DCE 401: CONCRETE TECHNOLOGY

Credits: 4 **Semester IV**

Module No.	Contents	Teaching Hours
I	**Introduction:** Concrete – Definition, uses in comparison to other building materials. **Ingredients of Concrete:** Cement- physical properties of cement; different types of cement as per IS Codes. Aggregates- Classification and Characteristics of aggregates according to size and shape, surface texture, specific gravity; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials, soundness, Grading of aggregates: coarse aggregate, fine aggregate; All-in- aggregate; fineness modulus; interpretation of grading charts. Water- Quality requirements as per IS: 456-2000. **Water Cement Ratio:** Hydration of cement, principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete.	10
II	**Workability:** Workability factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consistometer; Recommended slumps for placement in various conditions as per IS: 456-2000/SP-23 **Properties of Concrete:** Workability, Harshness, Segregation, Bleeding and Strength, Dimensional changes, Durability, Impermeability. Proportioning for Normal Concrete: Objectives of mix design, introduction to various grades as per IS: 456- 2000; proportioning for nominal mix design as prescribed by IS 456-2000. Adjustment on site for-Bulking of fine aggregate, water absorption of aggregate, workability, Difference between nominal and controlled concrete, Introduction to IS-10262-2009-Code for controlled mix design, **Admixtures:** Introduction to Admixtures (chemicals and minerals) for improving performance of concrete **Special Concretes**: Concreting under special conditions, difficulties and precautions before, during and after concreting-Cold weather concreting, Under water concreting, Hot weather concreting, Ready mix concrete, Fiber reinforced concrete, Polymer Concrete, Fly ash concrete, Silica fume concrete	12
III	**Concreting Operations:** 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) 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,	14

	operation of mixers, Maintenance and care of machines. Transportation of concrete- Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc. Placement of concrete- Checking of form work. Shuttering and precautions to be taken during placement. Compaction-	

	Hand compaction, Machine compaction. Vibrators – Types, internal screed vibrators and form vibrators,&election of suitable vibrators. Finishing concrete slabs - screeding, floating and trowelling. Curing- Objectives of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing, Duration for curing and removal of form work. Jointing- Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location. **Defects in concrete:** Identification of and methods of repair, Importance and methods of non-destructive tests.	

Reference Books/ Text Books / Case Studies:

1. Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi
2. Krishnamurthy,KT;Rao,AKasundraandKhandekar,AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi.
3. Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.
4. Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi.
5. Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London.
6. Orchard; "Concrete Technology"; Vol I, II, and III
7. Handoo,BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; Satya Prakashan, New Delhi,
8. Sood, Hemant, Mittal LN and Kulkarni PD; "Laboratory Manual on Concrete Technology", CBS Publishers, New Delhi, 2002.
9. Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers, Delhi.
10. Gambhir, ML; "Concrete Technology";, MacMillan India Ltd., New Delhi.
11. Siddique, R., “Special Structural Concretes”, , Galgotia Publishers Pvt. Ltd. Delhi.
12. Birinder Singh, “Concrete Technology”, Kaption Publications, Ludhiana.
13. Module on ‘Special Concretes by Dr Hemant Sood , NITTTR Chandigarh.
14. Concrete Technology by P Dayaratman.
15. Video programme on different experiments in ‘Concrete Technology’ developedby NITTTR, Chandigarh.

DCE 402: WATER SUPPLY AND WASTE WATER ENGINNERING

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
I	**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. **Quality of Water:** Physical, Chemical and bacteriological tests and their significance, Standard of potable water as per Indian Standard **Water Treatment:** Sedimentation - purpose, types of sedimentation tanks, Coagulations flocculation - Filtration - significance, types of filters, disinfection of water, forms of chlorination, break point chlorine, residual chlorine. Flow diagram of different treatment units.	14
II	**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 **Laying out Pipes:** Setting out alignment of pipes, Laying of pipes . Handling, and jointing of pipes, testing of pipe lines, back filling. **Building Water Supply:** Connections to water main (practical aspect only), Water supply fixtures and installations related to plumbing.	16
III	**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. **Sewerage System:** Types of sewerage systems, materials for sewers, joints, Appurtenance- . Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts **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 **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	18

	land treatment, Nuisance due to disposal. **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 **BuildingDrainage:** Different sanitary fittings and installations, Traps, seals, causes of breaking seals rain water harvesting daring precautions.	

Reference Books/ Text Books / Case Studies:

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

DCE 403: IRRIGATION ENGINEERING

Credits: 3 **Semester IV**

Module No.	Contents	Teaching Hours
I	**Introduction:** Definition of irrigation, Necessity of irrigation, History of development of irrigation in India. Major, medium and minor irrigation projects. 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), culturable commanded area (CCA), intensity of irrigation, irrigable area. **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. **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.	10
II	**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, **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.	12
	Dams:	

III	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. **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.	14

	Hydraulic Structures: Falls, Cross and head regulators, Outlets, Canal Escapes – genral sketch. **River Training Works:** Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off. **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.	

Reference Books/ Text Books / Case Studies:

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”.
8. Priyani BB, ‘The Fundamental Principles of Irrigtion and Water Power.
9. BIS Codes.
10. Wan. E. Houk, “Irrigation Engineering” Vol. I and II.
11. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.

DCE 404 : SURVEYING- II

Credits: 4 **Semester IV**

Module No.	Contents	Teaching Hours
I	**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 . **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 deflection angle method; traversing by stadia angles and 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.	10
II	**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. **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.	8
III	**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 only. Vertical curve- Setting out of a vertical curve. **Modern Surveying equipment and techniques:** EDM or Distomat, Planimeter, Total station, Introduction to remote	6

	sensing , GIS and GPS. **Minor Instruments:** Introduction and use of minor instruments like Clinometer, Pantograph, Abney Level etc. Use of planimeter for computing areas	

Reference Books/ Text Books / Case Studies:

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

DCE 405: DESIGN OF CONCRETE STRUCTURES

Credits: 4 **Semester IV**

Module No.	Contents	Teaching Hours
I	**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, **Methods of RCC design:** Working stress method, Limit state method. **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. **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.	16
II	**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. **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 **One Way Slab:** Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method.	14
III	**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 details (plan and two sections), **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). **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.	18

Reference Books/ Text Books / Case Studies:

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

DCE 451: CIVIL ENGINEERING DRAWINGS- II.

Credits: 2 **Semester IV**

Module No.	Contents	Teaching Hours
	WATER SUPPLY AND WASTE WATER ENGINEERING DRAWING	36
1	Drains and Sewers: 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)	
2	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	
3	Septic Tank and Soak Pit: Detailed plan and cross sections of a domestic septic tank with soak pit for 10 and 50 users	
4	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	
5	Draw sectional elevation of a two storied building showing details of one pipe and two pipes systems with sanitation system.	
6	Practice of reading water supply and sanitary engineering working drawings (PWD/urban Development agencies) including hot water and cold water supply system of a two room set.	
7	Detailed Layout Plan of Sewage Treatment Plant for a residential area and Effluent Treatment Plant for an industrial unit.	
	IRRIGATION ENGINEERING DRAWING:	36
1	Typical cross-section of a channel 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.	
2	Layout plan of a canal head works.	
3	Draw the typical L-section of a weir	
4	Draw the X-section of an Earthen Dam 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:

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

DCE 452: CONCRETE TECHNOLOGY LAB.

Credits: 2 **Semester IV**

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	Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)	
8	To determine necessary adjustment for bulking of fine aggregate	
9	To determine workability by slump test:	
10	To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump	
11	Compaction factor test for workability	
12	Nondestructive test on concrete by: **a.** Rebound Hammer Test **b.** Ultrasonic Pulse Velocity Test	
13	Tests for compressive strength of concrete cubes for different grades of concrete	

DCE 453 : SURVEYING LAB-II

Credits: 2 **Semester IV**

List Of Practical

Module No.	Contents	Teaching Hours
	Contouring: Preparing a contour plan by radial line method by the **a.** use of a Tangent Clinometer/Tachometer **b.** Preparing a contour plan by method of squares **c.** Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.	12
	Theodolite: **a.** Taking out the Theodolite, mounting on the tripod and placing it back in the box **b.** Study of a transit vernier theodolite; temporary adjustments of theodolite **c.** Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods **d.** Measurement of vertical angles and use of tachometric tables **e.** Measurement of magnetic bearing of a line **f.** Running a closed traverse with a theodolite (at least five sides) and its plotting Height of objects with and without accessible **g.** bases.	28
	Curves: **a.** Setting out of a simple circular curve with given data by the following methods I. Offsets from the chords produced II. One theodolite method IV	12
	Minor instruments: **a.** Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc. **b.** Use of planimeter for computing areas **c.** Demonstration of digital instruments through field visits to Survey of India and other government agencies.	12
	Total Station (only demonstrateons).	8