



Invertis Institute of Engineering & Technology

Invertis Village
Bareilly-Lucknow NH-24, Bareilly

Effective from the batches admitted in 2017-18
onwards

Diploma in Civil Engineering

Vision of the Institute

To develop responsible citizens who would 'think global and act local' and become the change agents of society to meet the challenges of future.

Mission of the Institute

To impart high quality Engineering and Management education to the budding professionals and provide the ambience needed for developing requisite skills to make a mark of excellence in Education, Business and Industry.

Departmental Vision

To produce a new generation of Civil Engineers by providing state-of-the-art education in Civil Engineering recognized worldwide for excellence. This would be guided by extensive research in technology and management for industrial and social needs for sustainable development.

Departmental Mission

Our endeavor is to make the department the highest seat of learning, prepare Engineers equipped with strong conceptual Foundation coupled with practical insight meet global Business changes.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) FOR DIPLOMA CIVIL ENGINEERING

The Diploma program aims to:

PEO1 Develop competent civil engineering technicians with professional skills, knowledge, abilities & attitude for wage employment and/or to become entrepreneur.

PEO2 Provide opportunities and develop competence to work as a leader, manager or team member in multidisciplinary civil engineering works and projects.

PEO3 Develop effective communication skills - Verbal, Written and Graphical, to justify technical solutions for diverse targets associated with civil engineering works.

PEO4 Provide opportunities and develop students in terms of social, economic and environment sensitive as responsible professionals.

PEO5 Develop understanding towards use of different codes - local, national and international, for execution of civil engineering works.

PEO6 Encourage and provide necessary knowledge, skills and opportunities for higher education and exploring different learning strategies for life-long learning.

PEO7 Provide opportunities and develop responsible professionals in terms of ethics and value systems.

PROGRAM OUTCOMES (POs) FOR DIPLOMA CIVIL ENGINEERING

After successful completion of the Diploma program, learners shall be able to:

PO1 Demonstrate the application of fundamental knowledge of mathematics, science, and civil engineering to solve simple problems related to civil engineering works.

PO2 Plan, design, develops and maintains civil engineering structures and buildings.

PO3 Supervise and manage civil engineering project related activities /practices/ resources effectively.

PO4 Collect samples, conduct experiments / tests and report results pertaining to civil engineering for execution of quality work

PO5 Communicate effectively through verbal, written and graphical presentations to diverse personnel

PO6 Understand the importance of ethical and professional responsibility and practices as civil engineer.

PO7 Ensure optimum use of resources in the context of environmental sensitivity, sustainable development and occupational safety.

PO8 Exhibit effective team work and function as leader & members in multidisciplinary civil engineering projects

PO9 Realize the habit of lifelong learning to stay abreast of the latest developments in civil engineering and allied field

PO10 Demonstrate necessary knowledge, skills and attitudes required to become an entrepreneur in civil engineering related business.

PO11 Appreciate and apply modern techniques, materials and tools for civil engineering construction works.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Learners will be able to apply technical skills and modern engineering tools for civil engineering day to day practice.

PSO2: Learners will be able to participate in practical aspects and problem solving of civil engineering field that requires analytical and design requirements.

PSO3: Learners will be able to pursue of lifelong learning and professional development to face the challenging and emerging needs of our society.

PSO4: Learners will comply with small to large concepts of building and civil engineering practical and field works to bring out safer and aesthetic environment to live.

CURRICULUM SEMESTER WISE

Diploma in Civil Engineering

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			
THEORY												
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
PRACTICAL/TRAINING/PROJECT												
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
		TOTAL	15	5	15	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

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			
THEORY												
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
PRACTICAL/TRAINING/PROJECT												
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
		TOTAL	17	5	16	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

YEAR III, SEMESTER V

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DCE501	Transportation Engineering – I	3	1	0	20	10	10	40	60	100	4
2	DCE502	Surveying – II	3	1	0	20	10	10	40	60	100	4
3	DCE503	Construction Management	4	0	0	20	10	10	40	60	100	4
4	DCE504	Earth quake Engineering	3	1	0	20	10	10	40	60	100	4
5	DCE505	Public Health Engineering – II	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DCE551	Transportation Engineering Lab	0	0	3	-	-	-	50	50	100	2
7	DCE552	Surveying Lab – II and Survey Camp of one week duration	0	0	6	-	-	-	50	50	100	3
8	DCE553	Mini Project work	0	0	2	-	-	-	100	100	200	3
9	GP501	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	16	4	11	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

YEAR III, SEMESTER VI

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DCE601	Design of RCC Structures	3	2	0	20	10	10	40	60	100	4
2	DCE602	Design of Steel Structures	3	1	0	20	10	10	40	60	100	4
3	DCE603	Transportation Engineering – II	3	1	0	20	10	10	40	60	100	4
4	DAS604	Environmental and Ecology	2	0	0	10	05	05	20	30	50	2
5	DCE605	Estimation , Costing and valuation	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DCE651	RCC Lab	0	0	3	-	-	-	50	50	100	2
7	DCE652	Major Project	0	0	8	-	-	-	150	200	350	8
8	GP601	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	14	5	11	90	45	45	430	520	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

**DEPARTMENT OF
CIVIL
ENGINEERING**

**SYLLABUS OF
3rd Semester**

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
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
PRACTICAL/TRAINING/PROJECT												
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
		TOTAL	15	5	15	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

Course Outcome of 3rd Semester

Subject: Surveying I
Subject Code: DCE 301
Credit: 4

Pre-requisite: Elementary knowledge of mathematical calculations and physics.

Course Objective:

- 1) To develop and plan process for any civil engineering or mining project, at first field survey of that area is carried out and various type of survey maps are prepared.
- 2) These maps and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and construction process etc

Course Outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

- CO1:** Handle various survey instruments for a particular survey work.
- CO2:** Carry out various civil engineering survey works.
- CO3:** Collect and analyze survey data for preparing drawings and maps.
- CO4:** Apply checks for errors elimination

Course Contents:

SURVEYING – I **Third Semester**

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) ssp 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 VidyarthiGrihaPrakashan, 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.
- Chandra A.M., *Surveying Problem Solving with Theory & Objective Type Questions*, New Age International Publishers New Delhi.

Subject: Building Construction - 1

Subject Code: DCE 302

Credit: 4

Pre-requisite: Basic knowledge of types of structures and properties of materials used in daily needs.

Course Objectives:

1. To study about various method for construction technology and also basic knowledge of it

2. To study about modern construction technology, equipments, pile foundations.
3. To study about the temporary structures like formwork, shuttering etc
4. To study about different earthquake terminology & earthquake resistant

Course Outcome:

CO1: To know the basic Knowledge and understanding of construction technology on the field.

CO2: Study about the equipment used in construction technology and various construction and structural elements and methods of construction.

CO3: To study types of staircase, paints, roofs, trusses, floors and methods of DPC in a building.

CO4: To understand the basic concepts of methods of construction of doors, windows, lintels and arches and the mortar used for different elements.

Course Content:

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.

Subject: Building Material

Subject Code: DCE 303

Credit: 4

Pre-requisite: Knowledge of basic materials, rocks and types of soil and the basics of chemistry and physics.

Course Objectives:

- 1) To select materials for engineering purpose is very much crucial activity In civil engineering any material of construction, the first and for most necessity is to know its properties, suitability, strength and durability.
- 2) To suggest the most suitable material which may fit the exact requirement of the construction items. In this course, the technology related to some of the important and widely used construction materials has been dealt with.
- 3) To enrich civil engineering technicians in performing their jobs with ease and confidence and will be able to select appropriate material for the given item of work on site.

Course Outcome:

After successful completion of this course students will able to:

CO1: Measure the required physical, chemical and engineering properties of Building Materials.

CO2: Select the appropriate construction materials as per construction activities and specifications.

CO3: Perform the different test for quality assurance of Building Materials.

CO4: Select and justify appropriate advanced and modern building materials for various applications.

CO5: Ascertain the current market price of each and every construction material.

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, Chir, 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 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.

Subject: Strength of Materials

Subject Code: DCE 304

Credit: 4

Pre-requisite: Knowledge of basic mathematical equation analysis and concepts of physics.

Course Objective:

1. To acquire Advance knowledge of structural behavior under direct loading.
2. To Analyse Statically Determinate structures like Beam, Column & Truss.
3. The subject will enable the student to analyze Steel & Concrete Structures used in Civil Engineering construction.

Course Outcome:

CO1: Analyze simple statically determinate structures like beam, column and truss under loading conditions.

CO2: Analyze the behavior of structural members with typical loading.

CO3: Evaluate the properties of materials of various members under direct loading.

Course Content:

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.

Subject: Hydraulics

Subject Code: DCE 305

Credit: 4

Pre-requisite: Basic knowledge of material, physical and chemical properties of water.

Course Objectives:

1. To understand the behavior of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc. is necessary for civil, environmental and transportation engineers.
2. To acquire basic knowledge about hydraulics will be useful in subjects like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application oriented content has been kept with a focus that students should be able to solve practical problems.
3. To develop Competencies by this course would therefore be useful for students while performing his/her job in the field of Water resources / Irrigation/ PHE and Environment Engineering.

Course Outcome:

After successful completion of this course students will able to:

CO1: Perform various tests regarding behavior of fluid/liquid.

CO2: Interpret the problems related to fluid/liquid and apply for solving fluid mechanics problem.

CO3: Compute discharge and loss of head through pipes, open channels, notches and other hydraulic structures.

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 Publications (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:-

Garde R.J., *Fluid Mechanics*, New Age International Publishers, New Delhi.

**DEPARTMENT OF
CIVIL
ENGINEERING**

**SYLLABUS OF
4th Semester**

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
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
PRACTICAL/TRAINING/PROJECT												
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
		TOTAL	17	5	16	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

Course Outcome of 4th Semester

Subject: Soil Mechanics and Foundation Engineering

Subject Code: DCE 401

Credit: 4

Pre-requisite: The earth structure and types of soil found in India. Concepts and knowledge of mathematics and solving linear equations.

Course Objectives:

1. To study different soil properties and soil characteristics.
2. To study different loading conditions soil is subjected to various stresses and problems like water logging, liquefaction of soil, seepage through soil and settlement.
- 3.

After successful completion of the course, the learners will be able to:

CO1: Calculate standard soil properties and classify a soil.

CO1: Carry-out laboratory tests for measuring engineering property parameters of a soil sample.

CO1: Specify the essential features and requirements of site investigation.

CO1: Calculate stresses in soil under various loading conditions.

Course Content:

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

Subject: Public Health Engineering I

Subject Code: DCE 402

Credit: 4

Pre-requisite: Knowledge of physical and chemical properties of water. Physics of fluid and its motion and material used to carry water.

Course Objectives:

1. To know the extremity of water crisis, we must appreciate water as "Nature's greatest gift". Our water requirement is rapidly increasing due to vast industrial development, population growth and changing life style. We are mostly dependent on rains as a predominant source of water.
2. To know that ground water table is declining rapidly due to its excessive use and misuse and also due to insufficient rainfall every year.
3. To stress upon the concept of water management and simultaneously to create the awareness about the proper use and conservation of water, this course is specially designed for the students of Diploma in Civil Engineering.
4. To develop theoretical knowledge with emphasis on certain aspects of water resources management an attempt has been made. The topics viz. hydrology, runoff, watershed management, etc. have been specifically dealt in the curriculum.

Course Outcome:

After successful completion of this course, students will be able to

CO1: Apply strategies of water resources management

CO1: Identify and select appropriate water resources for domestic, commercial and industrial application.

CO1: Collect, compute and analyze hydrological data.

CO1: Select the appropriate methods of artificial recharging for rain water and rainwater harvesting structures.

CO1: Develop a proper planning of laying the pipes for water supply.

CO1: Ensure effective/optimum utilization of water and maintain water resources

Course Content:

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 (vii) 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.

(iv)

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.
- S.k.gerg ,*Water Supply Engineering*,

Subject: Concrete Technology

Subject Code: DCE 403

Credit: 4

Pre-requisite: Types and properties of building materials used for the construction.

Course Objectives:

- 1) To study the basic composition of concrete,
- 2) To study the properties of cement and aggregate.
- 3) To study about the admixtures and its types, workability of concrete.
- 4) To study about the concrete mix design, hardened concrete, special concrete.

Course Outcomes:

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

CO1: To know the basic properties of ingredients of concrete.

CO1: To know about the different tests of cement and aggregate.

CO1: To know about the workability and strength of concrete.

CO1: To know the different type of concrete and mix design.

CO1: To know about the concreting techniques.

Course Content:

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 IS456, 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, bulkage, 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.

Subject: Irrigation Engineering

Subject Code: DCE 404

Credit: 4

Pre-requisite: Basic knowledge of crops and it seasons, concept of physical characteristics of water and necessity of water for crops.

Course Objectives:

- 1) To understand the behavior of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc. is necessary for civil, environmental and transportation engineers.
- 2) To acquire basic knowledge about the subject will be useful in subjects like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application oriented content has been kept with a focus that students should be able to solve practical problems.
- 3) To develop Competencies by this course would therefore be useful for students while performing his/her job in the field of Water resources / Irrigation/ PHE and Environment Engineering.

Course Outcomes:

After successful completion of this course students will able to:

CO1: Perform various tests regarding behavior of fluid/liquid.

CO2: Interpret the problems related to fluid/liquid and apply for solving fluid mechanics problem.

CO3: Compute discharge and loss of head through pipes, open channels, notches and other hydraulic structures.

CO4: Solve practical problems related to irrigation, water logging, and canals for the purpose of irrigation.

Course Content:

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 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:- Aqueduct, 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.

Subject: Building Construction II

Subject Code: DCE 405

Credit: 4

Pre-requisite: Basic knowledge of building materials, properties of different materials like bricks, cement, aggregates, etc.

Course Objectives:

- 1) To study about various method for construction technology and also basic knowledge of it.

- 2) To study about modern construction technology, equipments, pile foundations.
- 3) To study about the temporary structures like roofs, floors, slabs and their method of construction.
- 4) To study about different types of stairs, floors finish, paints and water repellents.

Course Outcomes:

After successful completion of the course, the learners will be able to-

CO1: To know the basic Knowledge and understanding of construction technology on the field

CO2: Study about the equipment used in construction technology.

CO3: To study types of staircase, roofs and slabs for floors.

Course Content:

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, rag

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 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 Pvt. Ltd. Delhi.

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF 5th Semester

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DCE501	Transportation Engineering – I	3	1	0	20	10	10	40	60	100	4
2	DCE502	Surveying – II	3	1	0	20	10	10	40	60	100	4
3	DCE503	Construction Management	4	0	0	20	10	10	40	60	100	4
4	DCE504	Earth quake Engineering	3	1	0	20	10	10	40	60	100	4
5	DCE505	Public Health Engineering – II	3	1	0	20	10	10	40	60	100	4

PRACTICAL/TRAINING/PROJECT												
6	DCE551	Transportation Engineering Lab	0	0	3	-	-	-	50	50	100	2
7	DCE552	Surveying Lab – II and Survey Camp of one week duration	0	0	6	-	-	-	50	50	100	3
8	DCE553	Mini Project work	0	0	2	-	-	-	100	100	200	3
9	GP501	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	16	4	11	100	50	50	450	500	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

Course Outcome of 5th Semester

Subject: Transportation Engineering I

Subject Code: DCE 501

Credit: 4

Pre-requisite: Basic concept of speed, velocity and formula of time and distance relationship. Information about building materials

Course Objectives:

- 1) To know the economy of any country is widely dependent either direct or indirect way on the transportation of various commodities which in turn dependent upon the “How efficiently the transportation system of the country is functioning.” Therefore, knowledge and understanding of various designs, construction and maintenance aspects of roads, railway and bridges are very important for engineers working at site in order to make transportation system safe and efficient.
- 2) To study about these aspects of roads, railways and bridges so as to develop their understanding in order to apply their knowledge in improving civil infrastructure for Transportation

Course Outcome:

CO1: After successful completion of this course, students will be able to

CO2: Prepare drawing of basic components of roads as per standards.

CO3: Setting out and supervise construction of different types of pavements such as flexible, rigid.

CO4: Select appropriate road materials for road construction at different stages as per design and specification.

CO5: Interpret geometric design fundamentals.

CO6: Demonstrate traffic control devices.

Course Content:

Unit I

HIGHWAYS

Introduction: (i) Importance of Highway transportation. (ii) Functions of IRC. (iii) IRC classification of roads. (iv) Organization of state highways department.

Road Geometrics: (i) Glossary of terms used in geometrics and their importance; Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient. (ii)

Drawing of typical cross-sections in cutting and filling on straight. (iii) Under pass & over pass (flyovers and bridges) Highway Surveys and Plans.

(i) Basic considerations governing alignment for a road in plain and hilly area.

(ii) Highway location.

Unit II

Marking of alignment.

Traffic Engineering: (i) Traffic control devices - Signs, markings and signals, their effectiveness and location, installation of signs, IRC standards. (ii) Segregation of traffic. (iii) Types of intersections and how to choose them. (iv) Accidents: Types, causes and remedies.

Road Materials: (i) Different types of road materials in use; soil, aggregates binders. (ii) Function of soil as Highway sub grade. (iii) C.B.R; Method of finding. CBR value and its significance. (iv) Aggregates : Availability of road aggregates in India, requirements of road aggregates as per IS specifications. (v) Binders: Common binders; cement, bitumen and Tar, properties as per IS specifications, penetration and viscosity test , procedures and significance. cut back and emulsion and their uses.

Unit III

Road Pavements ; Types and Their Construction: (i) Road pavement : Flexible and rigid pavement, their merits and demerits, typical cross-sections , functions of various components. (ii) Sub-grade preparation - 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. methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for sub grade preparation. (iii) Flexible pavements: sub base necessity and purpose. stabilized sub base; purpose of stabilization.

Types of Stabilization: (a) Mechanical stabilization. (b) Lime stabilization. (c) Cement stabilization. (d) Fly ash stabilization. (e) Granular sub base

(iv) **Base course:** (a) Brick soling. (b) Stone soling. (c) Medaling: water bound macadam and bituminous macadam. Methods of construction as per Ministry of Shipping and transport (Government of India).

(v) **Surfacing:**

Types of surfacing: (a) Surface dressing. (b) (i) Premix carpet. (ii) Semi dense carpet (S.D.C)

(c) Asphalt concrete. (d) Grouting.

Methods of constructions as per Ministry of Surface and Transport, Government of India, specifications and quality control; equipment used.

(vi) **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.

Unit IV

Hill Roads: (i) Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cut and partly in fill. **(ii) Landslides :** Causes, preventions and control measures.

Road Drainage: (i) Necessity of road drainage work, cross drainage works. **(ii)** Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross-sections.

Road maintenance: (i) Common types of road failures-their causes and remedies. **(ii)** Maintenance of bituminous roads such as patch work and resurfacing. Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices.

Unit V

Construction Equipment: Output and use of the following plant and equipments:

(i) Hot Mix Plant. **(ii)** Tipper, tractors (wheel and crawler) scraper, bull-dozer, dumpers, shovels, grader, roller, dragline. **(iii)** Asphalt mixer and tar boilers. **(iv)** Road pavers.

Arboriculture: Names of trees used in arboriculture, distance of trees from centre of roads and distance between centre to centre of trees, tree guards, maintenance and revenue from trees.

Text Books:-

1. Gupta B.L., *Road, Railway, Bridges, Tunnels & Harbour Dock Engineering*, Standard Publishers Distributors, Delhi.
2. Rangwala S.C., *Highway Engineering*, Charotar Publishing House (P) Ltd., Anand.
3. Ahuja & Birdi, *Road, Railway, Bridges & tunnels Engineering*, Standard Books House, Delhi.

Reference Books:-

1. Khana S.K. & Justo, *Highway Engineering*, Nem Chand & Bros., Roorkee.

Subject: Surveying II

Subject Code: DCE 502

Credit: 4

Pre-requisite: Knowledge and basic concepts of surveying and instruments used in surveying.

Course Objectives:

- 1) To study Field survey and the basic requirement for preparing any engineering maps or drawings.
- 2) To carry out Field survey professionally various steps involved in the survey work are known with skills of operating modern survey equipment.
- 3) To study about these aspects so as to develop their understanding, performance oriented abilities in order to apply their knowledge in construction industry.

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Calculate heights of different structures using appropriate instruments.

CO2: Calculate relative altitudes and distances of different points on ground.

CO3: Perform setting of horizontal curves on field.

CO4: Carry-out survey work using total station.

Course Content:

Unit I

Plane Table surveying

- (i) Purpose of plane table surveying. Equipment used in plane table survey
(a) Plane table, (b) Alidade (Plain and Telescopic), (c) accessories.
- (ii) Method of plane tabling (a) centering (b) leveling (c) Orientation.
- (iii) Methods of plane table surveying (a) Radiation, (b) Intersection, (c) Traversing (d) Resection.
- (iv) Two point problem.
- (v) Three point problem by
(a) Mechanical Method (Tracing paper), (b) Bessel's Graphical Method.
(c) Trial and error method.

Errors in plane table survey and precautions to control them.

Unit II

Contouring: Concept of contour: Purpose of contouring; Contour interval and horizontal equivalent; Factors affecting contour interval; characteristics of contour; 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 earthwork and reservoir capacity from a contour map.

Unit III

Theodolite Surveying: Working of a transit vernier theodolite, Fundamental axes of a theodolite and their relation; Temporary adjustments of a transit theodolite; least count and 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 method; traversing by stadia measurement; Theodolite triangulation and plotting a traverse; concept of coordinate. Errors in theodolite survey and precautions taken to minimize them; Limits of precision in theodolite traversing. Principle and working of a Electronic theodolite. Brief introduction to tachometry. Total Station & Auto Level : Working and application of total station and auto level.

Unit IV

Curves: Simple circular curves: Need and definition of a simple circular curve; Elements of simple circular curve, Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord, deflection angle, apex distance and mid-ordinate. Setting out of simple circular curve: (a) By linear measurements only: - Offsets from the tangents. - Successive bisection of arcs. - Offsets from the chord produced. (b) By Tangential angles using a theodolite.

Unit V

Transition Curves: Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curves; length of transition curves for roads by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only. **Vertical curves:** Setting out of a vertical curve.

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. Dass G., *Surveying Vol. I & II*, Nav Bharat Prakashan, Meerut.

Reference Books:-

1. Punmia B.C., *Surveying Vol. I & II*, Laxmi Publications (P) Ltd. New Delhi.
2. Guggal S.K., *Surveying Vol. I & II*, New Age International Publishers New Delhi.
3. Chandra A.M., *Surveying Problem Solving with Theory & Objective Type Questions*, New Age

Subject Code: DCE 503

Credit: 4

Pre-requisite: Basic knowledge of steps followed in construction of any structure and materials used.

Course Objectives:

- 1) To study about the construction works management and equipment use on the site.
- 2) Application of new construction activities.
- 2) To study about scheduling techniques, CPM & PERT.

Course Outcome:

After successful completion of the course, learners will be able -

CO1: To gain the knowledge and understanding of construction works and field management.

CO1: To know about the construction planning, scheduling & controlling.

CO1: To know about the material and labor management, equipment management, safety management and disaster management.

Course Contents:

Unit I

Introduction: (i) Classification of construction into light, heavy and industrial construction. construction from conception to realization. (iii) The construction team: Owner, engineer and contractors, their functions and interrelationship. (iv) Resources for construction industry; men, machines, materials, money and management. (v) Main objectives of Civil engineering management. (vi) Functions of construction management, planning, organizing, staffing, directing, controlling and co-ordination, meaning of each of these with respect to a construction job.

Unit II

Construction Planning: (i) Stages at which planning is done. Pre tender and contract planning by the contractor. (ii) Scheduling: Definition, Methods of scheduling: bar charts and CPM, advantages of scheduling. No problem on CPM to be set in the examination. (iii) Planning and scheduling of construction jobs by bar charts.(iv) Preparation of construction schedule, labour schedule, material schedule, and equipment schedule. (v) Limitations of bar charts. (vi) Cost-time balancing.

Unit III

Organization: (i) Types of organization: Line, staff, functional and their characteristics. (ii) Principles of organization; (only meanings of the following and their significance); Span of control ; Delegation of authority and responsibility; Ultimate authority and responsibility; Unity of command; contact; unity of assignment; job definition; increasing organization relationship. (iii) Motivation and human relationship concept, need and fundamentals.

Site Organization: (i) Factors influencing, job layout from site plan. (ii) Principle of storing and stacking materials at site. (iii) Location of equipment. (iv) Preparation of actual job layout for a building. (v) Organizing labour at site.

Unit IV

Construction Labour: (i) Conditions of construction workers in India, wages paid to workers. (ii) Trade unions connected with construction industry and trade Union Act. (iii) Labour welfare. (iv) Payment of wages Act. Minimum wages Act. (v) Workmen compensation Act. (vi) Contract Labour Act.

Control of Progress: (i) Methods of recording progress. (ii) Analysis of progress. (iii) Taking corrective actions keeping head of office informed.

Unit V

Inspection and Quality Control :- (i) Principles of inspection. (ii) Major items in construction job requiring quality control.

Accidents and Safety in Construction: (i) Accidents - causes. (ii) Safety measures for: - (a) Excavation work (b) Drilling and blasting. (c) Hot bituminous works. (d) Scaffolding, ladders, form work. (e) Demolitions. (iii) Safety campaign. Professional practice.

Text Books:-

1. Sadimala C.M., *Materials and Financial Management*, New Age International Publishers, Delhi.

Reference Books:-

1. Gahlot P.S., *Construction Planning and Management*, International Publishers, Delhi.

Subject: Earthquake Engineering

Subject Code: DCE 504

Credit: 4

Pre-requisite: knowledge of earth's structure and preliminary concepts of physics and mathematics and structure analysis 1 and 2.

Course Objectives:

- 1) To teach analytical methods for evaluation of seismic resistance buildings.
- 2) To highlight the deficiencies of existing multi-storeyed reinforced buildings.
- 3) To describe the available seismic retrofit strategies for the deficient buildings.

Course Outcomes:

After learning the course the students should be able to:

CO1: Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.

CO2: Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.

CO3: Determine the lateral forces generated in the structure due to earthquake.

CO4: Apply the concept of ductile detailing in RC structures

Course Contents:

Unit :- I

Causes of earthquakes and seismic waves, magnitude, intensity and energy release, Basic terminology, Characteristics of earthquakes, Seismic hazard, vulnerability and risk, Seismic Zoning. Earthquakes performance of structures in past earthquakes.

Unit :- II

Philosophy of earthquake resistant design and concept of ductility, Short and long period structures, Concept of spectrum, Static force calculations. Architectural considerations : Building simplicity, symmetry. Irregularities, Continuity and Uniformity.

Unit :- III

Effect of soils and liquefaction, Remedial measures, Construction of earth structures. Seismic construction of masonry buildings, provisions of IS:4326.

Unit :- IV

Seismic construction of RC buildings detailing, provisions of IS: 13920. Retrofitting of masonry and reinforced concrete buildings.

Unit :- V

DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

Text Books:-

1. Srivastava H.N., *Earthquakes Geography and Management*, New Age International Publishers, Delhi.
2. Jai Krishna, *Elements of Earthquake Engineering*, South Asian Publishers, New Delhi.
3. Chopra A.K., *Dynamics of Structure*, Pearson Education.

Reference Books:-

1. Agarwal P.N., *Engineering Seismology*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Richter C.F., *Elementary Seismology*, Eurasia Publishing House Pvt. Ltd., New Delhi.
3. IS: 4326 India Standard- "Earthquake Resistant Design and Construction of Buildings – Code of Practice" Bureau of Indian Standard, MankBhawan, New Delhi.
4. IS: 13920 India Standard- "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces" Bureau of Indian Standard, MankBhawan, New Delhi.

Subject: Public Health Engineering II

Subject Code: DCE 505

Credit: 4

Pre-requisite: Complete knowledge of public health engineering I and water resource engineering.

Course Objectives:

- 1) To study about quality of water and waste water and also have general idea about different methods of removing impurities.
- 2) To study techniques for treatment of water and waste water like skimming, screening, sedimentation & filtration.
- 3) To study about the disposal of the sewage.
- 4) To have brief idea regarding water supply and its treatment before supplying to the consumers.

Course Outcomes:

CO1: To know about the quality and quantity of water.

CO2: To know the treatment of water & distribution system.

CO3: To know the sanitation system and disposal of the sewage.

CO4: To know about drains and sewer sections.

Course Contents:

Unit:- I

(B) SANITARY ENGINEERING

Introduction: Waste: Dry, semi liquid, liquid, Necessity of systematic collection and disposal of waste. Brief description of sewage disposal system. Conservancy and water carriage system, their advantages and disadvantages.

Quantity of Sewage: (i) Sewage: Domestic, industrial and storm water. (ii) Volume of domestic sewage (DWF), variability of flow, limiting velocities in sewers. (iii) Use of table as per IS 1742-1983 to determine relationship between gradient, diameter, discharge and velocity.

Unit:- II

Sewerage Systems: (i) Types of sewerage systems separate, combined and partially separate. (ii) Sewers : Stoneware, cast iron, concrete and masonry sewers their sizes and joints. (iii) Appurtenances: (Location, function and construction) manholes, drop manhole, lamp hole catch basin, inverted siphon, flushing tanks, ventilating shafts and storm water flows. (iv) **Laying of sewers:** Setting out alignment of sewer. Excavation, checking the gradient with the help of boning rods, preparation of bedding, handling, lowering, laying and jointing, testing and backfilling. (v) Construction of surface drains and different sections required.

Unit:- III

Building Drainage: (i) Aims of building drainage and its requirements. General layout of sanitary fittings and house drainage arrangement for a building (single and multistoried) as per IS 1742-1983. (ii) Different sanitary fittings and their installation. (iii) Traps, seal in traps, causes of breaking of seal, precautions taken, Gully, Intercepting and Grease traps.

Unit:- IV

Rural Sanitation: (a) Drainage: Topography, alignment of lanes, storm water, natural passage, development of drains, alignment, size and gradient. Phase Programme. (b) Disposal of night soil and village latrines: (i) Collection and disposal of garbage and refuse.

Unit:- V

Maintenance: Inspection of mains, cleaning and flushing of sewers. Precautions during cleaning,

maintenance of traps, cleaning of house drainage line. Tools and equipment needed for maintenance.

Sewage Treatment: (i) Meaning and principle of primary and secondary treatment, constructional details of screening chamber, grit chamber, clarifier, trickling filters, secondary clarifiers/aeration tank.

(ii) Sludge treatment, sludge digestion, sludge drying, sludge disposal **(iii)** Oxidation ponds.

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.

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF 6th Semester

SYLLABUS OF 6th SEMESTER

S. No.	Course Code	SUBJECT	PERIODS	EVALUATION SCHEME		TOTAL	Credit
				SESSIONAL EXAM.	E-		

			L	T	P	CT	TA	AT	TOTAL	SEM.		
THEORY												
1	DCE601	Design of RCC Structures	3	2	0	20	10	10	40	60	100	4
2	DCE602	Design of Steel Structures	3	1	0	20	10	10	40	60	100	4
3	DCE603	Transportation Engineering – II	3	1	0	20	10	10	40	60	100	4
4	DAS604	Environmental and Ecology	2	0	0	10	05	05	20	30	50	2
5	DCE605	Estimation , Costing and valuation	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DCE651	RCC Lab	0	0	3	-	-	-	50	50	100	2
7	DCE652	Major Project	0	0	8	-	-	-	150	200	350	8
8	GP601	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	14	5	11	90	45	45	430	520	950	29
L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks												

Course Outcome of 6th Semester

Subject: Deign of RCC Structures

Subject Code: DCE 601

Credit: 4

Pre-requisite: Knowledge of properties of cement, concrete, aggregates and behavior of structures under different loads. Concept of structural moments and shear force and calculation.

Course Objectives:

- 1) To study about various methods for designing structural components like beam, column, slab, footing etc.
- 2) To study the IS provisions for design consideration of different R.C.C. structures.
- 3) To study about the concept of designing slabs and their reinforcement required.

Course Objectives:

CO1 : To design various components of the structure.

CO2: Study of development length and shear reinforcement.

CO3: To design the axially loaded column, isolated column footing.

Course Content:

Unit I

Introduction: Concept of reinforced concrete structures, advantages and disadvantages. Different materials used in RCC with their properties. Load and loading standard as per IS:875 Concept of design of reinforced concrete based on working stresses method and limit state method and their difference.

(A) Design based on Working Stress Method: Fundamental of working stress method: **(i)** Assumptions in the theory of simple bending for RCC beams. **(ii)** Flexural strength of a singly reinforced RCC beam. Position of the Neutral Axis. Resisting moment of the section, critical neutral axis, actual neutral axis, concept of balanced, under reinforced and over-reinforced sections. **(iii)** Shear Strength : Permissible shear stresses as per IS:456 – 2000. Development of stresses in reinforcement, development length and anchoring of bars. **(iv)** Bond Strength: Concept of bond, local and average, permissible bond stresses for plain and deformed bars as per IS, minimum length of embedment of bars, minimum splice length, actual bond stress in RCC beams and slabs, bond length as per IS: 456 – 2000. Design of singly reinforced concrete beams as per IS:456 – 2000 from the given data such as span, load and properties of materials used. Design of lintel.

Unit:- II

Design of a cantilever beam and slab. Design of Doubly Reinforced Concrete Beams: **(i)** Doubly reinforced concrete beam and its necessity., **(ii)** Strength of a double reinforced concrete beam section., **(iii)** Method of design: Simple problems only. **(iv)** Reinforcement details of doubly reinforced concrete beam.

Design of RCC Slabs:- **(i)** Structural behavior of slabs under uniformly distributed load (UDL)., **(ii)** Types of end supports., **(iii)** Design of one way slab., **(iv)** Design of Two-way slab with the help of tables of IS:456 –

2000.(Corners not held down)-IS-code method., **(v)** Detailing of reinforcement.

Unit:- III

Design of Tee Beams:- **(i)** Structural behaviour of a beam and slab floor laid monolithically., **(ii)** Rules for the design of T-Beams., **(iii)** Economical depth of T-Beams, Strength of T-Beams., **(iv)** Design of singly reinforced Tee-Beams., **(v)** Detailing of reinforcement.

Unit:- IV

Design of Columns & Column Footings:- **(i)** Concept of long and short columns. **(ii)** Specifications for main and lateral reinforcement. **(iii)** Behavior of RCC column under axial load. **(iv)** Design of Axially loaded short and long columns with hinged ends (circular, square and rectangular as per IS specifications). **(v)** Concept of column footing. Design criteria. Design of square isolated column footings. **(vi)** Detailing of reinforcement.

Cantilever Retaining Wall:- Concept of design and function of different parts of a cantilever retaining wall and reinforcement details (No numerical shall be asked in the examination).

Unit:- V

Design Based on Limit State Method:- Fundamentals of Limit State Method **i.** Theory of limit state method. **ii.** Partial safety factors. **iii.** Flexural strength. **iv.** Shear Strength. **v.** Development Length of bars. Design requirements.

Design of the following : **i.** Singly reinforced rectangular beam. **ii.** One way slab simply supported

Text Books:-

1. S.K. Mallick, *Reinforced Concrete*, Oxford & IBH Publishing Co., Delhi.
2. Ashok K. Jain, *Reinforced Concrete by Limit State Design by Nem Chand & Bros.*, Roorkee.

Reference Books:-

1. Punmia B.C., *Limit State Design of Reinforced Concrete*, Laxmi Publication (P), Delhi.
2. Raju N.K., *Reinforced Concrete Design IS 456 – 2000 Principles & Practice*, New Age International Publishers, New Delhi.

3. BIS, *IS 456 – 2000 Code of Practice for Plain & Reinforced Concrete*.

Subject: Design of Steel Structures**Subject Code: DCE 602****Credit: 4****Pre-requisite:** Properties of steel as material used in structures and the concept of moment of resistance, shear force and bending of steel.**Course Objectives:**

- 1) Analysis and design of steel structure.
- 2) Design of bolted and welded connections.
- 3) Analysis and design of axially loaded tension member, axially loaded column, design of lacing and batten system, design of slab base foundation.

Course Outcomes:**CO1:** To know the basic properties of steel and to understand the behaviour according to it.**CO2:** To know the different steel structure analysis and design.**CO3:** To know the design and analysis of angle sections, bolted & welded connection.**CO4:** Design of steel structures according to IS-800-2007 by limit state method.**Course Contents:****Unit:- I****Structural Steel and Sections:** (ii) Properties of structural steel as per IS:226 and IS:1977, Designation of structural steel sections as per IS Handbook and IS:800.**Structural Steel Connections: (i) Riveted connections** - types of rivets, permissible stresses in rivets.

Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints.

Specification for riveted joints. Design of riveted joints for axially loaded members.

(ii) Welded Connections:- Comparison between riveted and welded joints, types of welds, permissible stresses in welds, types of welded connections, strength of welded joint, Design of welded joints for axially loaded members.**(iii) Introduction to Bolted Connections.****Unit:- II****Tension Members:** Forms of common sections. Permissible Stresses in tension for steel. Strength of a tension member. Design of tension members (flats, angles & Tee Sections only). Tension splice and their design.**Unit:- III**

Compression Members: Design of struts and columns as per IS:800. Effective length, slenderness ratio and permissible stresses, simple and built up sections, concept of lacings in built up columns.

Unit:- IV

Beams: Design criteria, allowable stresses, Design of laterally restrained beams including simple built-up sections, Checks for web bulking, web crippling and deflection.

Unit:- V

Column Bases:-Column bases, design of simple column base for axially loaded columns.

Text Books:-

1. Ram Chandra, *Design of steel Structures*, Standard Book House, Delhi.
2. Negi L.S., *Design of steel Structures*, Tata Mc. Graw Hill Education Pvt. Ltd., Delhi.

Reference Books:-

1. Punmia B.C., *Design of steel Structures*, Laxmi Publication (P) Ltd., Delhi.
2. Ramamarutham S., *Design of steel Structures*, Dhanpat Rai Publishing Co., Delhi.
3. BIS, *IS 800 – 2005 Code of Practice for General Construction in steel*.

Subject: Transportation Engineering II

Subject Code: DCE 603

Credit: 4

Pre-requisite: Knowledge of Indian roads classification, types of roads and materials used for the construction of roads. Basic concepts of surveying and determining the elevation and curves in roads.

Course Objectives:

- 1) To get the knowledge and understanding of various aspects of highway geometrics, traffic engineering, different road materials, design of pavements, highway drainage, and airport engineering.
- 2) To study about the aspects of geometrics design of highway, traffic characteristics, traffic studies, traffic problem, road materials, highway drainage, road side development and airport engineering,
- 3) To develop their understanding in order to apply their knowledge in improving civil infrastructure for transportation.

Course Outcomes:

CO1: To understand the various aspects of geometrics design of highway, traffic engineering, different road materials used in pavement.

CO2: To study design of pavements, highway drainage and airport engineering.

Course Contents:

Unit:- I

RAILWAYS

Introduction: Railways - An important system of communication in India.

Permanent Way: Definition of a permanent way; components of a permanent way, sub grade, ballast, sleepers, rails, fixtures and fastenings. Concept of gauge and different gauges prevalent in India. Suitability of these gauges under different conditions.

Track Materials: (i) **RAILS:** Function of rails. Different types of rail sections-double header, bull headed and flat footed their standard length, weights and comparison. Welded rails-appropriate length of welded rails and advantages of welded rails. Creep: Its definition, causes, effects and prevention. Wear of rails: its causes and effects. (ii) **SLEEPERS:** Function of sleepers; Different types of sleepers: wooden, steel, cast iron (pot type), concrete and prestressed concrete, their sizes, shapes, characteristics and spacing. (iii) **BALLAST:** Function, materials used for making ballast stone, brick, slag and cinder, their characteristics. (iv) **FIXTURES AND FASTENINGS:**

(a) Connections of rail to rail-Fishplate and fish bolts.

(b) Connection of Rail to sleepers: Sketches of connection between flat footed rails with various types sleepers with details of fixtures and fasteners used.

Unit:- II

Geometrics for Broad Gauge: Typical Cross-sections of single and double broad gauge railway tracks in cutting and embankment. Permanent and temporary land width. Gradients ruling, maximum, minimum for drainage. Gradients in station yards. Curves; Limiting radius of a curve for broad gauge. Transition length to be provided for railway curves as per railway code. Super-elevation-its necessity and limiting value. Definition of equilibrium cant and cant deficiency, widening of gauge on curves.

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, overall length of turnout, facing and trailing points, diamond crossing, cross over, triangle.

Track Laying: Preparation of sub grade. Collection of materials setting up of material depot and carrying out initial operations such as adzing of sleepers, bending of rails and assembling of crossings. Definitions of base and rail head. Transportation by material trolleys, rail carriers and material trains. Method of track laying (parallel, telescopic and American methods). Organization of layout at rail head. Ballasting of the track.

Unit:- III

BRIDGES

INTRODUCTION: Bridge: Its function and component parts, different parts, difference between a bridge and culvert.

CLASSIFICATION OF BRIDGES:

Their structural elements and suitability:

(i) According to life: Permanent and temporary. (ii) According to road way level: Deck, through and semi-through. (iii) According to material: Wooden, steel, RCC, prestressed and masonry. (iv) According to structural form:

(a) Beam type-RCC, T-Beam, steel girder bridges, plate girder and box girder, trussed bridges and Warren girder bridges. (b) Arch type-open spandrel and filled spandrel, barrel and rib type. (c) Suspension type-Unstiffened sling type, its description with sketches. (d) According to the position of highest flood level: submersible and non submersible.

Unit:- IV

Piers, abutments and wing walls: Piers: Definition parts. Types: solid (masonry and RCC); Open cylindrical and abutment piers. Definition of the following terms; height of pier, water way (natural and artificial), afflux and

clearance. Abutments and wing walls: Definition, types of abutments (straight and tee) abutment with wing walls (straight, splayed, return and curved).

Bridge Bearings: Purpose of bearings: Types of bearings: Fixed plate, sliding plate, deep cast base, rocker and

roller bearings, their functions with sketches.

Temporary Bridges: Necessity, description with sketches of pontoon and boat bridges.

Unit:- V

Air Port: Basic Element, Runway and Taxi Way. Tunnel: Introduction, Classification and Construction Method.

Text Books:-

1. Gupta B.L., *Road, Railway, Bridges, Tunnels & Harbour Dock Engineering*, Standard Publishers Distributors, Delhi.
2. Rangwala S.C., *Highway Engineering*, Charotar Publishing House (P) Ltd., Anand.
3. Ahuja & Birdi, *Road, Railway, Bridges & tunnels Engineering*, Standard Books House, Delhi.
4. Gupta D.V., *Transportation Engineering*, Asian Publishers Muzaffarnagar.

Reference Books:-

1. Khana S.K. & Justo, *Highway Engineering*, Nem Chand & Bros., Roorkee.

Subject: Environment and Ecology

Subject Code: DAS 604

Credit: 4

Pre-requisite: Knowledge of ecosystem, biological diseases and basic chemistry and physics.

Course Objectives:

1. To learn basic concepts.
2. To learn Auto Ecology and Population Ecology.
3. To learn Dynamics of Population.
4. To learn Ecology of Communities.
5. To learn Functional and Structural Features of Communities.
6. To learn Ecosystem and Characteristics.
7. To learn Functional Characteristics of Ecosystems.
8. To learn Ecological Cycles, Biological Accumulation.
9. To learn The Great Ecosystems in the World.
10. To learn Evolutional Ecology, Natural Selection, Genetic Variability.

Course Outcomes: After successful completion of the subject

1. Students will demonstrate broad-based knowledge of the fundamentals of Ecology, Behavior, Evolution and Physiology and the relationships among these disciplines.
2. Students will demonstrate skills in the observation and experimental study of organisms, using both field-based and laboratory-based approaches.
3. Students will demonstrate skills in identifying, accessing, comprehending and synthesizing scientific information, including interpretation of the primary scientific literature. This includes understanding key questions and hypotheses, interpreting results and conclusions, and evaluating quality through critique.
4. Students will demonstrate the ability to conceive and execute independent scientific research, including developing their own questions and hypotheses, designing an appropriate theoretical or empirical/experimental approach, executing that approach, and analyzing and interpreting data.

Course Contents:

Unit-I

Introduction to Environmental Science - Definition and scope and need for public awareness
Ecosystems ,Concept, structure and functions, restoration of damaged ecosystems
Biodiversity – Definition, description at national and global level, threats and conservation

Unit-II

Natural Resources - Renewable and non-renewable and their equitable use for sustainability,
Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional

Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass,
biodiesel, hydrogen as an alternative fuel.

Unit-III

Transportation and industrial growth Social Issues Related to Environment–Sustainable
development, reset lement and rehabilitation Environmental ethics.

Unit-IV

Environmental Changes and Human Health Environmental Pollution–Definition, causes and
effects, control measures for water, air, soil, noise, thermal pollution,

Textbook:

Environmental Studies, J Krishna wamy , R J Ranjit Daniels, Wiley India.

Reference Books:

- 1.Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
- 2.Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
- 3.Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
- 4.Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
- 5.Textbook of Environmental Science and Technology, M.Anjireddy, BS Publication

Subject: Estimation, Costing and Evaluation

Subject Code: DAS 605

Credit: 4

Pre-requisite: Knowledge of construction methods, materials used for construction, process of construction and basics of mathematics.

Course Objectives:

- 1) To study about basic units, measurement and quantities.
- 2) Prepare rate analysis of different item works, quantity of items and valuation of properties.
- 3) To study about the methods of computing the quantities.
- 4) To study the estimate of compound wall, Two room up to plinth, Single storey and two-storey residential building, R.C.C Beam, R.C.C column with footing, R.C.C slab, R.C.C weather shed and R.C.C retaining wall.

Course Outcomes:

- 1) To know the basic measurements method, rate analysis, quantity of items and valuation of properties.
- 2) To know about specifications and rate analysis.
- 3) To know the estimation and valuation of materials and costs in construction.

