and effects, detection, prevention and remedies waterlogging Surface and sub-surface drains and their layout.

#### Major Irrigation Projects in India

#### Practice:

Visits to at least one of the Irrigation Projects and write specific report about the same. Ground Water Recharge, Aim, Method and Advantage.

#### Text Books:-

1. Agarwal G.D., *Irrigation Engineering*, B. Bharti Prakashan, Merrut.
2. Modi P.N., *Irrigation Engineering*, Standard Book House, Delhi.

#### Reference Books:-

1. Dr. Bharat Singh, *Irrigation Engineering*, Nem Chand & Bros., Roorkee.
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## BUILDING CONSTRUCTION – II

### Fourth Semester

Course Code: DCE 405

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	-	-	<b>3</b>

#### Course

#### Contents: Unit I

##### Damp Proofing

Dampness and its ill effects. Types of dampness – moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture. Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bath rooms etc. Damp proofing materials and their specifications rich concrete and mortar, bitumen, bitumen mastic. Methods of damp proofing basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, W.C. and Kitchen, Damp Proofing for roofs and window sills. Plinth Protection and Aprons.

#### Unit II

##### Floors

Ground floors:

- (a) Glossary of terms – floor finish, base course and their purpose.
- (b) Types of floor finishes – cast in situ concrete flooring (monolithic, bonded) Tile flooring. Terrazzo flooring, Timber flooring.

##### Upper floors:

- (a) Flooring on RCC Slab
- (b) Flooring on R.B. Slab.

#### Unit III

**Roofs:** Glossary of terms for pitched roofs – batten, eaves board, facial board, gable hip, lap, purlin, rafter, rafter bolt, valley, ridge. Pitched roof, steel trusses, North light truss. Roof coverings for pitched roofs – Asbestos sheeting, Trafford sheets, method of arranging and fixing to the battens, rafters, purlins – both steel and wooden. Drainage arrangement for pitched roofs.

#### Unit IV

**Stairs and Staircase:-** (i) Glossary of terms: Stair case winders landing, strings, newel, baluster, riser, tread, width of staircase, hand rail, nosing. (ii) Planning and layout 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. Bifurcated stair, spiral stair.

#### Unit V

**Surface Finishes:** Plastering – Proportion of mortars used for different plasters, preparation of mortars, techniques of plastering and curing. Pointing – Different types of pointing, mortar used and method of pointing. **Painting** – On wooden, steel and plastered wall surfaces. White washing, colour washing and distempering. Application of cement and plastic paints. Commonly used water repellants for exterior surfaces, their names and application.

#### Text Books:-

1. Kumar Susheel, *Building Construction*, Standard Publishers Distributors, Delhi.
2. Singh Gurcharn, *Building Construction*, Standard Publishers, Delhi.
3. Gupta D.V., *Building Construction*, Asian Publishers, Muzaffarnagar.

#### Reference Books:-

1. Punmia B.C., *Building Construction*. Laxmi Publication Pvt. Ltd. Delhi.

**SOIL MECHANICS AND FOUNDATION ENGINEERING LAB**  
**Fourth Semester**

<b>Course Code: DCE 451</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	-	-	4	2

1. Determination of moisture content by oven drying method.
2. Determination of specific gravity of soil particles by specific gravity bottle/pycnometer.
3. Determination of soil particles size distribution by sieving.
4. Determination of liquid limit and plastic limit of soil.
5. Determination of permeability by constant Head Permeameter and falling head permeameter.
6. Shear strength of sand by Shear Box test.
7. Unconfined compression test.
8. Standard Proctor compaction test.

**PUBLIC HEALTH ENGINEERING LAB**  
**Fourth Semester**

<b>Course Code: DCE 452</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	-	-	2	1

1. To determine dissolved and suspended solids in water.
2. To determine pH value of water sample.
3. To determine turbidity of water.
4. To calculate:
  - i. Oxygen Demand (OD)
  - ii. Biological Oxygen Demand (BOD)
  - iii. Chemical Oxygen Demand (COD)
5. To determine residual chlorine in water sample.
6. To perform Jar Test for Coagulants.
7. To perform chlorine demand test.
8. To determine hardness of water.
9. To determine available chlorine in bleaching powder.
10. To visit and write specific report for the following: (Any one)
  - a. Water treatment plant
  - b. Sewage treatment plant for 5.
  - c. Construction site for layout of water supply & sewerage system.

**CONCRETE TECHNOLOGY LAB**  
**Fourth Semester**

<b>Course Code: DCE 453</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	-	-	4	2

- (i) To determine flakiness index and elongation index of coarse aggregate (ISI:2386-pt.1-1963)
- (ii) Field method to determine fine silt in aggregate.
- (iii) Determination of specific gravity and water absorption of aggregates (IS:2386 Part-III-1963) (for aggregates 40mm to 10mm)
- (iv) Determination of bulk density and voids of aggregates (IS:2386-Part-III-1963)
- (v) To determine necessary adjustment for bulking of fine aggregate by field method (IS:2383-Part-III-1983).
- (vi) Test for workability (slump test);
  - (a) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/cement ratio on slump.
  - (b) To test cube strength of concrete with varying water cement ratio.

- (vii)** Compacting factor test for workability (IS:1199-1959)
- (viii)** Workability of concrete by Vee-Bee consistometer.
- (ix)** Fineness modulus of sand.

**CIVIL ENGINEERING DRAWING-I**  
**Fourth Semester**

<b>Course Code: DCE 454</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>2</b>	<b>-</b>	<b>6</b>	<b>5</b>

1. Foundations.
2. Doors & windows.
3. Roofs: Wooden roof truss details. Section of RCC & RB flat roofs.
4. Floors.
  - (a) Concrete floor finish over ground floor.
  - (b) Terrazzo floor finish over ground floor.
  - (c) Terrazzo tile floor finish over ground.
5. Working drawing of a two roomed building with kitchen, bath and W.C.
6. Working drawing of a three roomed building from a given line plan and given data.
  
7. Details of dog legged stairs.Plans of remaining type of stairs.
8. Detailed plan and cross section of a domestic septic and soak pit for 10 users as per IS:2470 Part I.
  
9. Detailed plan and cross section of bathroom, kitchen and W.C. connections.
  
10. Two Room building working drawing with AutoCAD.

**Text Books:-**

1. Singh Gurcharan, *Civil Engineering Drawing*, Standard Publishers Distributors, Delhi.
2. Sati K.D., *Civil Engineering Drawing – I*, Asian Publishers Muzaffarnagar.