GOVERNMENT OF NAGALAND
DIRECTORATE OF TECHNICAL EDUCATION
NAGALAND: KOHIMA

DIPLOMA CURRICULUM STRUCTURE FOR CIVIL ENGINEERING (CE) 3 (THREE) YEARS COURSE

APPROVED
BY
STATE COUNCIL FOR TECHNICAL EDUCATION (SCTE)
NAGALAND

DESIGNED IN COLLABORATION WITH

- STRUCTURE BY NITTTR, KOLKATA
- AICTE MODEL CURRICULUM
- BASED ON NEP2020
- COA GUIDELINES AND NORMS

FOR THE STATE OF NAGALAND
(*July 2025)*

Name of the course : CONSTRUCTIONS MATERIALS	
Course code: CEPC201	**Semester - III**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3hrs/week** Tutorial : **0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks** **End Semester Theory Exam : 60 Marks**
Credit : 3	

Course Objectives:	
Following are the objectives of the course:	
1	To learn about various construction materials, and understand their relevant characteristics.
2	To be able to identify suitability of various materials for different construction purposes.
3	To know about natural, artificial, and processed materials available for various purposes of construction activities.

	CONTENTS (THEORY)	Hrs.	Marks
UNIT - I	**1 OVERVIEW OF CONSTRUCTION MATERIALS** 1.1. Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering Irrigation Engineering (applications only). 1.2 Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy 1.3 Board classification of materials - Natural, artificial, special, finishing, and recycled.	6	8
UNIT - II	**2 NATURAL CONSTRUCTION MATERIALS** 2.1 Requirements of good building stone; general characteristics of stone; quarrying and dressing method and tools for stone. 2.2 Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction. 2.3 Asphalt, bitumen and tar used in construction, properties and uses. 2.4 Properties of lime, its types and uses. 2.5 Types of soil and its suitability in construction. 2.6 Properties of sand and uses. 2.7 Classification of coarse aggregate according to size.	12	17
UNIT - III	**3 ARTIFICIAL CONSTRUCTION MATERIALS** 3.1 Bricks, Special bricks –fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks. 3.2 Flooring tiles – Types, uses 3.3 Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses. Field tests on cement. 3.4 Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses. 3.5 Plywood, particle board, Veneers, laminated board and their uses. 3.6 Types of glass: soda lime glass, lead glass and borosilicate glass and their users.	12	15

	3.7 Ferrous and non-ferrous metals and their uses.		
UNIT - IV	**4 SPECIAL CONSTRUCTION MATERIALS** 4.1 Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials. 4.2 Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (only users) 4.3 Geo-polymer cement: Geo-cement: properties, users.	6	8
UNIT - V	**5 PROCESSED CONSTRUCTION MATERIALS** 5.1 Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses. 5.2 Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used). 5.3 Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses. 5.4 Agro waste materials - Rice husk, Bagasse, coir fibres and their uses. 5.5 Special processed construction materials; Geo-synthetic, FerroCrete, Artificial timber, Artificial timber, Artificial sands and their users.	10	12
	CLASS TEST	2	
	Total	**48**	**60**

Course outcomes:

After completing this course the students will be able to;

1	Identify relevant construction materials.
2	Identify relevant natural construction materials.
3	Select relevant artificial construction materials.
4	Select relevant special type of construction materials.
5	Identify and use of processed construction material.

Text / Reference Books

Name of the Authors	Title of the Book	Name of the Publishers
Ghose, D, N,,	Construction material	Tata McGraw Hills, New Delhi
SK. Sharma,	Civil Engineering construction materials	Khanna publishing house, Delhi
Varghese, PC,	Building materials,	PHI learning, New Delhi
Rangwala, PC,	Engineering materials,	Charator publisher, ahemdabad
Somayaji, Shan,	Civil Engineering Materials,	Pearson education, New Delhi
Rajput, R.K	Engineering Materials,	S. Chand and Co., New Delhi.
Sood H.	Laboratory Manual on Testing of Engineering Materials,	New Age Publishers, New Delhi.
Sharma C. P.	Engineering Materials,	PHI Learning, New Delhi
Duggal, S. K	Building Materials	New International, New Delhi.

Name of the course : BASIC SURVEYING	
Course Code: CEPC203	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 2	**Theory End Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To understand types of surveying works required.
2.	To know the types of method and equipments to be used for different surveys.
3.	To know the use and operational details of various surveying equipments.

	Contents (Theory)	**Hrs**	**Marks**
UNIT-I	**1. OVERVIEW AND CLASSIFICATION OF SURVEY** 1.1. Survey- Purpose and Use. 1.2. Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydrographic, Photogrammetric and Aerial. 1.3. Principles of Surveying. 1.4. Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale.	**2**	**5**
UNIT-II	**2. CHAIN SURVEYING** 2.1 Instruments used in chain survey: Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square. 2.2 Chain survey Station, Base line, Check line, Tie line, Offset, Tie station. 2.3 Ranging: Direct and Indirect Ranging. 2.4 Methods of Chaining, obstacles in chaining. 2.5 Errors in length: Instrumental error, personal error, error due to natural cause, random error. 2.6 Principles of triangulation. 2.7 Types of offsets: Perpendicular and Oblique. 2.8 Conventional Signs, Recording of measurements in a field book.	**6**	**8**
UNIT-III	**3. COMPASS TRAVERSE SURVEY** 3.1 Compass Traversing- open, closed. 3.2 Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and	**10**	**22**

	examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination. 3.3 Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings. 3.4 Local attraction, Methods of correction of observed bearings - Correction at station and correction to included angles. 3.5 Methods of plotting a traverse and closing error, Graphical adjustment of closing error.		
UNIT- IV	**4. LEVELLING AND CONTOURING** 4.1 Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks-GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments. 4.2 Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level. 4.3 Types of Levelling Staff: Self-reading staff and Target staff. 4.4 Reduction of level by Line of collimation and Rise and Fall Method. 4.5 Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Levelling. 4.6 Contour, contour intervals, horizontal equivalent. 4.7 Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.	**12**	**20**
UNIT-V	**5. MEASUREMENT OF AREA AND VOLUME** 5.1 Components and use of Digital Planimeter. 5.2 Measurement of area using digital Planimeter. 5.3 Measurement of volume of reservoir from contour map.	**2**	**5**
	Total:	**32**	**60**

Course Outcomes	
After completing this course, student will be able to:	
1.	Select the type of survey required for given situation.
2.	Compute area of open field using chain, tape and cross staff.
3.	Conduct traversing in the field using chain and compass.
4.	Use levelling instruments to determine reduced level for preparation of contour maps
5.	Use digital planimeter to calculate the areas.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar	Surveying I	Laxmi Publications, New Delhi.
Basak, N. N.	Surveying and Levelling	McGraw Hill Education, New Delhi
Kanetkar, T. P.; Kulkarni, S. V	Surveying and Levelling volume I	Pune Vidyarthi Gruh Prakashan.
Duggal, S. K	Survey I	McGraw Hill Education, New Delhi

Saikia, M D.; Das. B.M.; Das. M.M.	Surveying	PHI Learning, New Delhi
Subramanian, R.	Fundamentals of Surveying and Levelling	Oxford University Press. New Delhi
Rao, P. Venugopala Akella, Vijayalakshmi	Textbook of Surveying	PHI Learning New Delhi
Bhavikatti, S. S	Surveying and Levelling, Volume 1	I. K. International, New Delhi.
Arora K R	Surveying Vol. I	Standard Book House.

Name of the course :MECHANICS OF MATERIALS	
Course Code: CEPC205	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
	End Semester Theory Exam : 60 Marks
Credit :2	

Course Objectives	
Following are the objectives of this course:	
1.	To learn properties of area and structural material properties.
2.	To understand the concept of stress and strain.
3.	To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
4.	To understand the concept of buckling loads for short and long columns.

	Contents (Theory)	Hrs	Marks
UNIT-I	**1. MOMENT OF INERTIA** **1.1** Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations). **1.2** M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other reference axis. **1.3** Polar Moment of Inertia of solid circular sections	5	8
UNIT-II	**2. SIMPLE STRESSES AND STRAINS** **2.1** Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity. **2.2** Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses. **2.3** Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety. **2.4** Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading. **2.5** Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section) **2.6** Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial	7	14

	and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only). **2.7** Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).		
UNIT-III	**3. SHEAR FORCE AND BENDING MOMENT** **3.1** Types of supports, beams and loads. **3.2** Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation). **3.3** Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	8	14
UNIT-IV	**4. BENDING AND SHEAR STRESSES IN BEAMS** **4.1.** Concept and theory of pure bending, assumptions, flexural equation (without derivaion), bending stresses and their nature, bending stress distribution diagram. **4.2.** Concept of moment of resistance and simple numerical problems using flexural equation. **4.3.** Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram. **4.4.** Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.	6	12
UNIT-V	**5.COLUMNS** **5.1**Concept of compression member, short and long column, Effective length, Radius of gyration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns. **5.2** Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load. **5.3** Rankine' s formula and its application to calculate crippling load. **5.4** Concept of working load/safe load, design load and factor of safety.	6	12
	Total	**32**	**60**

Course Outcomes:

After completing this course, student will be able to:

1.	Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
2.	Analyse structural behaviour of materials under various loading conditions.
3.	Interpret shear force and bending moment diagrams for various types of beams and loading conditions.
4.	Determine the bending and shear stresses in beams under different loading conditions.
5.	Analyse the column for various loading and end conditions.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Bedi D.S	Strength of Materials	Khanna Publishing House, Delhi, Ed. 2018

Timoshenko S	Strength of Materials	Vol. I, CBS, New Delhi
Khurmi, R.S.	Strength of Materials	S Chand and Co. Ltd. New Delhi
Ramamurtham, S	Strength of Materials	Dhanpat Rai and sons, New Delhi.
Punmia B C	Strength of Materials	Laxmi Publications (p) Ltd. New Delhi
Rattan S.S	Strength of Materials	McGraw Hill Education; New Delhi.
Bansal R K,	Strength of Materials	Laxmi Publications.
Subramaniam R	Strength of Materials	Oxford University Press

Name of the course : BUILDING CONSTRUCTION	
Course Code: CEPC207	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week** Tutorial : **0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks**
Credit : 2	**End Semester Theory Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To identify different components of building.
2.	To understand different types of foundation and their significance.
3.	To know different types of masonry and their construction.
4.	To highlight the importance of communications in building planning.

Contents (Theory)		**Hrs.**	**Marks**
UNIT-I	**1. OVERVIEW OF BUILDING COMPONENTS** 1.1 Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure. 1.2 Building Components - Functions of Building Components, Substructure – Foundation, Plinth. 1.3 Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.	**6**	**10**
UNIT-II	**2. CONSTRUCTION OF SUBSTRUCTURE** 2.1. Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions 2.2. **Earthwork:** Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork. 2.3. **Foundation:** Functions of foundation, Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only)	**6**	**12**

UNIT-III	**3. CONSTRUCTION OF SUPERSTRUCTURE** 3.1 **Stone Masonry:** Terms used in stone masonry- facing, backing, hearting, through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction 3.2. **Brick masonry:** Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Masonry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry 3.3. **Scaffolding and Shoring:** Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal offormwork	**8**	**14**
UNIT-IV	**4. BUILDING COMMUNICATION AND VENTILATION** 4.1 **Horizontal Communication: Doors** –Components of Doors, Full Paneled Doors, Partly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS. 4.2.**Windows:** Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators 4.3. Fixtures and fastenings for doors and windows- Material used and functions of Window Sill and Lintels, Shed / Chajja 4.4. **Vertical Communication:** Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase- steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails, newel post, landing, headroom, winder. Types of stair- case (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden and Metal	**6**	**12**

UNIT-V	**5. BUILDING FINISHES** 5.1 **Floors and Roofs**: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs. 5.2. **Wall Finishes:** Plastering – Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Pre- cautions to be taken in plastering, defects in plastering. Pointing – Necessity, Types of pointing and procedure of Pointing. Painting –Necessity, Surface Preparation for painting, Methods of Application	**6**	**12**
	Total:	**32**	**60**

Course Outcomes	
After completing this course, students will be able to:	
1.	Identify components of building structures.
2.	Propose suitable type of foundation for building structures.
3.	Select suitable type of masonry for building structures.
4.	Propose relevant means of communications for different types of buildings.
5.	Select relevant material for finishing works.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
S. P. Arora and Bindra.	Building Construction	Dhanpat Rai Publication, Delhi.
Sushil Kumar.,	Building Construction	Standard Publication
Rangawala, S. C.	Building Construction	Charotar Publication, Anand.
Punmia B. C. and Jain A. K.,	Building Construction	Firewall Media
Sharma S. K.	Building Construction	S. Chand and Co. Pvt. Ltd., New Delhi
Janardan Zha	Building Construction	Khanna Publication.
Bhavikatti S. S.	Building Construction	Vikas Publication House Pvt. Ltd., Delhi.
Mantri S.	A to Z Building Construction	Satya Prakashan, New Delhi

Name of the course : CONCRETE TECHNOLOGY	
Course Code: CEPC209	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
	Theory PA
Theory : **2 hrs/ week**	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
Tutorial : **0 hrs/ week**	**Total : 40 Marks**
	End Semester Theory Exam : 60 Marks
Credit : 2	

Course Objectives:	
Following are the objectives of this course:	
1	To know properties of cement, aggregate and water used in concrete
2	To understand different characteristics of concrete
3	To learn about role of admixtures in concrete

	Contents (Theory)	Hrs.	Marks
UNIT - I	**1. CEMENT, AGGREGATES AND WATER** 1.1 Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes. 1.2 Testing of cement: Laboratory tests- fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement. 1.3 BIS Specifications and field applications of different types of cement: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement. 1.4 **Aggregates:** Requirement of good aggregate, Classification according to size and shape. 1.5 **Fine aggregates:** Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed sand. 1.6 **Coarse aggregates:** Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications. 1.7 **Water:** Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456.	8	15
UNIT – II	**2. CONCRETE** 2.1 Concrete: Different grades of concrete, provisions of IS 456 2.2 Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposures as per IS 456. 2.3. Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures.	7	13

	2.4 Properties of Hardened concrete: Strength, Durability, Impermeability.		
UNIT - III	**3 CONCRETE MIX DESIGN AND TESTING OF CONCRETE** 3.1 Concrete mix design: Objectives, methods of mix design, study of mix design as per IS 10262 (only procedural steps). 3.2 Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results. 3.3 Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS 13311 (part 1 and 2), Importance of NDT tests.	5	10
UNIT - IV	**4 . QUALITY CONTROL OF CONCRETE** 4.1 Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete. 4.2 Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456 4.3 Waterproofing: Importance and need of waterproofing, methods of waterproofing and materials used for waterproofing. 4.4 Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.	6	10
UNIT - V	**5 CHEMICAL ADMIXTURE, SPECIAL CONCRETE AND EXTREME WEATHER CONCRETING** 5.1 Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers. 5.2 Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix concrete, Fiber Reinforced Concrete, High performance Concrete Self compacting and light weight concrete. 5.3 Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weathering conditions. 5.4 Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather conditions.	6	12
	CLASS TEST	2	
	Total	**48**	**60**

Course outcomes:	
After completing this course, student will be able to:	
1	Use different types of cement and aggregates in concrete
2	Prepare concrete of desired compressive strength
3	Prepare concrete of required specification
4.	Maintain quality of concrete under different conditions
5.	Apply relevant admixtures for concreting

Text/Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
Gambhir, M.L.	Concrete Technology	Tata McGraw Hill Publishing Co. Ltd., Delhi
Shetty, M.S.	Concrete Technology	S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi
Santhakumar, A.R.,	Concrete Technology	Oxford University Press, New Delhi
Neville, A.M. and Brooks, J.J.	Concrete Technology	Pearson Education Pvt. Ltd.
Neville, A.M.,	Concrete Technology	Pearson Education Pvt. Ltd., New Delhi
Sood, H., Kulkarni P.D., Mittal L.N.,	Laboratory Manual in Concrete Technology	CBS Publishers, New Delhi.

Name of the course: GEOTECHNICAL ENGINEERING	
Course Code: CEPC211	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory :**2 hrs/week** Tutorial :**0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks** **End Semester Theory Exam : 60 Marks**
Credit: 2	

Course Objectives	
Following are the objectives of this course:	
1.	To understand and determine physical and index properties and classification of soil
2.	To estimate permeability and shear strength of soil
3.	To know the load bearing capacity of soil
4.	To learn various soil stabilization and compaction methods

	CONTENTS (THEORY)	Hrs	Marks
UNIT-I	**1. OVERVIEW OF GEOLOGY AND GEOTECHNICAL ENGINEERING** **1.1** Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks. **1.2** Importance of soil as construction material in Civil engineering structures and as foundation bed for structures. **1.3** Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.	3	7
UNIT-II	**2. PHYSICAL AND INDEX PROPERTIES OF SOIL** **2.1** Soil as a three-phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer. **2.2** Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index. **2.3** Particle size distribution test and plotting of curve. Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.	8	16
UNIT-III	**3. PERMEABILITY AND SHEAR STRENGTH OF SOIL** **3.1** Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of	7	12

	coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems). **3.2** Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test – laboratory methods.		
UNIT- IV	**4. BEARING CAPACITY OF SOIL** **4.1** Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity. **4.2** Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. **4.3** Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.	6	10
UNIT-V	**5. COMPACTION AND STABILIZATION OF SOIL** **5.1** Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation. **5.2** Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction **5.3** Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.	8	14
	Total:	**32**	**60**

Course Outcomes	
After completing this course, student will be able to:	
1.	Identify types of rocks and sub soil strata of earth.
2.	Interpret the physical properties of soil related to given construction activities.
3.	Use the results of permeability and shear strength test for foundation analysis.
4.	Interpret soil bearing capacity results.
5.	Compute optimum values for moisture content for maximum dry density of soil through various tests.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C	Soil Mechanics and Foundation Engineering	Laxmi Publication, Delhi
Murthy, V.N.S.,	A text book of soil mechanics and foundation Engineering	CBS Publishers & Distributors Pvt. Ltd., New Delhi.

Ramamurthy, T.N. & Sitharam,T.G	Geotechnical Engineering (Soil Mechanics	S Chand and Company LTD., New Delhi.
Raj, P. Purushothama	Soil Mechanics and Foundation Engineering	Pearson India, New Delhi.
Kasamalkar, B. J	Geotechnical Engineering	Pune Vidyarthi Griha Prakashan, Pune.
Arora K R	Soil Mechanics and Foundation Engineering	Standard Publisher

Name of the course : CONSTRUCTIONS MATERIALS LAB	
Course code: CEPC213	**Semester - III**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs / week**	**Practical PA**
	Sessional : 40 Marks Viva – Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam : 40 Marks
Credit : 1	

Course Objectives:

Following are the objectives of this course:

1	To learn about various construction materials, and understand their relevant characteristics.
2	To be able to identify suitability of various materials for different construction purposes.
3	To know about natural, artificial, and processed materials available for various purposes of construction activities.

	List of Practical to be performed:	Hrs.	Marks
1	Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm) • Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.	32	40
2	Identify the available construction materials in the laboratory on the basis of their sources.		
3	Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)		
4	Prepare the lime putty by mixing lime (1 kg) with water in appropriate proportion and prepare report on slaking of lime.		
5	Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part I		
6	Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part II		
7	Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.		
8	Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.		
9	Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti- skid tiles, chequered tiles, paving blocks and prepare report about the specifications.		
10	Apply the relevant termite chemical on given damaged sample of timber.		
11	Identify the type of glasses from the given samples.		
12	Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/rollers adopting safe practices. Part I		
13	Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special processed construction material.		
	Total	**32**	**40**

Course Outcomes

After completing this course, student will be able to perform:

1	Identify relevant construction materials.
2	Identify relevant natural construction materials
3	Select relevant artificial construction materials
4	Select relevant special type of construction materials
5	Identify and use of processed construction materials.

Text / Reference Books

Name of the Authors	Title of the Book	Name of the Publishers
Ghose, D. N	Construction Materials	Tata McGraw Hill, New Delhi.
S.K. Sharma	Civil Engineering Construction Materials	Khanna Publishing House, New Delhi
Varghese, P.C	Building Materials	PHI learning, New Delhi
Rangwala, S.C	Engineering Materials	Charator publisher, Ahemdabad
Somayaji, Shan	Civil Engineering Materials	Pearson education, New Delhi
Rajput, R.K	Engineering Materials	S. Chand and Co., New Delhi
Sood H.	Laboratory Manual on Testing of Engineering Materials	New Age Publishers, New Delhi
Sharma C. P	Engineering Materials	PHI Learning, New Delhi
Duggal, S. K	Building Materials	New International, New Delhi

Name of the course : BASIC SURVEYING LAB	
Course Code: CEPC215	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva-voce : 20 Marks
	Total : 60 Marks
Credit : 1	**Practical End Exam : 40 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To understand types of surveying works required.
2.	To know the type of method and equipments to be used for different surveys.
3.	To know the use and operational details of various surveying equipments.

	List of Practical to be performed	Hrs	Marks
1.	Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.	**32**	**40**
2.	Undertake reciprocal ranging and measure the distance between two stations.		
3.	Determine area of open field using chain and cross staff survey.		
4.	Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.		
5.	Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.		
6.	Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.		
7.	Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical No.6.		
8.	Undertake simple leveling using dumpy level/ Auto level and leveling staff.		
9.	Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff.		
10.	Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff.		
11.	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.		
12.	Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in Survey Project mentioned at practical No.11		
13.	Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m.		
14.	Plot the contours on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical No.13.		

15.	Measure area of irregular figure using Digital planimeter.		
	Total	**32**	**40**

Course Outcomes	
After completing this course, student will be able to:	
1.	Select the type of survey required for given situation.
2.	Compute area of open field using chain, tape and cross staff.
3.	Conduct traversing in the field using chain and compass.
4.	Use levelling instruments to determine reduced level to prepare contour maps
5.	Use digital planimeter to calculate the areas.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar	Surveying I	Laxmi Publications, New Delhi.
Basak, N. N.	Surveying and Levelling	McGraw Hill Education, New Delhi
Kanetkar, T. P.; Kulkarni, S. V	Surveying and Levelling volume I	Pune Vidyarthi Gruh Prakashan.
Duggal, S. K	Survey I	McGraw Hill Education, New Delhi
Saikia, M D.; Das. B.M.; Das. M.M.	Surveying	PHI Learning, New Delhi
Subramanian, R.	Fundamentals of Surveying and Levelling	Oxford University Press. New Delhi
Rao, P. Venugopala Akella, Vijayalakshmi	Textbook of Surveying	PHI Learning New Delhi
Bhavikatti, S. S	Surveying and Levelling, Volume 1	I. K. International, New Delhi.
Arora K R	Surveying Vol. I	Standard Book House.

Name of the course :MECHANICS OF MATERIALS LAB	
Course Code: CEPC217	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
Credit : 1	**End Semester Practical Exam : 40 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To know the procedure for the conduct of tensile and compressive strength.
2.	To understand the concept of stress and strain through testing of different materials.
3.	To calculate shear force, bending moment and their corresponding stresses.
4.	To understand flexural strength and abrasive properties of floor tiles.

List of Practical to be performed:		**Hrs.**	**Marks**
1.	Study and understand the use and components of Universal Testing Machine (UTM).	**32**	**40**
2.	Perform Tension test on mild steel as per IS:432(1).		
3.	Perform tension test on Tor steel as per IS:1608, IS:1139.		
4.	Conduct compression test on sample test piece using Compression Testing Machine.		
5.	Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /castiron etc as per IS:1598.		
6.	Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /castiron etc as per IS:1757.		
7.	Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tile IS:1237.		
8.	Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.		
9.	Conduct Abrasion Test on flooring tiles (any one) e.g. Mosaic tiles, Ceramic Tiles as per IS:13630 (part7), Cement Tile as per IS: 1237.		
10.	Perform Single Shear and double shear test on any two metals e.g. Mild steel/ brass/aluminum/copper / cast iron etc as per IS:5242.		
11.	Conduct Compression test on timber section along the grain and across the grain as perIS:2408.		
12.	Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.		
13.	Plot Shear force and Bending Moment diagrams for overhanging beams for different typesof loads including moment loading.		
14.	Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.		
15.	Conduct Flexure test on floor tiles IS:1237,IS:13630 or roofing tiles as per IS:654,IS:2690.		
	TOTAL:	**32**	**40**

Course Outcomes	
After completing this course, student will be able to:	
1.	Test different Civil engineering materials on Universal Testing Machine.
2.	Analyse structural behaviour of materials under various loading conditions.
3.	Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
4.	Determine bending and shear stresses in beams under different loading conditions.
5.	Calculate flexural strength of different types of floor tiles.

Text/ Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
Bedi D.S	Strength of Materials	Khanna Publishing House, Delhi, Ed. 2018
Timoshenko S	Strength of Materials	Vol. I, CBS, New Delhi
Khurmi, R.S.	Strength of Materials	S Chand and Co. Ltd. New Delhi
Ramamurtham, S	Strength of Materials	Dhanpat Rai and sons, New Delhi.
Punmia B C	Strength of Materials	Laxmi Publications (p) Ltd. New Delhi
Rattan S.S	Strength of Materials	McGraw Hill Education; New Delhi.
Bansal R K,	Strength of Materials	Laxmi Publications.
Subramaniam R	Strength of Materials	Oxford University Press

Name of the course: CONCRETE TECHNOLOGY LAB	
Course Code: CEPC219	**Semester : III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/ week** Tutorial : **0 hrs/ week**	**Practical PA** Sessional : 40 Marks Viva- Voce : 20 Marks
	Total : 60 Marks
Credit : 1	**End Semester Practical Exam : 40 Marks**

Course Objectives

Following are the objectives of this course

1.	To know properties of cement, aggregate and water used in concrete
2.	To understand different characteristics of concrete
3.	To learn about role of admixtures in concrete

	List of Practical to be performed	Hrs	Marks
1	Determine fineness of cement by Blaine's air permeability apparatus or by sieving	32	40
2	Determine specific gravity, standard consistency, initial and final setting times of cement		
3.	Determine compressive strength of cement		
4	Determine silt content in sand		
5	Determine bulking of sand		
6	Determine bulk density of fine and coarse aggregate		
7	Determine water absorption of fine and coarse aggregate		
8	Determine fineness modulus of fine aggregate by sieve analysis		
9	Determine impact value of aggregate		
10	Determine crushing value of aggregate		
11	Determine abrasion value of aggregate		
12	Determine elongation and flakiness index of coarse aggregate		
13	Determine workability of concrete by slump cone test		
14	Determine workability of concrete by compaction factor test		
15	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.		
16	Demonstration of NDT equipments.		
	Total	32	40

Course outcomes

After completing this course, student will be able to :	
1.	Identify different types of cement by performing laboratory tests
2.	Know the physical properties of fine and coarse aggregates
3.	Prepare concrete of required specification
4.	Maintain the quality of concrete applying scientific principles
5.	Use relevant admixtures for improving the workability of concrete

Text/Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Gambhir, M.L.	Concrete Technology	Tata McGraw Hill Publishing Co. Ltd., Delhi
Shetty, M.S.	Concrete Technology	S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi
Santhakumar, A.R.,	Concrete Technology	Oxford University Press, New Delhi
Neville, A.M. and Brooks, J.J.	Concrete Technology	Pearson Education Pvt. Ltd.
Neville, A.M.,	Concrete Technology	Pearson Education Pvt. Ltd., New Delhi
Sood,H., Kulkarni P.D., Mittal L.N.,	Laboratory Manual in Concrete Technology	CBS Publishers, New Delhi.

Name of the course: GEOTECHNICAL ENGINEERING LAB.	
Course Code: CEPC221	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2hrs/week**	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam :40 Marks
Credit: 1	

Course Objectives	
Following are the objectives of this course:	
1.	To understand and determine physical and index properties of soil.
2.	To estimate the permeability and shear strength of soil.
3.	To know the procedure for performing C.B.R test.
4.	To learn various compaction methods for soil stabilization.

List of Practical to be performed:		**Hrs**	**Marks**
1.	Identification of rocks from the given specimen.	**32**	**40**
2.	Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).		
3.	Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).		
4.	Determine dry unit weight of soil in field by core cutter method as per IS-2720 (Part- XXIX).		
5.	Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part-XXVIII).		
6.	Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS-2720 (Part- V).		
7.	Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).		
8.	Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS-2720 (Part- IV).		
9.	Use different types of soil to identify and classify soil by conducting field tests-Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.		
10.	Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).		
11.	Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).		
12.	Determine shear strength of soil by direct shear test as per IS 2720 (Part-XIII).		
13.	Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).		
14.	Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part-VII).		
15.	Determination of CBR value on the field as per IS2720 (Part - XVI).		

	TOTAL	**32**	**40**

Course Outcomes	
After completing this course, student will be able to perform:	
1.	Identify types of rocks and sub soil strata of earth.
2.	Interpret the physical properties of soil related to given construction activities.
3.	Use the results of permeability and shear strength test for foundation analysis.
4.	Interpret the soil bearing capacity results.
5.	Compute optimum moisture content values for maximum dry density of soil through various tests.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C	Soil Mechanics and Foundation Engineering	Laxmi Publication
Murthy, V.N.S	A text book of soil mechanics and foundation Engineering	CBS Publishers & Distributors Pvt. Ltd., New Delhi
Ramamurthy, T.N. & Sitharam T.G	Geotechnical Engineering (Soil Mechanics)	S Chand and Company LTD., New Delhi
Raj, P. Purushothama	Soil Mechanics and Foundation Engineering	Pearson India
Kasamalkar, B. J	Geotechnical Engineering	Pune Vidyarthi Griha Prakashan, Pune
Arora K R	Soil Mechanics and Foundation Engineering	Standard Publisher

Name of the course: SUMMER INTERNSHIP-I	
Course Code: SI201	**Semester: III**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
4 Weeks after Semester II	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam :40 Marks
Credit: 2	

Rationale:

The purpose of industrial training is to expose students to the latest practices, equipments and techniques used in the field and to provide opportunities for hands on experiences in their field. Such opportunities expose them to the intricacies of the world of work. The basic purpose of this course is to provide an opportunity to student during their course of study for such an experience. This would not only improve their technical competency but also develop non-technical skills such as planning, scheduling, problem solving, team work, decision making, time management etc. The nature of training may vary with the discipline and the area selected. Some of the widely used forms of industrial training in the country are: designing a component/ part/machine for a specific purpose, Engineering Analysis, Innovative Product Development, Feasibility Study and Generating solution's for real life problem.

On the basis of the electives and the courses/subjects completed student can undergo training of six week duration in any of the following areas in consultation with faculty.

The students may also be given special projects within the institute in case it is not feasible to place them in various industries/agencies. The special projects could be

- Organize adventure sports
- Preparing a feasibility report to start a travel agency
- Prepare a report to enhance tourism in the state through incentives
- Plan a tour for students during summer outside the state and prepare a comprehensive report.

The Industrial Training has basically the following three components:

1. Orientation Programme
2. Training in the Industry
3. Report Writing and
4. Evaluation

Note:

1. Orientation programme:

During the orientation programme complete guidelines will be provided to the students regarding planning, implementation and evaluation of industrial training.

2. Training in industry:

During the training student will have to maintain a daily dairy to record his observations and experiences in various department/section and on the basis of daily dairy student will prepare and submit the Industrial Training Report. Competent faculty / staff member shall follow-up the students' progress regularly. The student should be encouraged to seek & collect relevant forms; brochures: & other print material from the various organization related to training/project.

3. Report writing:

Daily dairy will form the basis for report writing. The formats for the report preparation will vary depending upon the type of training/project and will be generated by the teacher guide.

4. Evaluation :

For the industrial training as per teaching and assessment scheme equal weightage is given for end of term and progressive assessment.

For the end of term evaluation each student has to prepare and present a seminar paper related to experience gained during the industrial training. Each student will be evaluated on the basis of training report, seminar presentation and viva voce.

For progressive assessment proper recording of events in daily dairy and generation of weekly reports will form the basis.

***SI201 should be undertaken in an industry/Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/Institutes/Schemes.**

TERM- IV

SEMESTER- IV

Name of the course: HYDRAULICS	
Course code: CEPC202	**Semester - IV**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week** Tutorial : **0hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks** **End Semester Theory Exam : 60 Marks**
Credit : 2	

Course Objectives:	
Following are the objectives of this course:	
1	To understand parameters associated with fluid flow and hydrostatic pressure.
2	To know head loss and water hammer in fluid flowing in pipes.
3	To learn different types of pumps and their uses.
4	To understand the kinematics of fluid particles.

	Contents (Theory)	**Hrs.**	**Marks**
UNIT - I	**1. PRESSURE MEASUREMENT AND HYDROSTATIC PRESSURE** 1.1. Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics. 1.2. Physical properties of fluid – density, specific volume, specific gravity, surface tension, capillarity, viscosity- Newton's law of viscosity. 1.3 Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. 1.4 Measurement of differential Pressure by different methods. 1.5 Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls. 1.6 Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either sides.	8	16
UNIT – II	**2. FLUID FLOW PARAMETERS** 2.1 Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number. 2.2 Discharge and its unit, continuity equation of flow. 2.3 Energy of flowing liquid: potential, kinetic and pressure energy 2.4 Bernoulli's theorem : statement, assumptions, equations	8	12

UNIT - III	**3 . FLOW THROUGH PIPES** 3.1. Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms. 3.2 Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings. 3.3 Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. 3.4 Hydraulic gradient line and total energy line. 3.5 Water hammer in pipes: Causes and Remedial measures. 3.6 Discharge measuring device for pipe flow: Venturi meter - construction and working. 3.7 Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.	7	10
UNIT - IV	**4 . FLOW THROUGH OPEN CHANNEL** 4.1. Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section. 4.2 Determination of discharge by Chezy's equation and Manning's equation. 4.3 Conditions for most economical rectangular and trapezoidal channel section. 4.4 Discharge measuring devices: Triangular and rectangular Notches. 4.5 Velocity measurement devices: current meter, floats and Pitot tube 4.6 Specific energy diagram, Froude's number	7	14
UNIT - V	**5 . HYDRAULIC PUMPS** 5.1. Concept of pump, Types of pump - centrifugal, reciprocating, submersible. 5.2. Centrifugal pump: components and working 5.3. Reciprocating pump: single acting and double acting, components and working. 5.4. Suction head, delivery head, static head, Manometric head 5.5. Power of centrifugal pump. 5.6. Selection and choice of pumps	6	8
	CLASS TEST	2	
	Total	**36**	**60**

Course outcomes:

After completing this course, student will be able to:

1	Measure pressure and determine total hydrostatic pressure for different conditions.
2	Understand various parameters associated with fluid flow
3	Determine head loss of fluid flow through pipes.
4	Find the fluid flow parameters in open channels.
5	Select relevant hydraulic pumps for different applications.

Text / Reference Books

Name of the Authors	Title of the Book	Name of the Publishers
Modi, P. N.and Seth, S.M	Hydraulics and Fluid Mechanics	Standard book house, Delhi.

S.S. Rattan	Fluid Mechanics & Hydraulic Machines	Khanna Book Publishing Co. New Delhi
Ramamrutham, and Narayan, R	Hydraulics, Fluid Mechanics and Fluid Machines	Dhanpat Rai Publishing Company, New Delhi.
Khurmi R S, Hydraulics	Fluid Mechanics, Hydraulic machines	S. Chand Publishers
Rajput, R K	Fluid Mechanics	S Chand, New Delhi.
Ojha, C S P, Berndtsson, R, and Chandramoulli P. N.	Fluid Mechanics and Machinery	Oxford University Press, New Delhi.

Name of the course : ADVANCED SURVEYING	
Course Code: CEPC204	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 2	**Theory End Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To know methods of plane surveying and Theodolite surveying and their use.
2.	To learn tacheometric surveying and curve setting.
3.	To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
4.	To know the concept of remote sensing, GPS and GIS.

	Contents (Theory)	Hrs	Marks
UNIT-I	**1. PLANE TABLE SURVEYING** 1.1 Principles of plane table survey. 1.2 Accessories of plane table and their use, Telescopic alidade. 1.3 Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method. 1.4 Methods of plane table surveys- Radiation, Intersection and Traversing. 1.5 Merits and demerits of plane table survey.	4	7
UNIT-II	**2. THEODOLITE SURVEYING** 2.1 Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite. 2.2 Technical terms- Swinging, Transiting, Face left, Face right. 2.3 Fundamental axes of transit Theodolite and their relationship 2.4 Temporary adjustment of transit Theodolite. 2.5 Measurement of horizontal angle- Direct and Repetition method, Errors eliminated by method of repetition. 2.6 Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle. 2.7 Measurement of vertical Angle. 2.8 Theodolite traversing by Included angle method and Deflection angle method. 2.9 Checks for open and closed traverse, Calculations of bearing	12	24

	from angles. 2.10 Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.		
UNIT-III	**3. TACHEOMETRIC SURVEYING AND CURVE SETTING** 3.1 Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens. 3.2 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical. 3.3 Field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry. 3.4 Types of curves used in roads and railway alignments. Designation of curves. 3.5 Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.	7	15
UNIT- IV	**4. ADVANCED SURVEYING EQUIPMENTS** 4.1 Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM. 4.2 Use of micro optic Theodolite and Electronic Digital Theodolite. 4.3 Use of Total Station, Use of function keys. 4.4 Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.	5	8
UNIT-V	**5. REMOTE SENSING, GPS AND GIS** 5.1 Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management. 5.2 Use of Global Positioning System (G.P.S.) instruments. 5.3 Geographic Information System (GIS): Over view, Components, Applications, Software for GIS. 5.4 Introduction to Drone Surveying.	4	6
	Total:	**32**	**60**

Course Outcomes

After completing this course, student will be able to :

1.	Prepare plans using Plane Table Surveys.
2.	Prepare plans using Theodolite surveys.
3.	Find distances and elevations using Tachometer.
4.	Prepare plans using Total Station instrument.
5.	Locate coordinates of stations using GPS.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Kanetkar, T. P.; Kulkarni, S. V.	Surveying and Levelling Part I and II,	Pune Vidyarthi Gruh Prakashan, Pune.

Basak, N. N.	Surveying and Levelling	McGraw Hill Education (India) Pvt. Ltd., Noida.
Duggal, S. K.	Survey I and Survey II	Tata McGraw Hill Education Pvt. Ltd., Noida.
Saikia, M D.; Das. B.M.; Das. M.M.	Surveying	PHI Learning Pvt. Ltd., New Delhi.
Subramanian, R.	Surveying and Levelling	Oxford University Press. New Delhi.
Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar	Surveying Vol. I and Surveying Vol. II	Laxmi Publications Pvt. Ltd., New Delhi.
Rao, P. Venugopala Akella, Vijayalakshmi	Textbook of Surveying	PHI Learning Pvt. Ltd., New Delhi.
Venkatramaiah, C	Textbook of Surveying	Universities Press, Hyderabad.
Anderson, James M and Mikhail, Edward M	Surveying theory and practice	Mc Graw Hill Education, Noida.
De, Alak	Plane Surveying	S. Chand Publications, New Delhi.

Name of the course: THEORY OF STRUCTURES	
Course Code: CEPC206	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory **:2 hrs/week** Tutorial **:0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total :40 Marks** **End Semester Theory Exam : 60 Marks**
Credit: 2	

Course Objectives	
Following are the objectives of this course:	
1.	To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam
2.	To analyze beams using various methods like slope deflection, three moment, and moment distribution
3.	To understand different methods of finding axial forces in trusses.

	Contents (Theory)	Hrs	Marks
UNIT-I	**1. DIRECT AND BENDING STRESSES IN VERTICAL MEMBERS** **1.1** Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses and distribution diagram. **1.2** Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule. **1.3** Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base. **1.4** Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses, resultant stresses and distribution diagram at base.	5	9
UNIT-II	**2. SLOPE AND DEFLECTION** **2.1** Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation). **2.2** Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span. **2.3** Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.	6	10
UNIT-III	**3. FIXED AND CONTINUOUS BEAM** **3.1** Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam.	8	16

	3.2 Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span. **3.3** Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam. **3.4** Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples. **3.5** Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. **3.6** Drawing SF diagrams showing point of contraflexure, shear and BM diagrams showing net BM and point of contraflexure for continuous beams.		
UNIT- IV	**4. MOMENT DISTRIBUTION METHOD** **4.1** Introduction to moment distribution method, sign convention, Carry over factor, stiffness factor, distribution factor. **4.2** Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia, supports at same level, up to three spans and two unknown support moments only. **4.3** Introduction to portal frames – Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.	8	15
UNIT-V	**5. SIMPLE TRUSSES** **5.1** Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss) **5.2** Calculate support reactions for trusses subjected to point loads at joints **5.3** Calculate forces in members of truss using Method of joints and Method of sections	5	10
	Total:	**32**	**60**

Course Outcomes	
After completing this course, student will be able to perform:	
1.	Analyze stresses induced in vertical member subjected to direct and bending loads.
2.	Analyze slope and Deflection in fixed and continuous beams.
3.	Analyze continuous beam under different loading conditions using the principles of Three Moments.
4.	Analyze continuous beam using Moment Distribution Method under different loading conditions.
5.	Evaluate axial forces in the members of simple truss.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Ramamrutham. S	Theory of structures	Dhanpatrai & Sons
Khurmi, R. S.	Theory of Structures	S. Chand and Co., New Delhi
Bhavikatti, S S	Structural Analysis Vol-1	Vikas Publishing House Pvt Ltd. New Delhi
Junnarkar, S. B.	Mechanics of structures, Volume-I and II	Charotar Publishing House, Anand.

Pandit, G.S. and Gupta, S.P.,	Theory of Structures	Tata McGraw Hill, New Delhi
Agor R	Structural Analysis	Khanna Publishing House, Delhi

Name of the course : BUILDING PLANNING AND DRAWING	
Course Code: CEPC208	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **1 hr/week** Tutorial : **0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks**
Credit : 1	**End Semester Theory Exam : 60 Marks**

Course Objectives

Following are the objectives of this course:

1.	To learn basic principles of building planning and drawing.
2.	To know graphical representation of various components of buildings
3.	To draw complete plan and elevation of a building.
4.	To learn basics of perspective drawings and Computer Aided Drawings.

	Contents (Theory)	Hrs.	Marks
UNIT-I	**1. CONVENTIONS AND SYMBOLS** 1.1. Conventions as per IS:962, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork and glass. 1.2. Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations. 1.3. Types of lines-visible lines, center line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions. 1.4. Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing. 1.5. Sizes of various standard papers/sheets. 1.6. Reading and interpreting readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer).	**2**	**6**
UNIT-II	**2. PLANNING OF BUILDING** 2.1. Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. 2.2. Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962. 2.3. Rules and bye-laws of sanctioning authorities for construction work. 2.4. Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).	**3**	**10**

	2.5. Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning. 2.6. Line plans for public building-school building, primary health centre, restaurant, bank, post-office, hostel, Function Hall and Library.		
UNIT-III	**3. DRAWING OF LOAD BEARING STRUCTURE** 3.1. Drawing of Single-storey Load Bearing residential building (2 BHK) with staircase. 3.2. Data drawing –plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building. 3.3. Working drawing – developed plan, elevation, section passing through staircase or WC and bath. 3.4. Foundation plan of Load bearing structure.	**4**	**16**
UNIT- IV	**4. DRAWING OF FRAMED STRUCTURE** 4.8 Drawing of Two-storeyed Framed Structure (G+1), residential building (2 BHK) with stair-case. 4.9 Data drawing – developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. Planning and design of staircase- Rise and Tread for residential and public building. 4.10 Working drawing of Framed Structure – developed plan, elevation, section passing throughstaircase or WC and bath. 4.4. Foundation plan of Framed Structure. 4.5. Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab. 4.6. Drawing with CAD- Draw commands, modify commands, layer commands.	**5**	**18**
UNIT-V	**5. PERSPECTIVE DRAWING** 5.4 Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing. 5.5 Two Point Perspective of small objects only such as steps, monuments, pedestals.	**2**	**10**
	Total:	**16**	**60**

Course Outcomes	
After completing this course, students will be able to:	
1.	Interpret the symbols, signs and conventions from the given drawing.
2.	Prepare line plans of residential and public buildings using principles of planning.
3.	Prepare submission and working drawing for the given requirement of Load Bearing Structure.
4.	Prepare submission and working drawing using CAD for the given requirement of Framed Structure.
5.	Draw two-point perspective drawing for given small objects.

Text/ Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
Shah. M.G. Kale, CM, Patki,S.Y.	Building Drawing	Mcgraw Hill Publishing company Ltd. NewDelhi.
Malik and Mayo	Civil Engineering Drawing	Computech Publication Ltd New Asian Publishers, New Delhi.
M. G. Shah and C. M. Kale	Principles of Perspective Drawing	Mcgraw Hill Publishing company Ltd. New Delhi
Swamy, Kumara; Rao, N, Kameshwara, A .	Building Planning and Drawing	Charotar Publication, Anand
Bhavikatti, S. S.	Building Construction	Vikas Publication House Pvt. Ltd., New Delhi
Mantri, Sandip	A to Z Building Construction	Satya Prakashan, New Delhi
Singh, Ajit	Working with Auto CAD 2000	Mcgraw Hill Publishing company Ltd. New Delhi
Sane, Y.S.	Planning and design of Building,	Allied Publishers, New Delhi

Name of the course: WATER RESOURCES ENGINEERING	
Course Code: CEPC210	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory :**2 hrs/week** Tutorial :**0 hrs/week**	**Practical PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total :40 Marks** **End Semester Theory Exam : 60 Marks**
Credit: 2	

Course Objectives	
Following are the objectives of this course:	
1.	To learn estimation of hydrological parameters.
2.	To understand water demand of crops and provisions to meet the same.
3.	To know planning of reservoirs and dams.
4.	To design irrigation projects, canals and other diversion works.

	Contents (Theory)	Hrs	Marks
UNIT-I	1. **INTRODUCTION TO HYDROLOGY** 1.1 Hydrology: Definition and Hydrological cycle 1.2 Rain Gauge: Symons rain gauge, automatic rain gauge, 1.3 Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method. 1.4 Runoff, Factors affecting Run off, Computation of run–off. 1.5 Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems. 1.6 Yield and Dependable yield of a catchment, determination of dependable yield.	6	12
UNIT-II	**2. CROP WATER REQUIREMENT AND RESERVOIR PLANNING** 2.1 Irrigation and its classification. 2.2 Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal. 2.3 Methods of application of irrigation water and its assessment. 2.4 Surveys for irrigation project, data collection for irrigation project. 2.5 Area capacity curve. 2.6 Silting of reservoir, Rate of silting, factors affecting silting and control measures. 2.7 Control levels in reservoir, Simple numerical problems on Fixing Control levels.	8	14
UNIT-III	**3. DAMS AND SPILLWAYS** 3.1 Dams and its classification: Earthen dams and Gravity dams (masonry and concrete). 3.2 Earthen Dams – Components with function, typical cross section, seepage through embankment and foundation and its control. 3.3 Methods of construction of earthen dam, types of failure of earthen dam and preventive measures.	7	12

	3.4 Gravity Dams – Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam. 3.5 Spillways-Definition, function, location, types and components, Energy dissipaters.		
UNIT- IV	**4. MINOR AND MICRO IRRIGATION** 4.1 Bandhara irrigation: Layout, components, construction and working, solid and open bandhara. 4.2 Percolation Tanks – Need, selection of site. 4.3 Lift irrigation Scheme-Components and their functions, Lay out. 4.4 Drip and Sprinkler Irrigation- Need, components and Layout. 4.5 Well irrigation: types and yield of wells, advantages and disadvantages of well irrigation.	5	10
UNIT-V	**5. DIVERSION HEAD WORKS & CANALS** **5.1** Weirs – components, parts, types, K.T. weir – components and construction **5.2** Diversion head works – Layout, components and their function. **5.3** Barrages – components and their functions. Difference between weir and Barrage. **5.4** Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section. **5.5** Canal lining - Purpose, material used and its properties, advantages. **5.6** Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing. **5.7** Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets	6	12
	Total:	**32**	**60**

Course Outcomes	
After completing this course, student will be able to perform:	
1.	Estimate hydrological parameters.
2.	Estimate crop water requirements of a command area and capacity of canals.
3.	Execute Minor and Micro Irrigation Schemes.
4.	Select the relevant Cross Drainage works for the specific site conditions.
5.	Design, construct and maintain simple irrigation regulatory structures.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C., Pande, B, Lal	Irrigation and Water Power Engineering	Laxmi Publications
Subramanayan	Engineering Hydrology	McGraw Hill
Mutreja K N	Applied Hydrology	. McGraw Hill
Sharma, R.K. and Sharma	T.K., Irrigation Engineering	S.Chand
Basak, N.N	Irrigation Engineering	McGraw Hill Education
Asawa, G.L	Irrigation and water resource Engineering	New Age
Dahigaonkar, J.G	Irrigation Engineering	Asian Book Pvt. Ltd., New Delhi

Garg, S K	Irrigation and Hydraulic Structures	Khanna Publishers, Delhi
Priyani V.B	Irrigation Engineering	Charotar Book Stall, Anand

Name of the course :TRANSPORTATION ENGINEERING	
Course Code: CEPC212	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory **: 2 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
	End Semester Theory Exam : 60 Marks
Credit : 2	

Course Objectives	
Following are the objectives of this course:	
1.	To identify the types of roads as per IRC recommendations.
2.	To understand the geometrical design features of different highways.
3.	To perform different tests on road materials.
4.	To identify the components of railway tracks.

	Contents (Theory)	**Hrs**	**Marks**
UNIT-I	**1. OVERVIEW OF HIGHWAY ENGINEERING •** **1.1.** Role of transportation in the development of nation, Scope and Importance of roads in India and its Characteristics. **1.2.** Different modes of transportation – land way, waterway, airway. Merits and demerits of roadway and railway; **1.3.** General classification of roads. **1.4.** Selection and factors affecting road alignment.	6	10
UNIT-II	**2. GEOMETRIC DESIGN OF HIGHWAY** **2.1** Camber: Definition, purpose, types as per IRC recommendations. **2.2** Kerbs: Road margin, road formation, right of way. **2.3** Design speed and various factors affecting design speed as per IRC recommendations. **2.4** Gradient: Definition, types as per IRC- recommendations. **2.5** Sight distance (SSD): Definition, types IRC –recommendations, simple numerical. **2.6** Curves: Necessity, types: Horizontal, vertical curves. **2.7** Extra widening of roads: numerical examples. **2.8** Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation. **2.9** Standards cross-sections of national highway in embankment and cutting.	8	12
UNIT-III	**3. CONSTRUCTION OF ROAD PAVEMENTS** **3.1** Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen-	10	12

	penetration, Ductility, Flash and Fire point test and Softening point test. **3.2** Pavement – Definition, Types, Structural Components of pavement and their functions **3.3** Construction of WBM road. Merits and demerits of WBM & WMM road. **3.4** Construction of Flexible pavement / Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, Seal coat, Merits and Demerits of BR. **3.5** Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.		
UNIT-IV	**4. BASICS OF RAILWAY ENGINEERING** **4.1** Classification of Indian Railways, zones of Indian Railways. **4.2** Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. **4.3** Rail, Rail Joints - requirements, types. **4.4** Creep of rail: causes and prevention. **4.5** Sleepers - functions and Requirement, types - concrete sleepers and their density. **4.6** Ballast - function and types, suitability. **4.7** Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.	8	12
UNIT-V	**5.TRACK GEOMETRICS, CONSTRUCTION AND MAINTENANCE** **5.1** Alignment- Factors governing rail alignment. **5.2** Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains, **5.3** Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail. **5.4** Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle. **5.5** Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station. **5.6** Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & draw backs of marshalling yards. **5.7** Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, organization of track maintenance, Duties of permanent way inspector, gang mate and key man	10	14
	Total	**42**	**60**
Course Outcomes			
After completing this course, student will be able to:			
1.	Identify the types of roads as per IRC recommendations.		

2.	Implement the geometrical design features of different highways
3.	Perform different tests on road materials
4.	Identify the components of railway tracks.
5.	Identify the defects in railway tracks

Text/ Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
L.R. Kadiyali,	Transportation Engineering	Khanna Book Publishing Co., Delhi (ISBN: 978-93- 82609-858) Edition 2018
Khanna S.K., Justo,, C E G and Veeraragavan	Highway Engineering	Nem Chand and Brothers, Roorkee.
Arora, N. L	Transportation Engineering	Khanna Publishers, Delhi
Saxena S C and Arora S P	A Textbook of Railway Engineering	Dhanpat Rai Publication.
Birdi, Ahuja	Road, Railways, Bridge and Tunnel Engg ,	Standard Book House, New Delhi
Sharma, S.K., Principles	Principles, Practice and Design of Highway Engineering,, S	Chand Publication, New Delhi.
Duggal, Ajay K. and Puri, V	Laboratory Manual in Highway Engineering, N	New Age International (P) Limited, Publishers, New Delhi
Subramanian, K.P	Highway, Railway, Airport and Harbour Engineering	Scitech Publications, Hyderabad.

Name of the course: HYDRAULICS LAB	
Course code: CEPC214	**Semester - IV**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs / week**	**Practical PA**
	Sessional : 40 Marks Viva – Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam : 40 Marks
Credit : 1	

Course Objectives:

Following are the objectives of this course:

1	To understand parameters associated with fluid flow and hydrostatic pressure.
2	To know head loss and water hammer in fluid flow through pipes
3	To learn different types of pumps and their uses

List of Practical to be performed:		**Hrs.**	**Marks**
1	Use piezometer to measure pressure at a given point.	32	40
2	Use Bourdon's Gauge to measure pressure at a given point.		
3	Use U tube differential manometer to measure pressure difference between two given points.		
4	Find the resultant pressure and its position for given situation of liquid in a tank.		
5	Use Reynold's apparatus to determine type of flow.		
6	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.		
7	Use Friction factor Apparatus to determine friction factor for a given pipe.		
8	Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.		
9	Determine minor losses in pipe fitting due to Bend and Elbow.		
10	Calibrate Venturimeter to find out the discharge in a pipe.		
11	Calibrate the Orifice to find out the discharge through a tank		
12	Use Current meter to measure the velocity of flow of water in open channel.		
13	Use Pitot tube to measure the velocity of flow of water in open channel.		
14	Use triangular notch to measure the discharge through open channel.		
15	Use Rectangular notch to measure the discharge through open channel.		
16	Determine the efficiency of centrifugal pump.		
	Total	**32**	**40**

Course outcomes:

After completing this course, student will be able to:

1	Measure pressure and determine total hydrostatic pressure for different conditions.
2	Understand various parameters associated with fluid flow.
3	Determine head loss of fluid flow through pipes

4	Find the fluid flow parameters in open channels.
5	Select relevant hydraulic pumps for different applications

Text / Reference Books		
Name of the Authors	**Title of the Book**	**Name of the Publishers**
Modi, P. N. and Seth, S.M.	Hydraulics and Fluid Mechanics,	Standard book house, Delhi.
S.S. Rattan.	Fluid Mechanics and Hydraulic Machines,	Khanna Publishing House, Delhi.
Ramamrutham, and Narayan, R.	Hydraulics, Fluid Mechanics and Fluid Machines,	Dhanpat Rai Publishing Company, New Delhi.
Khurmi,R S, Hydraulics,	Fluid Mechanics, Hydraulic machines,	S Chand Publishers, New Delhi.
Rajput, R K,	Fluid Mechanics,	S Chand, New Delhi.
Ojha, C S P, Berndtsson, R, and Chandramoulli P. N.	Fluid Mechanics and Machinery	Oxford University Press, New Delhi.

Name of the course : ADVANCED SURVEYING LAB	
Course Code: CEPC216	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva-voce : 20 Marks
	Total : 60 Marks
Credit : 1	**Practical End Exam : 40 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To know methods of plane surveying and Theodolite surveying and their use.
2.	To learn tacheometric surveying and curve setting.
3.	To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
4.	To know the concept of remote sensing, GPS and GIS.

	List of Practicals to be performed	Hrs.	Marks
1.	Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.	**32**	**40**
2.	Use plane table survey to prepare plans, locate details by Intersection Method.		
3.	Use plane table survey to prepare plans, locate details by Traversing Method.		
4.	Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.		
5.	Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.		
6.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.		
7.	Use Thedolite as a Tacheometer to compute reduced levels and horizontal distances.		
8.	Set out a circular curve by Rankine's Method of Deflection Angles.		
9.	Use micro optic Theodolite to Measure Horizontal angle by Direct Method.		
10.	Use EDM to measure horizontal distance.		
11.	Use Total station instrument to measure horizontal distances.		
12.	Use Total station instrument to measure vertical angle.		
13.	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.		
14.	Use GPS to locate the coordinates of a station.		
15.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.		
	Total	**32**	**40**

Course Outcomes	
After completing this course, student will be able to:	
1.	Prepare plans using Plane Table Surveys.
2.	Prepare plans using Theodolite surveys.
3.	Find distances and elevations using Tachometer
4.	Make measurements using Total Station.
5.	Locate coordinates of survey stations using GPS

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Kanetkar, T. P.; Kulkarni, S. V.	Surveying and Levelling Part I and II,	Pune Vidyarthi Gruh Prakashan, Pune.
Basak, N. N.	Surveying and Levelling	McGraw Hill Education (India) Pvt. Ltd., Noida.
Duggal, S. K.	Survey I and Survey II	Tata McGraw Hill Education Pvt. Ltd., Noida.
Saikia, M D.; Das. B.M.; Das. M.M.	Surveying	PHI Learning Pvt. Ltd., New Delhi.
Subramanian, R.	Surveying and Levelling	Oxford University Press. New Delhi.
Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar	Surveying Vol. I and Surveying Vol. II	Laxmi Publications Pvt. Ltd., New Delhi.
Rao, P. Venugopala Akella, Vijayalakshmi	Textbook of Surveying	PHI Learning Pvt. Ltd., New Delhi.
Venkatramaiah, C	Textbook of Surveying	Universities Press, Hyderabad.
Anderson, James M and Mikhail, Edward M	Surveying theory and practice	Mc Graw Hill Education, Noida.
De, Alak	Plane Surveying	S. Chand Publications, New Delhi.

Name of the course : BUILDING PLANNING AND DRAWING LAB	
Course Code: CEPC218	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical **: 4 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva- Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam : 40 Marks
Credit : 2	

Course Objectives

Following are the objectives of this course:

1.	To learn basic principles of building planning and drawing.
2.	To know graphical representation of various components of buildings
3.	To draw complete plan and elevation of a building.
4.	To learn basics of perspective drawings and Computer Aided Drawings.

List of Practicals/Drawings to be completed:

A. Sketch Book		**Hrs.**	**Marks**
1.	Draw various types of lines, graphical symbols for materials, doors and windows, symbols forsanitary, water supply and electrical installations and write abbreviations as per IS 962.		
2.	Write summary of observations of all technical details from the given drawing (One/Two BHK)obtained from the professional architect or civil engineer (Group activity in four students)		
3.	a) Measure the units of existing building (Load Bearing / Frame structure).		
	b) Draw line plan of measured existing building at **serial no 3a** to the suitable scale.		
4.	Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom)		
	a) Residential Bungalows (Minimum three plans)		
	b) Apartment (Minimum two plans)		
5.	Draw line plans to suitable scale for any **Five** Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).		
6.	Draw the following plans for a Framed Structure (One/Two BHK) from given line plan.		
	a. Developed plan, Elevation		
	b. Section for above developed plan.		
	c. Site plan for above drawings including area statement, schedule of opening		

	and construction notes.		
B. Full Imperial Size Sheet (A1)			
1.	Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing		
	a)Developed plan and elevation:		
	b) Section passing through Stair **or** W.C. and Bath		
	c) Foundation plan and schedule of openings.		
	d) Site plan (1:200), area statement, construction notes.		
2.	Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing:		
	a) Developed plan.		
	b) Elevation.		
	c) Section passing through Stair case, WC and Bath		
	d) Site plan (1:200) and area statement		
	e) Schedule of openings and Construction Notes.		
3.	Draw the above mentioned drawing at serial number (B-2) using CAD software and enclosethe print out.		
	a) Developed plan		
	b) Elevation.		
	c) Section passing through Staircase, W.C. and Bath		
	d) Foundation plan		
	e) Site plan (1:200), area statement, Schedule of openings andconstruction notes.		
4.	Draw working drawing for above mentioned drawing at serial number (B-2) showing:		
	a)Foundation plan to the scale 1:50		
	b) Detailed enlarged section of RCC column and footing with plinth filling.		
	c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.		
	d) Detailed enlarged section of RCC staircase and slab.		
5.	Draw two point perspective drawing of small objects - steps, monuments, pedestals (any one)scale 1:50		
	a)Draw plan, elevation, eye level, picture plane and vanishing points		
	b) Draw perspective view.		
	TOTAL	**62**	**40**

Course Outcomes

After completing this course, student will be able to:

1.	Interpret the symbols, signs and conventions from the given drawing.
2.	Prepare line plans of residential and public buildings using principles of planning.
3.	Prepare working drawing for the given requirement of Load Bearing Structure.
4.	Prepare working drawing using CAD for the given requirement of FramedStructure.
5.	Draw two-point perspective drawing for given small objects.

Text/ Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
Shah. M.G. Kale, CM, Patki, S.Y.	Building Drawing	Mcgraw Hill Publishing company Ltd. NewDelhi.
Malik and Mayo	Civil Engineering Drawing	Computech Publication Ltd New Asian Publish-ers, New Delhi.
M. G. Shah and C. M. Kale	Principles of Perspective Drawing	Mcgraw Hill Publishing company Ltd. New Delhi
Swamy, Kumara; Rao, N, Kameshwara, A .	Building Planning and Drawing	Charotar Publication, Anand
Bhavikatti, S. S.	Building Construction	Vikas Publication House Pvt. Ltd., New Delhi
Mantri, Sandip	A to Z Building Construction	Satya Prakashan, New Delhi
Singh, Ajit	Working with Auto CAD 2000	Mcgraw Hill Publishing company Ltd. New Delhi
Sane, Y.S.	Planning and design of Building,	Allied Publishers, New Delhi

Name of the course: WATER RESOURCES ENGINEERING LAB	
Course Code: CEPC220	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2hrs/week**	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam :40 Marks
Credit: 1	

Course Objectives

Following are the objectives of this course:

1.	To learn estimation of hydrological parameters.
2.	To understand water demand of crops and provisions to meet the same.
3.	To know planning of reservoirs and dams.
4.	To design irrigation projects, canals and other diversion works.

List of Practical to be performed:		Hrs	Marks
1.	Calculate average rainfall for the given area using arithmetic mean method.	**16**	**40**
2.	Calculate average rainfall for the given area using isohyetal, Theissen polygon method .		
3.	Compute the yield of the Catchment area demarcated in **Sr.No.2**		
4.	Delineation of contributory area for the given outlet from the given topo-sheet.		
5.	Estimate crop water requirement for the given data.		
6.	Estimate capacity of the canal for the given data.		
7.	Calculate reservoir capacity from the given data.		
8.	Calculate control levels for the given data for a given reservoir.		
9.	Draw a labeled sketch of the given masonry/earthen dam section.		
10.	Draw the theoretical and practical profile of the given gravity dam section.		
11.	Prepare a presentation on the technical details of any one micro or minor irrigation scheme.		
12.	Prepare a model of any irrigation structure using suitable material.		
13.	Prepare a maintenance report for any major/minor irrigation project site in the vicinity of your area, based on field visit.		
14.	Prepare summary of the technical details of any existing water resource project in the vicinity of your area.		
15.	Draw a labeled sketch of the given diversion head works and Cross Drainage works.		
16.	Design a canal section for the given conditions with estimation of the quantity of material required for lining.		
	TOTAL	**16**	**40**

Course Outcomes

After completing this course, student will be able to perform:	
1.	Estimate hydrological parameters.
2.	Estimate crop water requirements of a command area and capacity of canals.
3.	Execute Minor and Micro Irrigation Schemes.
4.	Select relevant Cross Drainage works for the specific site conditions.
5.	Design, construct and maintain simple irrigation regulatory structures.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Punmia, B.C., Pande, B, Lal	Irrigation and Water Power Engineering	Laxmi Publications
Subramanayan	Engineering Hydrology	McGraw Hill
Mutreja K N	Applied Hydrology	. McGraw Hill
Sharma, R.K. and Sharma	T.K., Irrigation Engineering	S.Chand
Basak, N.N	Irrigation Engineering	McGraw Hill Education
Asawa, G.L	Irrigation and water resource Engineering	New Age
Dahigaonkar, J.G	Irrigation Engineering	Asian Book Pvt. Ltd., New Delhi
Garg, S K	Irrigation and Hydraulic Structures	Khanna Publishers, Delhi
Priyani V.B	Irrigation Engineering	Charotar Book Stall, Anand

Name of the course: TRANSPORTATION ENGINEERING LAB	
Course Code: CEPC222	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2hrs/week**	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam :40 Marks
Credit: 1	

Course Objectives	
Following are the objectives of this course:	
1.	To identify the types of roads as per IRC recommendations.
2.	To understand the geometrical design features of different highways.
3.	To perform different tests on road materials.
4.	To identify the components of railway tracks.

List of Practical to be performed:		**Hrs**	**Marks**
1.	Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR	**16**	**40**
2.	Flakiness and Elongation Index of aggregates.		
3.	Angularity Number of aggregates.		
4.	Aggregate impact test		
5.	Los Angeles Abrasion test		
6.	Aggregate crushing test		
7.	Softening point test of bitumen.		
8.	Penetration test of bitumen.		
9.	Flash and Fire Point test of bitumen.		
10.	Ductility test of Bitumen.		
11.	Visit the constructed road for visual inspection to identify defects and suggest remedial mea-sures.		
12.	Prepare the photographic report containing details for experiment **No. 11.**		
13.	Visit the hill road constructed site to understand its components.		
14.	Prepare the photographic report containing details for experiment **No. 13**		
15.	Visit the road of any one type (flexible or rigid) to know the drainage condition.		
16.	Prepare the photographic report suggesting possible repairs and maintenance for experi-ment **No. 15**.		
17.	Visit to railway track for visual inspection of fixtures, fasteners and yards.		
18.	Prepare the photographic report containing details for experiment **No. 17.**		
	TOTAL	**16**	**40**

Course Outcomes	
After completing this course, student will be able to perform:	
1.	Identify the types of roads as per IRC recommendations.
2.	Implement the geometrical design features of different highways.
3.	Perform different tests on road materials.
4.	Identify the components of railway tracks.
5.	Identify the defects in railway tracks

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
L.R. Kadiyali,	Transportation Engineering	Khanna Book Publishing Co., Delhi (ISBN: 978-93- 82609-858) Edition 2018
Khanna S.K., Justo,, C E G and Veeraragavan	Highway Engineering	Nem Chand and Brothers, Roorkee.
Arora, N. L	Transportation Engineering	Khanna Publishers, Delhi
Saxena S C and Arora S P	A Textbook of Railway Engineering	Dhanpat Rai Publication.
Birdi, Ahuja	Road, Railways, Bridge and Tunnel Engg ,	Standard Book House, New Delhi
Sharma, S.K., Principles	Principles, Practice and Design of Highway Engineering,, S	Chand Publication, New Delhi.
Duggal, Ajay K. and Puri, V	Laboratory Manual in Highway Engineering, N	New Age International (P) Limited, Publishers, New Delhi
Subramanian, K.P	Highway, Railway, Airport and Harbour Engineering	Scitech Publications, Hyderabad.

Name of the course : RURAL CONSTRUCTION TECHNOLOGY	
Course Code: CEPE206	**Semester: IV**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 3	**End Semester Theory Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To learn development and planning of low cost housing infrastructure.
2.	To know about different government schemes for rural development.
3.	To understand techniques for rural road construction as per IRC stipulations.
4.	To learn rural irrigation techniques and watershed management.

	Contents (Theory)	**Hrs.**	Marks
UNIT-I	**1. RURAL DEVELOPMENT AND PLANNING** 1.1 Scope; development plans; various approaches to rural development planning. 1.2 Significance of rural development. 1.3 Rural development programme/projects.	**4**	**8**
UNIT-II	**2. RURAL HOUSING** 2.1. Low cost construction material for housing 2.2. Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls. 2.3. Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rat- trap bond for walls; Panels for roof, ferro-cement flooring/roofing units. 2.4. Biomass - types of fuels such as firewood, agricultural residues, dung cakes. 2.5. Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewable energy. 2.6. Working of gobar gas and bio gas plants.	**12**	**16**

UNIT-III	**3. WATER SUPPLY AND SANITATION FOR RURAL AREAS** 3.1 Sources of water: BIS & WHO water standards. 3.2. Quality, Storage and distribution for rural water supply works. 3.3. Hand pumps-types, installation, operation, and maintenance of hand pumps. 3.4. Conservation of water - rainwater harvesting, drainage in rural areas. 3.5. Construction of low cost latrines: Two pits pour flush water seal, septic tank etc. 3.6. Low cost community and individual Garbage disposal systems, Ferro-cement storage tanks.	**12**	**16**
UNIT-IV	**4. LOW COST RURAL ROADS** 4.1 Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases. 4.2. Guidelines for Surfacing of Rural Road as per relevant IRC codes. 4.3. Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.	**6**	**8**
UNIT-V	**5. LOW COST IRRIGATION** 5.1 Design consideration and construction of tube-well, drip & sprinkler irrigation systems. 5.2. Watershed and catchment area development –problems and features of watershed management. 5.3. Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm pond, Bandhara system.	**8**	**12**
	Total:	**42**	**60**

Course Outcomes

After completing this course, students will be able to:

1.	Plan low cost housing using rural materials.
2.	Make use of relevant government schemes for construction of roads and housing.
3.	Use guidelines for rural road construction.
4.	Implement different irrigation systems for rural areas.
5.	Identify the need of watershed management in rural areas.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Madhov Rao A G, and Ramachandra Murthy, D S	Appropriate Technologies for low cost Housing	Oxford and IBH Publishing Co. Pvt. Ltd.
CBRI, Roorkee,	Advances in Building Materials and Constriction.	Charotar Publication, Anand.
Desai,Vasant	Rural Development in India: Past, Present and Future : A Challenge in the Crisis,	Himalaya Publishing House, Delhi.

Rastogi, A.K.	Rural Development Strategy,	Wide Vision, Jaipur
Singh, Katar,	Rural Development Principles, Policies and Management,	Sage Publications India Pvt.Ltd.
Gaur, Keshav Dev,	Dynamics of Rural Development,	Mittal Publications, Delhi.
Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.		

Name of the course : MINOR PROJECT	
Course code: PR202	**Semester : IV**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Practical **:** **4** **hrs/week**	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
Credit **:** **2**	**End Semester Practical Exam :40 Marks**

Rationale:

The diploma-holders in Civil Engineering, many a times , are involved with project work in design and drawing offices. The major works involve making survey, drawing plan and sections, collection of data , organization and analysis of data, estimation and elementary design of structures or their components. They are also expected to have some knowledge of actual practice in construction work. The course " Project and Industrial visits" should therefore be very important to the diploma students of Civil Engineering to make them professionally sound and valuable

Course Objective :-

Following are the objectives of this course:

1.	Apply knowledge gained in different subjects through solving real life problems in Civil Engineering Apply he ideas of the state of art of construction practices through industrial visits
2.	Apply the ideas of the state of art of construction practices through industrial visits
3.	Develop self-confidence for working in Civil Engineering projects
4	Prepare necessary drawings, estimates and project reports

Pre-Requisite :-

Courses learned upto second year.

Contents		Hrs	Marks
UNIT- I	Selection of groups	5	8
UNIT - II	Development of project topics and conduct reconnaissance survey	5	8
UNIT - III	Collection of data, required survey work, Preparation of synopsis and selection of project	8	13
UNIT - IV	Management and construction procedure,	12	19
UNIT – V	Scheduling of planning, Preparation of designing and drawing in detail	12	19
UNIT - VI	Estimation of the project	4	6
UNIT - VII	Execution of the project	8	13
UNIT - VIII	Documentation and final presentation	8	14
Total		**62**	**100**

Practical :-

S.No	Skills to be developed
1	Intellectual skills-. 1) Decide and collect data for projects. 2) Read and interpret the drawing, data. 3) Design the components. 4) Apply the principles rules regulations and byelaws.
2	Motor skills- 1) Plan for different phases of a task. 2) Prepare drawings for project. 3) Use of computer for drawing, networking. 4) Work in a group for a given task.
3	Social skills- 1. Development of ethics. 2. Will learn to work with peer as group. 3. Able to keep safe and amicable working environment

SPECIFICATION TABLE

CIVIL ENGINEERING- TERM- III

Name of the Course: **CONSTRUCTIONS MATERIALS**
Course Code: **CEPC201**
Semester: **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Overview of Construction Material	6	1	3	4	8
2	Natural construction material	12	3	6	8	17
3	Artificial construction materials	12	3	5	7	15
4	Special Construction Materials	6	1	3	4	8
5	Processed Construction Materials	10	2	4	6	12
	Total	**46**	**10**	**21**	**29**	**60**

Name of the Course : **BASIC SURVEYING**
Course Code : **CEPC203**
Semester : **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total
1	Overview and Classification of Survey	**2**	3	2	-	**5**
2	Chain Surveying	**6**	4	4	-	**8**
3	Compass Traverse Curve	**10**	5	7	10	**22**
4	Levelling and Contouring	**12**	5	8	7	**20**
5	Measurement of Area and Volume	**2**	3	2	-	**5**
TOTAL		**32**	**20**	**23**	**17**	**60**

Name of the Course : **MECHANICS OF MATERIALS**
Course Code : **CEPC205**
Semester : **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	**Name of Chapter**	**Hours**	**Marks**			
			K	**C**	**A**	**Total**
1.	Moment of Inertia	**5**	2	6	-	**8**
2.	Simple Stresses and Strains	**7**	4	6	4	**14**
3.	Shear Force and Bending Moment	**8**	2	4	8	**14**
4.	Bending and Shear Stresses in beams	**6**	2	6	4	**12**
5.	Columns	**6**	2	4	6	**12**
	TOTAL	**32**	**12**	**26**	**22**	**60**

Name of the Course : **BUILDING CONSTRUCTION**
Course Code : **CEPC207**
Semester : **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1	Overview Of Building Components	6	2	4	4	10
2	Construction Of Substructure	6	4	4	4	12
3	Construction Of Superstructure	8	4	4	6	14
4	Building Communication And Ventilation	6	4	4	4	12
5	Building Finishes	6	3	5	4	12
	Total	**32**	**17**	**21**	**22**	**60**

Name of the Course: **CONCRETE TECHNOLOGY**
Course Code: **CEPC209**
Semester: **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1	Cement, Aggregates and Water	8	4	5	6	15
2	Concrete	7	2	7	4	13
3	Concrete Mix Design and Testing of Concrete	5	2	3	5	10
4	Quality Control of Concrete	6	2	4	4	10
5	Chemical Admixture, Special Concrete and Extreme Weather concreting	6	2	4	6	12
	Total	**32**	**12**	**23**	**25**	**60**

Name of the Course : **GEOTECHNICAL ENGINEERING**
Course Code : **CEPC211**
Semester : **III**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1.	Overview Of Geology And Geotechnical Engineering	**3**	3	5	-	8
2.	Physical And Index Properties Of Soil	**8**	4	5	7	16
3.	Permeability And Shear Strength Of Soil	**7**	3	5	4	12
4.	Bearing Capacity Of Soil	**6**	3	4	3	10
5.	Compaction And Stabilization Of Soil	**8**	5	6	3	14
	TOTAL	**32**	**18**	**25**	**17**	**60**

CIVIL ENGINEERING- TERM- IV

Name of the Course: **HYDRAULICS**
Course Code: **CEPC202**
Semester: **IV**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Pressure measurement and Hydrostatic pressure	8	3	4	7	16
2	Fluid Flow Parameters	8	2	4	4	12
3	Flow through pipes	7	2	4	6	10
4	Flow through Open Channel	7	3	4	7	14
5	Hydraulic Pumps	6	2	4	4	8
	Total	**46**	**12**	**20**	**28**	**60**

Name of the Course : **ADVANCED SURVEYING**
Course Code : **CEPC204**
Semester : **IV**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total
1	Plane Table Surveying	**4**	3	4	-	**7**
2	Theodolite Surveying	**12**	6	8	10	**24**
3	Tacheometric Surveying and Curve Setting	**7**	4	6	5	**15**
4	Advanced Surveying Equipments	**5**	4	4	-	**8**
5	Remote Sensing, GPS and GIS	**4**	3	3	-	**6**
TOTAL		**32**	**20**	**25**	**15**	**60**

Name of the Course : **THEORY OF STRUCTURES**
Course Code : **CEPC206**
Semester : **IV**

SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1.	Direct And Bending Stresses In Vertical Members	**5**	3	3	3	9
2.	Slope And Deflection	**6**	4		6	10
3.	Fixed And Continuous Beam	**8**	4	3	9	16
4.	Moment Distribution Method	**8**	3	4	8	15
5.	Simple Trusses	**5**	3	-	7	10
	TOTAL	**32**	**17**	**10**	**33**	**60**

Name of the Course : **BUILDING PLANNING AND DRAWING**
Course Code : **CEPC208**
Semester : **IV**

SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1	Conventions And Symbols	2	2	4	-	6
2	Planning Of Building	3	4	6	-	10
3	Drawing Of Load Bearing Structure	4	-	6	10	16
4	Drawing Of Framed Structure	5	-	8	10	18
5	Perspective Drawing	2	2	3	5	10
	Total	**16**	**8**	**27**	**25**	**60**

Name of the Course : **WATER RESOURCES ENGINEERING**
Course Code : **CEPC210**
Semester : **IV**

SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1.	Introduction To Hydrology	**6**	2	4	6	12
2.	Crop Water Requirement And Reservoir Planning	**8**	3	5	6	14
3.	Dams And Spillways	**7**	5	7	-	12
4.	Minor And Micro Irrigation	**5**	3	7	-	10
5.	Diversion Head Works & Canals	**6**	4	8	-	12
	TOTAL	**32**	**17**	**31**	**12**	**60**

Name of the Course : **TRANSPORTATION ENGINEERING**
Course Code : **CEPC212**
Semester : **IV**

SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	**Name of Chapter**	**Hours**	**Marks**			
			K	**C**	**A**	**Total**
1.	Overview of Highway Engineering	**6**	4	6	-	**10**
2.	Geometric Design of Highway	**8**	2	4	6	**12**
3.	Construction of Road Pavements	**10**	2	4	6	**12**
4.	Basics of Railway Engineering	**8**	2	6	4	**12**
5.	Track geometrics, Construction & Maintenance	**10**	2	6	6	**14**
	TOTAL	**42**	**12**	**26**	**22**	**60**

Name of the Course : **RURAL CONSTRUCTION TECHNOLOGY**
Course Code : **CEPE206**
Semester : **IV**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	**Name of Chapter**	**Hours**	**Marks**			
			K	**C**	**A**	**Total**
1.	Rural Development and Planning	**8**	2	6	-	**8**
2.	Rural Housing	**16**	4	6	6	**16**
3.	Water supply and sanitation for rural areas	**16**	2	4	8	**14**
4.	Low-cost Rural roads	**8**	2	6	2	**8**
5.	Low-cost irrigation	**12**	2	4	6	**12**
	TOTAL	**32**	**12**	**26**	**22**	**60**

PART- III

THIRD YEAR (V & VI Semesters)

CURRICULUM OF DIPLOMA PROGRAMME ON

CIVIL ENGINEERING (CE)

TERM- V

SEMESTER- V

PROGRAM OUTCOMES OF DIPLOMA IN CIVIL ENGINEERING

Code	Program Outcome	Description
PO1	Basic and Discipline specific knowledge	Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
PO2	Problem Analysis	Identify and analyse well-defined engineering problems using codified standard methods.
PO3	Design/ Development of Solution	Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PO4	Engineering Tools, Experimentation and Testing.	Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
PO5	Engineering practices for society, sustainability and environment	Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PO6	Project Management	Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
PO7	Life-long learning	Ability to analyse individual needs and engage in updating in the context of technological changes.

A. Definition of Credit:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

B. Structure of Diploma in Civil Engineering Programme:

Sl. No.	Particulars	Credits
1.	**Humanities & Social Sciences Courses**	**8**
2.	**Basic Science Courses**	**19**
3.	**Engineering Science Courses**	**15**
4.	**Program Core Courses (Civil Engg.)**	**45**
5.	**Program Elective Courses (Civil Engg.)**	**12**
6.	**Open Elective Courses (from other technical and/or emerging subjects)**	**9**
7.	**Project work, Seminar and Internships.**	**12**
8.	**Audit Courses**	**(Non- Credit)**
Total		**120**

C. Course Level Coding Scheme:

Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course e.g.

101, 102 … etc. for first year

201, 202 …. etc. for second year

301, 302 …etc. for third year

D. Course Code and Definition:

CODE	DEFINITION
L	**Lecture**
T	**Tutorial**
P	**Practical**
HS	**Humanities & Social Sciences Courses**
BS	**Basic Sciences Courses**
ES	**Engineering Science Courses**
PC	**Program Core Courses**
PE	**Program Elective Courses**
OE	**Open Electives**
AU	**Audit Courses**
SI	**Summer Internship**
PR	**Project**
SE	**Seminar**

E. Category Wise Courses:

HUMANITIES & SOCIAL SCIENCES COURSES (HS)

Sl. No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	HS101	Communication Skills	**2**	**0**	**0**	**I**	**2**
2.	HS103	Sports & Yoga	**0**	**0**	**2**	**I**	**1**
3.	HS105	Communication Skills Lab	**0**	**0**	**2**	**I**	**1**
4.	HS302	Entrepreneurship & Start-ups	**3**	**1**	**0**	**VI**	**4**
Total Credits							**8**

BASIC SCIENCES COURSES (BS)

Sl. No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	BS101	Mathematics-I	**2**	**1**	**0**	**I**	**3**
2.	BS103	Applied Physics-I	**2**	**1**	**0**	**I**	**3**
3.	BS105	Applied Chemistry	**2**	**1**	**0**	**I**	**3**
4.	BS107	Applied Physics-I Lab	**0**	**0**	**2**	**I**	**1**
5.	BS109	Applied Chemistry Lab	**0**	**0**	**2**	**I**	**1**
6.	BS102	Mathematics-II	**3**	**1**	**0**	**II**	**4**
7.	BS104	Applied Physics-II	**2**	**1**	**0**	**II**	**3**
8.	BS106	Applied Physics-II Lab	**0**	**0**	**2**	**II**	**1**
Total Credits							**19**

ENGINEERING SCIENCES COURSES (ES)

Sl. No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	ES101	Engineering Graphics	**0**	**0**	**3**	**I**	**1.5**
2.	ES103	Engineering Workshop Practice	**0**	**0**	**3**	**I**	**1.5**
3.	ES102	Introduction to IT systems	**2**	**0**	**0**	**II**	**2**
4.	ES104	Fundamentals of Electrical & Electronics Engineering	**2**	**1**	**0**	**II**	**3**
5.	ES106	Engineering Mechanics	**2**	**1**	**0**	**II**	**3**
6.	ES108	Introduction to IT systems Lab	**0**	**0**	**4**	**II**	**2**
7.	ES110	Fundamentals of Electrical & Electronics Engineering Lab	**0**	**0**	**2**	**II**	**1**
8.	ES112	Engineering Mechanics Lab	**0**	**0**	**2**	**II**	**1**
Total Credits							**15**

PROGRAM CORE COURSES (PC)

Sl. No.	Course Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	CEPC201	Construction Materials	3	0	0	III	3
2.	CEPC203	Basic Surveying	2	0	0	III	2
3.	CEPC205	Mechanics of Materials	2	0	0	III	2
4.	CEPC207	Building Construction	2	0	0	III	2
5.	CEPC209	Concrete Technology	2	0	0	III	2
6.	CEPC211	Geotechnical Engg.	2	0	0	III	2
7.	CEPC213	Construction Materials Lab	0	0	2	III	1
8.	CEPC215	Basic Surveying Lab	0	0	2	III	1
9.	CEPC217	Mechanics of Materials Lab	0	0	2	III	1
10.	CEPC219	Concrete Technology Lab	0	0	2	III	1
11.	CEPC221	Geotechnical Engg. Lab	0	0	2	III	1
12.	CEPC202	Hydraulics	2	0	0	IV	2
13.	CEPC204	Advanced Surveying	2	0	0	IV	2
14.	CEPC206	Theory of Structures	2	0	0	IV	2
15.	CEPC208	Building Planning & Drawing	1	0	0	IV	1
16.	CEPC210	Water Resources Engg.	2	0	0	IV	2
17.	CEPC212	Transportation Engg.	2	0	0	IV	2
18.	CEPC214	Hydraulics Lab	0	0	2	IV	1
19.	CEPC216	Advanced Surveying Lab	0	0	2	IV	1
20.	CEPC218	Building Planning & Drawing Lab	0	0	4	IV	2
21.	CEPC220	Water Resources Engg. Lab	0	0	2	IV	1
22.	CEPC222	Transportation Engg. Lab	0	0	2	IV	1
23.	CEPC301	Design of Steel & RCC Structures	3	0	0	V	3
24.	CEPC303	Estimating & Costing	2	0	0	V	2
25.	CEPC305	Design of Steel & RCC Structures Lab	0	0	2	V	1
26.	CEPC307	Estimating & Costing Lab	0	0	2	V	1
27.	CEPC302	Public Health Engg.	2	0	0	VI	2
28.	CEPC304	Public Health Engg. Lab	0	0	2	VI	1
Total Credits							45

PROGRAM ELECTIVE COURSES (PE)

Sl. No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
ELECTIVE I (Anyone to be selected)							
1.	CEPE202	Precast & Prestressed Concrete.	3	0	0	IV	3
2.	CEPE204	Construction Management	3	0	0	IV	3
3.	CEPE206	Rural Construction Technology	3	0	0	IV	3
ELECTIVE II (Anyone to be selected)							
1.	CEPE301	Traffic Engineering	3	0	0	V	3
2.	CEPE303	Solid Waste Management	3	0	0	V	3
3.	CEPE305	Advanced Construction Technology	3	0	0	V	3
ELECTIVE III (Anyone to be selected)							
1.	CEPE307	Pavement Design & Maintenance	3	0	0	V	3
2.	CEPE309	Green Building & Energy Conservation	3	0	0	V	3
3.	CEPE311	Building Services and Maintenance	3	0	0	V	3
ELECTIVE IV (Anyone to be selected)							
1.	CEPE302	Repairs & Maintenance of Structures	3	0	0	VI	3
2.	CEPE304	Advanced Design of Structures	3	0	0	VI	3
3.	CEPE306	Tendering & Accounts	3	0	0	VI	3
Total Credits							12

OPEN ELECTIVE COURSES (OE)

Note:

(i) Number of Open Elective Courses: 3 to 4 (minimum ten courses to be specified out of the suggestive list of open elective courses given as Appendix III)

(ii) Credits: 9-12

(iii) The Open Elective Courses to be offered preferably in III year (one course may be offered in V Semester and two courses in VI Semester)

(iv) The students can opt only for those open elective courses that are offered by other than their respective departments

Sl.No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	CSEOE304	Artificial Intelligence & Machine Learning.	3	0	0	VI	3
2.	CSEOE301	Internet of Things.	3	0	0	V	3
3.	OE	Disaster Management	3	0	0	VI	3
4.	OE	Soft Computing Techniques.	3	0	0	V	3
5.	CEOE302	Project Management	3	0	0	VI	3
6.	OE	Renewable Energy Technologies	3	0	0	V	3
7.	OE	Artificial Intelligence	3	0	0	VI	3
						Total Credits	**9**

PROJECT WORK, SEMINAR & INTERNSHIPS

Note:

- SI201 should be undertaken in an industry/Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/Institutes/Schemes.
- SI301 should be undertaken in an industry only'
- PR302 should be based on real/ live problems of the Industry/Govt./NGO/ MSME/Rural Sector or an innovative idea having the potential of a Start-up

Sl.No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	SI201	Summer Internship-I (3-4 weeks) after semester II.	0	0	0	III	2
2.	SI301	Summer Internship-II (4-6 weeks) after semester IV.	0	0	0	V	3
3.	PR202	Minor Project	0	0	4	IV	2
4.	PR302	Major Project	0	0	2	V	4
5.			0	0	6	VI	
6.	SE302	Seminar	1	0	0	VI	1
		Total Credits					**12**

AUDIT COURSES (AU)

Sl.No.	Code	Course Title	Hours/week			Semester	Credits
			L	T	P		
1.	AU102	Environmental Science	**2**	**0**	**0**	**II**	**0**
2.	AU202	Essence of Indian Knowledge and tradition.	**2**	**0**	**0**	**IV**	**0**
3.	AU302	Indian Constitution	**2**	**0**	**0**	**VI**	**0**
Total Credits							**0**

F. Mapping of Marks to Grades

Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade
91-100	AA/A^{+}
81-90	AB/A
71-80	BB/B^{+}
61-70	BC/B
51-60	CC/C^{+}
46-50	CD/C
40-45	DD/D
< 40	FF/F (Fail due to less marks)
-	F^{R} (Fail due to shortage of attendance and therefore, to repeat the course)

STUDENT INDUCTION PROGRAM (SIP)

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal, although that is for UG students of Engineering & Technology.

G. Mandatory Visits/Workshop/Expert Lectures:

i. It is mandatory to arrange one industrial visit every semester for the students of each branch.

ii. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.

iii. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

H. Evaluation Scheme:

i. **For Theory Courses:**

(The weightage of internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

ii. **For Practical Courses:**

(The weightage of internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

iii. **For Summer Internship / Projects / Seminar etc.:**

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

iv. **Internal Assessment:**

The internal assessment shall be based on the student's performance in mid semester tests, assignments, attendance, viva-voce in practical, lab record etc.

For Theory Based Subjects: The total internal marks of 40 shall be distributed as below:

i) 20 Marks for Internal Exams which shall be computed as the average of best two internal tests out of 3 tests to be conducted in the session,

ii) 10 marks for Tutorial Sheets/Assignments

iii) 10 marks for Attendance.

For Practical Based Subjects, the total internal marks of 60 shall be distributed as

i) 20 Marks for internal viva

ii) 20 Marks for Internal Practical Conduction

iii) 10 Marks for Lab Record Maintenance iv) 10 Marks for Attendance

Common Structure for First Year

SEMESTER- I

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	BASIC SCIENCE	BS101	Mathematics –I		2	1	0	60	20	15	5	-	-	-	100	3
2		BS103	Applied Physics -I		2	1	0	60	20	15	5	-	-	-	100	3
3		BS105	Applied Chemistry		2	1	0	60	20	15	5	-	-	-	100	3
4		BS107	Applied Physics –I Lab		0	0	2	0	-	-	-	40	40	20	100	1
5		BS109	Applied Chemistry Lab		0	0	2	0	-	-	-	40	40	20	100	1
6	HUMANITIES & SOCIAL SCIENCE	HS101	Communication skills in English		2	0	0	60	20	15	5	-	-	-	100	2
7		HS103	Sports & Yoga/ NCC/NSS		0	0	2	-	-	-	-	40	40	20	100	1
8		HS105	Communication skills in English Lab-I		0	0	2	-	-	-	-	40	40	20	100	1
9	ENGINEERING SCIENCE	ES101	Engineering Graphics		0	0	3	-	-	-	-	-	60	40	100	1.5
10		ES103	Engineering Workshop Practice		0	0	3	-	-	-	-	-	60	40	100	1.5
			TOTAL		8	3	14	240	80	60	20	160	280	160	1000	18

SEMESTER- II

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	BASIC SCIENCE	BS102	Mathematics – II	BS101	3	1	0	60	20	15	5	-	-	-	100	4
2		BS104	Applied Physics – II	BS103	2	1	0	60	20	15	5	-	-	-	100	3
3		BS106	Applied Physics – II Lab	BS107	0	0	2	-	-	-	-	40	40	20	100	1
4	ENGINEERING SCIENCE	ES102	Introduction to IT Systems		2	0	0	60	20	15	5	-	-	-	100	2
5		ES104	Fundamentals of Electrical & Electronics Engineering		2	1	0	60	20	15	5	-	-	-	100	3
6		ES106	Engineering Mechanics	BS103 & BS104	2	1	0	60	20	15	5	-	-	-	100	3
7		ES108	Introduction to IT Systems Lab		0	0	2	-	-	-	-	40	40	20	100	1
8		ES110	Fundamentals of Electrical & Electronics Engineering Lab		0	0	2	-	-	-	-	40	40	20	100	1
9		ES112	Engineering Mechanics Lab	BS107 & BS106	0	0	2	-	-	-	-	40	40	20	100	1
10	HUMANITIES & SOCIAL SCIENCE	HS106	Communication skills in English Lab-II	HS105	0	0	2	-	-	-	-	-	-	-	-	1
11	MANDATORY AUDIT COURSE	AU102	Environmental Science		2	0	0	-	-	-	-	-	-	-	0	0
			TOTAL		13	4	10	300	100	75	25	160	160	80	900	20

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Semester-III

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	PROGRAM CORE	CEPC201	Construction Material		3	0	0	60	20	15	5	-	-	-	100	3
2		CEPC203	Basic Surveying		2	0	0	60	20	15	5	-	-	-	100	2
3		CEPC205	Mechanics of Materials	ES106	2	0	0	60	20	15	5	-	-	-	100	2
4		CEPC207	Building Construction		2	0	0	60	20	15	5	-	-	-	100	2
5		CEPC209	Concrete Technology		2	0	0	60	20	15	5	-	-	-	100	2
6		CEPC211	Geotechnical Engineering		2	0	0	60	20	15	5	-	-	-	100	2
7		CEPC213	Construction Material Lab		0	0	2	-	-	-	-	40	40	20	100	1
8		CEPC215	Basic Surveying Lab		0	0	2	-	-	-	-	40	40	20	100	1
9		CEPC217	Mechanics of Materials Lab	ES112	0	0	2	-	-	-	-	40	40	20	100	1
10		CEPC219	Concrete Technology Lab		0	0	2	-	-	-	-	40	40	20	100	1
11		CEPC221	Geotechnical Engineering Lab		0	0	2	-	-	-	-	40	40	20	100	1
12	SUMMER INTERNSHIP (4 weeks) after Semester II	SI201	Summer Internship-I		0	0	0	-	-	-	-	40	40	20	100	2
			TOTAL		13	0	10	360	120	90	30	240	240	120	1200	20

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Semester-IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	PROGRAM CORE	CEPC202	Hydraulics		2	0	0	60	20	15	5	-	-	-	100	2
2		CEPC204	Advanced Surveying	CEPC203	2	0	0	60	20	15	5	-	-	-	100	2
3		CEPC206	Theory of Structure	CEPC205	2	0	0	60	20	15	5	-	-	-	100	2
4		CEPC208	Building Planning and Drawing	CEPC207	1	0	0	60	20	15	5	-	-	-	100	1
5		CEPC210	Water Resource Engineering		2	0	0	60	20	15	5	-	-	-	100	2
6		CEPC212	Transportation Engineering		2	0	0	60	20	15	5	-	-	-	100	2
7		CEPC214	Hydraulics Lab		0	0	2	-	-	-	-	40	40	20	100	1
8		CEPC216	Advanced Surveying Lab	CEPC215	0	0	2	-	-	-	-	40	40	20	100	1
9		CEPC218	Building Planning and Drawing Lab		0	0	4	-	-	-	-	40	40	20	100	2
10		CEPC220	Water Resource Engineering Lab		0	0	2	-	-	-	-	40	40	20	100	1
11		CEPC222	Transportation Engineering Lab		0	0	2	-	-	-	-	40	40	20	100	1
12	PROGRAM ELECTIVE COURSE	CEPE206	Rural Construction Technology		3	0	0	60	20	15	5	-	-	-	100	3
13	MINOR PROJECT	PR202	Minor Project		0	0	4	-	-	-	-	40	40	20	100	2
14	Mandatory Course	AU202	Essence of Indian Knowledge and Tradition		2	-	-	-	-	-	-	-	-	-	0	0
			TOTAL		16	0	16	420	140	105	35	240	240	120	1300	22

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Semester-V

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	PROGRAM CORE	CEPC301	Design of Steel and RCC structure		3	0	0	60	20	15	5	-	-	-	100	3
2		CEPC303	Estimating, Costing and valuation	CEPC208	2	0	0	60	20	15	5	-	-	-	100	2
3		CEPC305	Design of Steel and RCC structure Lab		0	0	2	-	-	-	-	40	40	20	100	1
4		CEPC307	Estimating, Costing and valuation Lab	CEPC218	0	0	2	-	-	-	-	40	40	20	100	1
5	PROGRAM ELECTIVE COURSE	CEPE303	Solid Waste Management		3	0	0	60	20	15	5	-	-	-	100	3
6		CEPE307	Pavement Design & Maintenance		3	0	0	60	20	15	5	-	-	-	100	3
7	OPEN ELECTIVE	CSEOE301	Internet of Things		3	0	0	60	20	15	5	-	-	-	100	3
8	SUMMER INTERNSHIP (6 weeks) after Semester IV	SI301	Summer Internship-II		0	0	0	-	-	-	-	40	40	20	100	3
9	MAJOR PROJECT	PR302	Major project		0	0	2	-	-	-	-	Assessment to be done, credit to be carried over				^
			TOTAL		14	0	6	300	100	75	25	120	120	60	800	19

^ Credit of Major Project to be carried over to VI sem.

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Semester-VI

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign-ment	Attend-ance		Sessional	Viva voce		
1	PROGRAM CORE	CEPC302	Public Health Engineering		2	0	0	60	20	15	5	-	-	-	100	2
2		CEPC304	Public Health Engineering Lab		0	0	2	-	-	-	-	40	40	20	100	1
3	PROGRAM ELECTIVE COURSE	CEPE306	Tendering and Accounts		3	0	0	60	20	15	5	-	-	-	100	3
4	HUMANITIES & SOCIAL SCIENCE COURSE	HS302	Entrepreneurship and Start-ups		3	1	0	60	20	15	5	-	-	-	100	4
5	OPEN ELECTIVE	CEOE302	Project Management		3	0	0	60	20	15	5	-	-	-	100	3
6	OPEN ELECTIVE	CSEOE304	Artificial Intelligence & Machine Learning		3	0	0	60	20	15	5	-	-	-	100	3
7	Mandatory Course	AU302	Indian Constitution		2	0	0	-	-	-	-	-	-	-	0	0
8	MAJOR PROJECT	PR302	Major Project		0	0	6	-	-	-	-	100	50	50	200	4^
9	SEMINAR	SE302	Seminar		1	0	0	-	-	-	-	-	50	50	100	1
			TOTAL		17	1	8	300	100	75	25	140	140	120	900	21

TERM- V

SEMESTER- V

Name of the course : DESIGN OF STEEL AND RCC STRUCTURE	
Course Code: CEPC301	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 3	**Theory End Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To learn the concept of limit state design for tension and compression steel member
2.	To learn the concept of limit state design of steel beams.
3.	To understand design of RCC elements.
4.	To know the design of short and long RCC columns.

	Contents (Theory)	**Hrs**	**Marks**
UNIT-I	**1. DESIGN OF STEEL TENSION AND COMPRESSION MEMBERS (LIMIT STATE METHOD)** 1.5. Types of sections used for Tension members. 1.6. Strength of tension member by yielding of section, rupture of net cross- section and block shear. 1.7. Design of axially loaded single angle and double angle tension members with bolted and welded connections. 1.8. Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress. 1.9. Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems). 1.10. Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.	15	20
UNIT-II	**2. DESIGN OF STEEL BEAMS (LIMIT STATE METHOD)** 2.1 Standard beam sections, Bending stress calculations. 2.2 Design of simple I and channel section. 2.3 Check for shear as per IS 800	6	10

UNIT-III	**3. DESIGN OF REINFORCED CONCRETE BEAMS BY LIMIT STATE METHOD** 3.1 Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456. 3.2 Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section. 3.3 Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of Ast and Asc.	10	14
UNIT- IV	**4. SHEAR, BOND AND DEVELOPMENT LENGTH IN DESIGN OF RCC MEMBER** 4.1 Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement. 4.2 Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90º hook, Lapping of bars. 4.3 Simple numericals on: Shear reinforcement, Adequacy of section for shear. 4.4 Introduction to serviceability limit state check.	12	8
UNIT-V	**5. DESIGN OF AXIALLY LOADED RCC COLUMN** 5.1 Definition and classification of column, Limit state of compression members, Effective length of column. 5.2 Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc. 5.3 Design of axially loaded short column - Square, Rectangular, and Circular only.	5	8
	Total:	**48**	**60**

Course Outcomes	
After completing this course, student will be able to:	
1.	Design of steel tension and compression member.
2.	Design of steel I and Channel sections.
3.	Design of singly and doubly reinforced RCC beam.
4.	Design of RCC beam for shear and development length.
5.	Design of short and long RCC columns.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Shah, V. L and Gore. V	Limit State Design of Steel Structures	Structures Publications, Pune

Dayarathnam P.	Design of Steel Structures	S. Chand and Company, Delhi
Subramanian N.	Design of Steel Structures	Oxford University Press
Sairam K.S	Design of Steel Structures	Pearson Publication, Chennai, Delhi.
Shah, V. L and Karve S.R	Limit State Theory and Design of Reinforced Concrete Structures,	Structures Publications, Pune,2014.
Sinha , N.C and Roy S.K.	Fundamentals of Reinforced Concrete	S. Chand & Co., New Delhi.
Krishna Raju and N. Pranesh, R.N	Reinforced Concrete Design Principles and Practice,	New Age International, Mumbai.
Pillai, S.U., and Menon, Devdas	Reinforced concrete Design	McGraw Hill Publications, New Delhi.
Varghese, P.C.	Limit State Design of Reinforced Concrete	Prentice Hall India Learning Private Limited, Delhi.

Name of the course :ESTIMATING, COSTING AND VALUATION	
Course Code: CEPC303	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : 2 hrs/week Tutorial : 0 hrs/week	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks**
Credit : 2	**End Semester Theory Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To learn the procedure for estimating and costing of Civil Engineering works.
2.	To perform rate analysis for different items associated with construction projects.
3.	To use software for detailed estimate related to civil infrastructural projects.

	Contents (Theory)	**Hrs.**	Marks
UNIT-I	**1. FUNDAMENTALS OF ESTIMATING AND COSTING** 1.1 Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. 1.2 Types of estimates – Approximate and Detailed estimate. 1.3 Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate. 1.4 Roles and responsibility of Estimator. 1.5 Checklist of items in load bearing and framed structure. 1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet. 1.7 Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200. 1.8 Rules for deduction in different category of work as per IS:1200. 1.9 Description / specification of items of building work as per PWD /DSR	**4**	**8**
UNIT-II	**2. APPROXIMATE ESTIMATES** 2.1. Approximate estimate- Definition, Purpose. 2.2. Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals) 2.3. Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects.	**5**	**6**

UNIT-III	**3. DETAILED ESTIMATE** 3.1. Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting. 3.2. Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals) 3.3. Long wall and Short wall method, Centre line method. 3.4. Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements 3.5. Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc. 3.6. Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.	**10**	**20**
UNIT-IV	**4. ESTIMATE FOR CIVIL ENGINEERING WORKS** 4.1. Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. 4.2. Detailed estimate for septic tank, Community well. 4.3. Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.	**7**	**12**
UNIT-V	**5. RATE ANALYSIS** 5.1. Rate Analysis: Definition, purpose and importance. 5.2. Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit 5.3. Procedure for rate analysis 5.4. Task work- Definition, types. Task work of different skilled labour for different items. 5.5. Categories of labours, their daily wages, types and number of labours for different items of work. 5.6. Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments. 5.7. Preparing rate analysis of different items of work pertaining to buildings and roads	**6**	**14**
	Total:	**32**	**60**

Course Outcomes	
After completing this course, student will be able to:	
1.	Select modes of measurements for different items of works
2.	Prepare approximate estimate of a civil engineering works.
3.	Prepare detailed estimate of a civil engineering works.
4.	Use relevant software for estimating the quantities and cost of items of works.

5.	Justify rate for given items of work using rate analysis techniques

Text/ Reference Books		
Name of the Authors	**Title of the book**	**Name of the Publisher**
Dutta B.N.	Estimating and Costing in Civil engineering	UBS Publishers Distributors Pvt. Ltd. New Delhi.
Peurifoy, Robert L. Oberlender, Garold	Estimating construction cost (fifth edition),	McGraw Hill Education, New Delhi.
Rangwala, S.C.	Estimating and Costing	Charotar Publishing House PVT. LTD., Anand.
Birdie, G.S.,	Estimating and Costing	Dhanpat Rai Publishing Company (P) Ltd. New Delhi.
Patil,B.S.,	Civil Engineering Contracts and Estimates	Orient Longman, Mumbai.
Chakraborti, M.	Estimating and costing, specification and valuation in civil engineering	Monojit Chakraborti, Kolkata.
PWD Schedule of Rates.		
Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.		
Manual of Specifications and Standards for DBFOT projects, EPC works.		

Name of the course : DESIGN OF STEEL AND RCC STRUCTURE LAB	
Course Code: CEPC305	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva-voce : 20 Marks
	Total : 60 Marks
Credit : 1	**Practical Semester End Exam : 40 Marks**

Course Objectives

Following are the objectives of this course:

1.	To learn the concept of limit state design of tension and compression steel members
2.	To understand design of steel beams.
3.	To learn the concept of limit state design of RCC beams.
4.	To know the limit state design of RCC columns.

List of Practical to be performed:		**Hrs**	**Marks**
16.	Draw any five commonly used rolled steel sections and five built up sections.	**32**	**40**
17.	Summarize the provisions of IS 800 required for the design of tension member in report form.		
18.	Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.		
19.	Draw sketches for single & double lacing of given built up columns.		
20.	Draw sketches for battening of given built up columns.		
21.	Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.		
22.	Draw cross section, strain diagram & stress diagram for singly reinforced section.		
23.	Draw cross section, strain diagram & stress diagram for doubly reinforced section.		
24.	Design simply supported I section steel beam for udl.		
25.	Design beams section for shear as per IS 800 provisions.		
26.	Draw sketches of different types of column footings.		
27.	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.		
28.	Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.		
29.	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.		
30.	Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.		
	Total	**32**	**40**

Course Outcomes	
After completing this course, student will be able to:	
1.	Design of steel tension and compression member.
2.	Design of steel beams including check for shear.
3.	Design of singly and doubly reinforced RCC beam.
4.	Design of shear reinforcement in RC beams.
5.	Design of RCC column as per IS 456.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Shah,V. L and Gore.V	Limit State Design of Steel Structures	Structures Publications, Pune
Dayarathnam P.	Design of Steel Structures	S. Chand and Company, Delhi
Subramanian N.	Design of Steel Structures	Oxford University Press
Sairam K.S	Design of Steel Structures	Pearson Publication, Chennai, Delhi.
Shah, V. L and Karve S.R	Limit State Theory and Design of Reinforced Concrete Structures,	Structures Publications, Pune,2014.
Sinha , N.C and Roy S.K.	Fundamentals of Reinforced Concrete	S.Chand & Co., NewDelhi.
Krishna Raju and N.Pranesh, R.N	Reinforced Concrete Design Principles and Practice,	New Age International, Mumbai.
Pillai, S.U., and Menon, Devdas	Reinforced concrete Design	McGraw Hill Publications, NewDelhi.
Varghese, P.C.	Limit State Design of Reinforced Concrete	Prentice Hall India Learning Private Limited, Delhi.

Name of the course :ESTIMATING, COSTING AND VALUATION LAB	
Course Code: CEPC307	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs/week**	**Practical PA**
	Sessional : 40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
Credit : 1	**End Semester Practical Exam : 40 Marks**

Course Objectives

Following are the objectives of this course:

1.	To learn the procedure for estimating and costing of Civil Engineering works.
2.	To perform rate analysis for different items associated with construction projects.
3.	To use software for detailed estimate related to civil infrastructural projects.

List of Practical to be performed:		**Hrs.**	**Marks**
1.	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing	**32**	**40**
2.	Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.		
3.	Study of items with specification given in the DSR (for any ten item)		
4.	Recording in Measurement Book (MB) for any four items		
5.	Prepare bill of quantities of given item from actual measurements. (any four items).		
6.	Prepare approximate estimate for the given civil engineering works.		
7.	Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase).		
8.	Prepare detailed estimate from the given set of drawings using “standard measurement and abstract format” for RCC framed structure using description of item from DSR along with face sheet and prepare quarry chart, lead statement (G+1 Building) .		
9.	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab)		
10.	Prepare rate analysis for the given five items of works.		
11.	Prepare detailed estimate of road of one kilometre length from the given drawing		
12.	Prepare detailed estimate of small Septic tank from the given set of drawings.		
13.	Prepare detailed estimate of well from the given set of drawing		
14.	Use the relevant software to prepare detailed estimate of a Road.		
15.	Use the relevant software to prepare detailed estimate of a residential building.		
	TOTAL:	**32**	**40**

Course Outcomes

After completing this course, student will be able to:	
1.	Select modes of measurements for different items of works
2.	Prepare approximate estimate of a civil engineering works.
3.	Prepare detailed estimate of a civil engineering works.
4.	Use relevant software for estimating the quantities and cost of items of works.
5.	Justify rate for given items of work using rate analysis techniques

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Dutta B.N.	Estimating and Costing in Civil engineering	UBS Publishers Distributors Pvt. Ltd. New Delhi.
Peurifoy, Robert L. Oberlender, Garold	Estimating construction cost (fifth edition),	McGraw Hill Education, , New Delhi.
Rangwala, S.C.	Estimating and Costing	Charotar Publishing House PVT. LTD., Anand.
Birdie, G.S.,	Estimating and Costing	Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
Patil,B.S.,	Civil Engineering Contracts and Estimates	Orient Longman, Mumbai.
Chakraborti, M.	Estimating and costing, specification and valuation in civil engineering	Monojit Chakraborti, Kolkata.
PWD Schedule of Rates.		
Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.		
Manual of Specifications and Standards for DBFOT projects, EPC works.		

Name of the course : SOLID WASTE MANAGEMENT	
Course Code: CEPE303	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3hrs/week** Tutorial : **0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks** **End Semester Theory Exam : 60 Marks**
Credit : 3	

Course Objectives	
Following are the objectives of this course:	
1.	To know various sources of solid.
2.	To learn techniques of collection and transportation of solid waste.
3.	To know various methods of disposal of solid waste.
4.	To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

CONTENTS (THEORY)		Hrs	Marks
UNIT-I	**1. INTRODUCTION** 1.1 Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. 1.2 Sources of solid waste, Classification of solid waste – hazardous and non-hazardous waste. 1.3 Physical and chemical characteristics of municipal solid waste.	7	8
UNIT-II	**2 STORAGE, COLLECTION AND TRANSPORTATION OF MUNICIPAL SOLID WASTE** 2.1 Collection, segregation, storage and transportation of solid waste. 2.2 Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community bin - like movable and stationary bin. 2.3 Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location. 2.4 Role of rag pickers and their utility for society.	9	14
UNIT-III	**3 COMPOSTING OF SOLID WASTE** 3.1 Concept of composting of waste, Principles of composting process. Factors affecting the composting process. 3.2 Methods of composting – Manual Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting	8	10

UNIT-IV	**4 TECHNIQUES FOR DISPOSAL OF SOLID WASTE** 4.1 Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques Traffic signals-Definition, Types, Traffic control signals, pedestrian signals. 4.2 Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste. 4.3 Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods.	14	16
UNIT-V	**5 BIOMEDICAL AND E-WASTE MANAGEMENT** 5.1 Definition of Bio medical Waste. 5.2 Sources and generation of Biomedical Waste and its classification. 5.3 Bio medical waste Management technologies. 5.4 Definition, varieties and ill effects of E- waste 5.5 Recycling and disposal of E- waste.	8	12
	Class Test	2	
	Total	48	60

Course Outcomes	
After completing this course, student will be able to:	
1.	Identify the sources of solid waste.
2.	Select the relevant method of collection and transportation of solid waste.
3.	Suggest an action plan for composting of solid waste.
4.	Devise suitable disposal technique for solid waste
5.	Use the relevant method for disposal of Bio-medical and E-waste

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Gupta O.P	Elements of Solid Hazardous Waste Management	Khanna Book Publishing Co., Delhi Ed. 2018
Bhide, A. D	Solid Waste Management	Indian National Scientific Documentation Centre, New Delhi
George Techobanoglous, Kreith, Frank.	Solid Waste	McGraw Hill Publication, New Delh
Sasikumar, K.	Solid Waste Management	PHI learning, Delhi.
Hosetti, B.B.	Prospect and Perspectives of Solid Waste Management	New Age International Publisher

Name of the course :PAVEMENT DESIGN AND MAINTENANCE	
Course Code: CEPE307	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
	End Semester Theory Exam : 60 Marks
Credit : 3	

Course Objectives	
Following are the objectives of this course:	
1.	To know types of pavements and their uses
2.	To learn issues in design of flexible and rigid pavements.
3.	To understand methods of pavement evaluation.
4.	To learn pavement maintenance methods.

	Contents (Theory)	Hrs	Marks
UNIT-I	**1 BASIC OF PAVEMENT DESIGN** **1.1** Types of pavement - Flexible, Rigid and Semi Rigid **1.2** Comparison of Rigid and flexible pavement according to Design precision, life maintenance, initial cost, stages of construction, availability of materials, surface characteristic, penetration of water in the pavement, utility location, glare and night visibility. **1.3** Functions and characteristics of pavement. **1.4** Factors affecting selection of type of pavement.	8	10
UNIT-II	**2. FUNDAMENTALS OF PAVEMENT DESIGN** **2.1** Factors affecting pavement design-design wheel load, Traffic factors, Environmental factors, Road geometry and material, Characteristics of soil and Drainage situation.	8	12
UNIT-III	**3. DESIGN OVERVIEW OF FLEXIBLE AND CONCRETE PAVEMENT** **3.1** Methods of flexible pavement design-Theoretical method, Empirical method with and without soil strength test. **3.2** IRC37 guidelines for design of flexible pavement (overview only) **3.3** Factors affecting design of concrete pavement. **3.4** IRC58 guidelines for design of concrete pavement (overview only) **3.5** Joints-Need, Types, requirements, spacing of joints.	10	10

UNIT-IV	**4. PAVEMENT EVALUATION** **4.1** Definition and purpose of pavement evaluation. **4.2** Methods of Pavement evaluation –Visual rating, Pavement serviceability index, Roughness measurements, Benkelman Beam deflection method.	10	12
UNIT-V	**5. PAVEMENT MAINTENANCE** **5.1** Types of pavement maintenance - routine, periodic, and special. Need for inspection and maintenance schedule. Causes of pavement failure and remedial measures. Typical flexible and rigid pavement failures. **5.2** Types and causes of damages in flexible pavement, surface defects, cracks. Deformations - Rutting, fatigue, settlement and upheaval. Disintegration- loss of aggregate, stripping, pothole. Remedial measures - slurry seal, liquid seal, fog seal, patching, ready mix patch. **5.3** Types of damages to rigid pavement - cracking, spalling, slab rocking, settlement, joint sealant failure. Methods of repair of spalled joints, full depth reconstruction, replacement of dowel bars.	12	16
	Total	**48**	**60**

Course Outcomes	
After completing this course, student will be able to:	
1.	Identify the components of the given type of pavement.
2.	Suggest the type of pavement for the given situation.
3.	Design the flexible pavement using the provisions of IRC.
4.	Design the concrete pavement using the provisions of IRC.
5.	Decide type of maintenance required under different damaged conditions.

Text/ Reference Books

Name of the Authors	**Title of the book**	**Name of the Publisher**
Kadiyali, L.R.	Highway Engineering	Khanna Book Publishing House, New Delhi (ISBN: 978-93-86173-133)
Chakroborty, Partha Das, Animesh.	Principles of Transportation engineering	Prentice-Hall of India Pvt.Ltd
Vazirani, V N, Chaondola, S P.	Transportation Engineering Vol. I & II	Khanna Publishers. Delhi
Yoder, E J	Principles of Pavement Design	Wiley India Pvt Ltd.
Bindra, S P.	Highway Engineering	Dhanpat Rai Publications (P) Ltd
Kumar R S	Pavement Evaluation and Maintenance Management system	University Press (India), Pvt. Ltd.
Sharma S K	Principles, Practice and Design of Highway Engineering	S Chand, New Delhi

Name of the course : MAJOR PROJECT	
Course code: PR302	**Semester : V & VI**
Teaching Scheme	**Maximum Marks : 200**
	PA and End Examination Scheme
Practical : **8 hrs/week**	**Practical PA**
	Sessional :50 Marks Viva-Voce : 50 Marks
	Total : 100 Marks
Credit : 4	**End Semester Practical Exam :100 Marks**

Rationale:

The diploma-holders in Civil Engineering, many a times , are involved with project work in design and drawing offices. The major works involve making survey, drawing plan and sections, collection of data , organization and analysis of data, estimation and elementary design of structures or their components. They are also expected to have some knowledge of actual practice in construction work. The course " Project and Industrial visits" should therefore be very important to the diploma students of Civil Engineering to make them professionally sound and valuable

Course Objective :-

Following are the objectives of this course:

1.	Apply knowledge gained in different subjects through solving real life problems in Civil Engineering Apply he ideas of the state of art of construction practices through industrial visits
2.	Apply the ideas of the state of art of construction practices through industrial visits
3.	Develop self-confidence for working in Civil Engineering projects
4	Prepare necessary drawings, estimates and project reports

Pre-Requisite :-

Courses learned upto second year.

Contents		Hrs	Marks
UNIT- I	Selection of groups	10	10
UNIT - II	Development of project topics and conduct reconnaissance survey	25	24
UNIT - III	Collection of data, required survey work, Preparation of synopsis and selection of project	25	24
UNIT - IV	Management and construction procedure,	35	33
UNIT – V	Scheduling of planning, Preparation of designing and drawing in detail	25	24
UNIT - VI	Estimation of the project	20	19
UNIT - VII	Execution of the project	35	33

UNIT - VIII	Documentation and final presentation	35	33
Total		**210**	**200**

Practical :-

S.No	**Skills to be developed**
1	Intellectual skills-. 1) Decide and collect data for projects. 2) Read and interpret the drawing, data. 3) Design the components. 4) Apply the principles rules regulations and byelaws.
2	Motor skills- 1) Plan for different phases of a task. 2) Prepare drawings for project. 3) Use of computer for drawing, networking. 4) Work in a group for a given task.
3	Social skills- 4. Development of ethics. 5. Will learn to work with peer as group. 6. Able to keep safe and amicable working environment

Name of the course: SUMMER INTERNSHIP-II	
Course Code: SI301	**Semester: V**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
6 Weeks after Semester IV	**Practical PA**
	Sessional :40 Marks Viva-Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam :40 Marks
Credit: 3	

Rationale:

The purpose of industrial training is to expose students to the latest practices, equipments and techniques used in the field and to provide opportunities for hands on experiences in their field. Such opportunities expose them to the intricacies of the world of work. The basic purpose of this course is to provide an opportunity to student during their course of study for such an experience. This would not only improve their technical competency but also develop non-technical skills such as planning, scheduling, problem solving, team work, decision making, time management etc. The nature of training may vary with the discipline and the area selected. Some of the widely used forms of industrial training in the country are: designing a component/ part/machine for a specific purpose, Engineering Analysis, Innovative Product Development, Feasibility Study and Generating solution's for real life problem.

On the basis of the electives and the courses/subjects completed student can undergo training of six week duration in any of the following areas in consultation with faculty.

The students may also be given special projects within the institute in case it is not feasible to place them in various industries/agencies. The special projects could be

- Organize adventure sports
- Preparing a feasibility report to start a travel agency
- Prepare a report to enhance tourism in the state through incentives
- Plan a tour for students during summer outside the state and prepare a comprehensive report.

The Industrial Training has basically the following three components:

1. Orientation Programme
2. Training in the Industry
3. Report Writing and
4. Evaluation

Note:

1. Orientation programme:

During the orientation programme complete guidelines will be provided to the students regarding planning, implementation and evaluation of industrial training.

2. Training in industry:

During the training student will have to maintain a daily dairy to record his observations and experiences in various department/section and on the basis of daily dairy student will prepare and submit the Industrial Training Report. Competent faculty / staff member shall follow-up the students' progress regularly. The student should be encouraged to seek & collect relevant forms; brochures: & other print material from the various organization related to training/project.

3. Report writing:

Daily dairy will form the basis for report writing. The formats for the report preparation will vary depending upon the type of training/project and will be generated by the teacher guide.

4. Evaluation :

For the industrial training as per teaching and assessment scheme equal weightage is given for end of term and progressive assessment.

For the end of term evaluation each student has to prepare and present a seminar paper related to experience gained during the industrial training. Each student will be evaluated on the basis of training report, seminar presentation and viva voce.

For progressive assessment proper recording of events in daily dairy and generation of weekly reports will form the basis.

***SI301 should be undertaken in an industry only.**

TERM- VI

SEMESTER- VI

Name of the course: PUBLIC HEALTH ENGINEERING	
Course code: CEPC302	**Semester - VI**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **2 hrs/week** Tutorial : **0 hrs/week**	**Theory PA** Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks **Total : 40 Marks** **End Semester Theory Exam : 60 Marks**
Credit : 2	

Course Objectives:

Following are the objectives of this course:

1	To learn the principles for identification of sources of surface and subsurface water.
2	To learn calculation of population and requirement of drinking water.
3	To understand the plotting of water supply scheme highlighting different features.
4	To know evaluation of characteristics and treatment of sewage.

	Contents (Theory)	Hrs.	Marks
UNIT - I	**4 SOURSES, DEMAND AND QUALITY OF WATER** 1.1 Water supply schemes - Objectives, components. 1.2 Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes. 1.3 Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town. 1.4 Quality of water**:** Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.	6	12
UNIT - II	**2. PURIFICATION OF WATER** 2.1 Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator. 2.2 Filtration - mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants.	6	12

	2.3 Miscellaneous water Treatments: Introduction to water softening, Defluoridation techniques.		
UNIT - III	**3. CONVEYANCE AND DISTRIBUTION OF WATER** 3.1 Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. 3.2 Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.	5	10
UNIT - IV	**4. DOMESTIC SEWAGE AND SYSTEM OF SEWERAGES** 4.1 Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions - Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe. Building Sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps types, qualities of good trap. Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape. 4.2 Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.	7	14
UNIT - V	**5. CHARACTERISTICS AND TREATMENTS OF SEWAGE** 5.1 Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance. Central Pollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant. 5.2 Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.	6	12
	CLASS TEST	2	
	Total	**32**	**60**

Course outcomes:

After completing this course, student will be able to:

1	Know the procedure to identify the sources of surface and subsurface. water

2	Estimate the quantity of drinking water required for a population.
3	Draw labelled layout for water supply scheme.
4	Device suitable water treatment technique.
5	Evaluate the characteristics and suggest treatment of sewage.

Text / Reference Books

Name of the Authors	Title of the Book	Name of the Publishers
Sharma S.C	Environmental Engineering.	Khanna Publishing House, New Delhi.
Garg, S.K.	Environmental Engineering Vol. I and Vol. II.	Khanna Publishers.
Birdie, G. S. and Birdie, J. S.	Water Supply and Sanitary Engineering.	Dhanpat Rai.
Gupta, O.P.	Elements of Environmental Pollution Control.	Khanna Publishing House, Delhi.
Rao, C.S.	Environmental Pollution Control Engineering.	New Age International.
Punmia, B C.	Environmental Engineering, vol. I and II,	Laxmi Publishers.
Peavy H S, Rowe D R, and Tchobanoglous G	Environmental Engineering,	McGraw.
Basak N N.	Environmental Engineering	McGraw Hill Publishers.

Name of the course: PUBLIC HEALTH ENGINEERING LAB	
Course code: CEPC304	**Semester - VI**
	Maximum Marks : 100
Teaching Scheme	**PA & End Examination Scheme**
Practical : **2 hrs / week**	**Practical PA**
	Sessional : 40 Marks Viva – Voce : 20 Marks
	Total : 60 Marks
	End Semester Practical Exam : 40 Marks
Credit : 1	

Course Objectives:

Following are the objectives of this course:

1	To learn the tests for measuring quality of drinking water.
2	To learn determination of BOD and COD requirement in sewage.
3	To understand the plotting of water supply scheme highlighting different features.

List of Practical to be performed:		**Hrs.**	**Marks**
1	Determine pH value of given sample of water.	32	40
2	Determine the turbidity of the given sample of water.		
3	Determine residual chlorine in a given sample of water.		
4	Determine suspended, dissolved solids and total solids of given sample of water.		
5	Determine the dissolved oxygen in a sample of water.		
6	Undertake a field visit to water treatment plant and prepare a report.		
7	Determine the optimum dose of coagulant in a given raw water sample by jar test.		
8	Draw sketches of various valves used in water supply pipe line		
9	Draw a sketch of one pipe and two pipe system of plumbing		
10	Determine B.O.D. of given sample of sewage.		
11	Determine pH value of given sample of sewage.		
12	Determine suspended solids dissolved and total solids for sample of sewage.		
13	Determine the dissolved oxygen in the given sample of sewage.		
14	Determine C.O.D. of given sample of sewage.		
15	Prepare a report of a field visit to sewage treatment plant		
	Total	**32**	**40**

Course outcomes:

After completing this course, student will be able to:

1	Perform various tests to assess quality of water.

2	Estimate dissolved solids as per BIS codes.
3	Measure BOD and COD of sewage sample.
4	Draw line diagram of water pipeline system for a locality.

Text / Reference Books

Name of the Authors	Title of the Book	Name of the Publishers
Sharma S.C	Environmental Engineering.	Khanna Publishing House, New Delhi.
Garg, S.K.	Environmental Engineering Vol. I and Vol. II.	Khanna Publishers.
Birdie, G. S. and Birdie, J. S.	Water Supply and Sanitary Engineering.	Dhanpat Rai.
Gupta, O.P.	Elements of Environmental Pollution Control.	Khanna Publishing House, Delhi.
Rao, C.S.	Environmental Pollution Control Engineering.	New Age International.
Punmia, B C.	Environmental Engineering, vol. I and II,	Laxmi Publishers.
Peavy H S, Rowe D R, and Tchobanoglous G	Environmental Engineering,	McGraw.
Basak N N.	Environmental Engineering	McGraw Hill Publishers.

Name of the course : TENDERING AND ACCOUNTS	
Course Code: CEPE306	**Semester: VI**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 3	**End Semester Theory Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To understand terminologies in contract and tender document and their significance.
2.	To know different types of contracts and their uses.
3.	To learn preparation of typical Tender documents for civil engineering work.
4.	To get acquainted with rent fixation and valuation of civil structures.

Contents (Theory)		**Hrs.**	Marks
UNIT-I	**1. PROCEDURE TO EXECUTE THE WORK** 1.1 Administrative approval, Technical sanction, budget provision, expenditure sanction. 1.2 Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis.	**5**	**8**

UNIT-II	**2. CONTRACTS** 2.1. Definition of contract, objects of contract, requirements of contract, overview of Indian Con-tract Act 2.2. Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract. 2.3. Introduction of FIDIC Conditions of contract. 2.4. Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor. 2.5. Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).	**10**	**14**
UNIT-III	**3. TENDER AND TENDER DOCUMENTS** 3.1 Definition of tender, necessity of tender, types of tender- Local, Global, Limited. 3.2. E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial). 3.3. Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting oftender notice. 3.4. Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award. 3.5. Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid. 3.6. Tender documents – Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc. 3.7. Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause (escalation), defect liability Period, liquidated Damages. 3.8. Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.	**12**	**18**

UNIT-IV	**4. ACCOUNTS** 4.1 Various account forms and their uses – Measurement Books, E-Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts. 4.2. Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.	**7**	**10**
UNIT-V	**5. INTRODUCTION TO VALUATION** 5.1 Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value. 5.2. Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value. 5.3. Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method. 5.4. Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage	**8**	**10**
	Total:	**42**	**60**

Course Outcomes

After completing this course, student will be able to:

1.	Understand various types of contract and when they are used
2.	Suggest the relevant type of contract for the given civil engineering work.
3.	Prepare the typical Tender document for the given civil engineering work.
4.	Decide type of payment for the executed work.
5.	Justify the rent fixation and valuation of given civil structure.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Dutta B.N.	Estimating and Costing in Civil engineering	UBS Publishers Distributors Pvt. Ltd. New Delhi.
Raina, V. K.	Construction Management and Contract Practices	Shroff Publishers & Distributers Pvt. Ltd.
Rangwala, S.C.	Estimating and Costing	Charotar Publishing House PVT. LTD., Anand.
Birdie, G.S.,	Estimating and Costing	Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
Patil, B.S.,	Civil Engineering Contracts and Estimates	Orient Longman, Mumbai.

Chakraborti, M.	Estimating and costing, specification and valuation in civil engineering	Monojit Chakraborti, Kolkata.

Name of the course : PROJECT MANAGEMENT	
Course Code: CEOE302	**Semester: VI**
	Maximum Marks: 100
Teaching Scheme	**PA & End Examination Scheme**
Theory : **3 hrs/week** Tutorial : **0 hrs/week**	**Theory PA**
	Internal Exam/Class Test : 20 Marks Assignment / Quiz etc. : 15 Marks Attendance : 5 Marks
	Total : 40 Marks
Credit : 3	**End Semester Theory Exam : 60 Marks**

Course Objectives	
Following are the objectives of this course:	
1.	To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
2.	To develop an understanding of key project management skills and strategies.

	Contents (Theory)	**Hrs.**	Marks
UNIT-I	**1. CONCEPT OF A PROJECT**: Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time) project priority matrix- work break down structure.	**5**	**8**
UNIT-II	**2. CAPITAL BUDGETING PROCESS:** Planning- Analysis-Selection-Financing-Implementation-Re- view. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis	**10**	**14**
UNIT-III	**3. FINANCIAL ESTIMATES AND PROJECTIONS:** Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.	**12**	**18**
UNIT-IV	**4. BASIC TECHNIQUES IN CAPITAL BUDGETING**: Non discounting and discounting methods- pay- back period-Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects**.**	**7**	**10**

UNIT-V	**5. PROJECT ADMINISTRATION**: Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off. Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management softwares.	**8**	**10**
	Total:	**42**	**60**

Course Outcomes

After completing this course, student will be able to:

1.	Understand the importance of projects and its phases.
2.	Analyze projects from marketing, operational and financial perspectives.
3.	Evaluate projects based on discount and non-discount methods.
4.	Develop network diagrams for planning and execution of a given project.
5.	Apply crashing procedures for time and cost optimization.

Text/ Reference Books

Name of the Authors	Title of the book	Name of the Publisher
Prasannachandra	Project planning, analysis, selection, implementation and review	TataMcGraw Hill
Clifford F. Gray & Erik W. Larson	Project Management – the Managerial Process	McGrawHill
David I Cleland	Project Management	Mcgraw Hill International Edition, 1999
Gopala krishnan	Project management	Mcmillan India Ltd.
Harry-Maylor	Project Management	Peason Publication

SPECIFICATION TABLE

CIVIL ENGINEERING TERM-V

Name of the Course : **DESIGN OF STEEL AND RCC STRUCTURES**
Course Code : **CEPC301**
Semester : **V**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total
1	Design of Steel Tension and Compression Members (Limit State Method)	**15**	6	6	8	**20**
2	Design of Steel Beams (Limit State Method)	**6**	2	3	5	**10**
3	Design of Reinforced Concrete Beams by Limit State Method	**10**	5	4	5	**14**
4	Shear, Bond and Development length in Design of RCC members	**12**	2	2	4	**8**
5	Design of Axially loaded RCC Column	**5**	2	2	4	**8**
TOTAL		**48**	**17**	**17**	**26**	**60**

Name of the Course : **ESTIMATING, COSTING AND VALUATION**
Course Code : **CEPC303**
Semester : **V**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Fundamentals Of Estimating And Costing	**4**	2	6	-	**8**
2	Approximate Estimates	**5**	2	4	-	**6**
3	Detailed Estimate	**10**	2	3	15	**20**
4	Estimate For Civil Engineering Works	**7**	-	4	8	**12**
5	Rate Analysis	**6**	2	6	6	**14**
	Total	**32**	**8**	**23**	**29**	**60**

Name of the Course: **SOLID WASTE MANAGEMENT**
Course Code: **CEPE303**
Semester: **V**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Introduction	**7**	3	5	-	**8**
2	Storage, Collection and Transportation of Municipal Solid Waste	**9**	2	4	8	**14**
3	Composting of Solid Waste	**8**	2	4	4	**10**
4	Techniques for Disposal of Solid Waste	**14**	2	6	8	**16**
5	Biomedical and E-waste management	**8**	2	6	4	**12**
	Total	**46**	**11**	**25**	**24**	**60**

Name of the Course : **PAVEMENT DESIGN AND MAINTENANCE**
Course Code : **CEPE307**
Semester : **V**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C= Comprehension Level, A= Application Level

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total
1.	Basic of Pavement Design	**8**	4	6	-	**10**
2.	Fundamentals of Pavement Design	**8**	2	4	6	**12**
3.	Design Overview of Flexible and Concrete Pavement	**10**	-	6	4	**10**
4.	Pavement Evaluation	**10**	2	4	6	**12**
5.	Pavement Maintenance	**12**	4	8	4	**16**
	TOTAL	**48**	**12**	**28**	**20**	**60**

CIVIL ENGINEERING TERM-VI

Name of the Course: **PUBLIC HEALTH ENGINEERING**
Course Code: **CEPC302**
Semester: **VI**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Sources, Demand and Quality of water	**6**	3	4	5	**12**
2	Purification of water	**6**	2	4	6	**12**
3	Conveyance and Distribution of water	**5**	2	4	4	**10**
4	Domestic sewage and System of Sewerages	**7**	3	4	7	**14**
5	Characteristics and treatment of Sewage	**6**	2	4	6	**12**
	Total	**30**	**12**	**20**	**28**	**60**

Name of the Course : **TENDERING AND ACCOUNTS**
Course Code : **CEPE306**
Semester : **VI**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Procedure To Execute The Work	**5**	2	6	-	**8**
2	Contracts	**10**	4	6	4	**14**
3	Tender And Tender Documents	**12**	6	8	4	**18**
4	Accounts	**7**	3	3	4	**10**
5	Introduction To Valuation	**8**	2	6	2	**10**
	Total	**42**	**17**	**29**	**14**	**60**

Name of the Course: **PROJECT MANAGEMENT**
Course Code: **CEOE302**
Semester: **VI**
SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge Level, C=Comprehension Level, A=Application Level

Chapter No.	**Chapter Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1	Concept Of A Project	**5**	4	4	-	**8**
2	Capital Budgeting Process	**10**	4	6	4	**14**
3	Financial Estimates And Projections	**12**	4	10	4	**18**
4	Basic Techniques In Capital Budgeting	**7**	3	4	3	**10**
5	Project Administration	**8**	3	4	3	**10**
	Total	**42**	**18**	**28**	**14**	**60**