C U R R I C U L U M

Diploma Program

in

C I V I L E N G I N E E R I N G

(Academic Year: 2021-22 onwards)

SECOND YEAR

Arunachal Pradesh State Council for Technical Education

(APSCTE)

(Under the Directorate of Higher and Technical Education)
Government of Arunachal Pradesh

Sample Path: THIRD Semester

Sl. No.	Category of Course	Course Code	Course Title	Hours per week				Credits
				L	T	P	Total	
1	Program Core	CEPC201	Construction Materials & Lab	3	0	2	5	4
2		CEPC203	Basic Surveying & Lab	2	0	2	4	4
3		CEPC205	Mechanics of Materials & Lab	2	0	2	4	4
4		CEPC207	Building Construction	2	0	0	2	2
5		CEPC209	Concrete Technology & Lab	2	0	2	4	3
6		CEPC211	Geotechnical Engineering & Lab	2	0	2	4	4
7	Internship	SI201	Summer Internship-I	-	-	-	-	2
			Total	**13**	**0**	**10**	**23**	**23**

Course Code: CEPC201
Course Title: Construction Materials

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
3	0	2	5	4	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

The subject of construction Material is very important for the diploma holders in Civil Engineering. Thecourse material has been designed for the students to know the properties of the construction as well asthe strength of the material as per IS code of practice. Further, practical input has been given for augmenting the learning by the students.

Course Outcomes:

After competing this course, student will be able to:

- Identify relevant construction materials.
- Identify relevant natural construction materials.
- Select relevant artificial construction materials.
- Select relevant special type of construction materials.
- Identify and use of processed construction materials.

Course Content

Unit-I: Overview of Construction Materials

- Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only).
- Selection of materials for different civil engineering structures onthe basis of strength, durability, Eco friendly and economy.
- Broad classification of materials: Natural, Artificial, special, finishing and recycled.

Unit-II: Natural Construction Materials

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone.
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defectsin timber, use of bamboo in construction.
- Asphalt, bitumen and tar used in construction, properties and uses.
- Properties of lime, its types and uses.
- Types of soil and its suitability in construction.
- Properties of sand and uses
- Classification of coarse aggregate according to size

Unit-III: Artificial Construction Materials

- Constituents of brick earth, Conventional / Traditional bricks,
- Modular and Standard bricks, Special bricks –fly ash bricks,Characteristics of good brick, Field tests on Bricks, Classificationof burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks.
- Flooring tiles – Types, uses
- Manufacturing process of Cement - dry and wet (only flow chart),types of cement and its uses. Field tests on cement.

- Pre-cast concrete blocks- hollow, solid, pavement blocks, and theiruses.
- Plywood, particle board, Veneers, laminated board and their uses.
- Types of glass: soda lime glass, lead glass and borosilicate glass and their uses.
- Ferrous and non-ferrous metals and their uses.

Unit-IV: Special Construction Materials

- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermaland sound insulating materials.
- Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (only uses).
- Geopolymer cement: Geo-cement: properties, uses.

Unit-V: Processed Construction Materials

- Constituents and uses of POP (Plaster of Paris), POP finishingboards, sizes and uses.
- Paints- whitewash, cement paint, Distempers, Oil Paints andVarnishes with their uses. (Situations where used).
- Industrial waste materials- Fly ash, Blast furnace slag, Graniteand marble polishing waste and their uses.
- Agro-waste materials - Rice husk, Bagasse, coir fibers and theiruses.
- Special processed construction materials; Geosynthetic, FerroCrete, Artificial timber, artificial sand and their uses.

List of Experiments

1. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
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 laboratoryand draw the various patterns. (along and perpendicular to the grains)
4. Prepare the lime putty by mixing lime (1 kg) with water in appropriate proportionand prepare report on slaking of lime.
5. Identify various layers and types of soil in foundation pit by visiting at least construction sites in different locations of city and prepare report consisting photographs and samples.
6. 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.
7. Select first class, second class and third-class bricks from the stake of bricks and preparereport 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. Apply the relevant termite chemical on given damaged sample of timber.
10. Identify the type of glasses from the given samples.
11. Apply two or more coats of selected paint on the prepared base of a given wall surface for the areaof 1m x 1m using suitable brush/rollers adopting safe practices. Part I
12. Apply two or more coats of selected paint on the prepared base of a given wall surface for the areaof 1m x 1m using suitable brush/rollers adopting safe practices. Part II
13. Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a specialprocessed construction material.
14. Prepare mortar using cement and Fly ash or Granite/marble polishing waste in theproportion 1:6 or 1:3.
15. Determine Water Absorption on bricks per IS: 3495 (part II), IS: 1077 or tile IS: 1237.
16. Determine Compressive strength of dry and wet bricks as per IS: 3495(part I), IS: 1077.

Suggested Learning Resources:

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C., Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.

Course Code: CEPC203
Course Title: Basic Surveying & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	4	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

Basic Surveying covers the technique of preparing survey map by plotting the observed data on the map at thefield itself, using the method of chain surveying, Plane Table Surveying. It also covers the technique of levelling instrument to determine the reduce level, contour map in the site.

Course Outcomes:

After competing this course, student will be able to:

- Select the type of survey required for given situation.
- Compute area of open field using chain, tape and cross staff.
- Conduct traversing in the field using chain and compass.
- Use levelling instruments to determine reduced level for preparation of contour maps
- Use digital planimeter to calculate the areas.

Course Content

Unit-I: Overview and Classification of Survey

- Survey- Purpose and Use.
- Types of surveying- Primary and Secondary, Classification: Plane,Geodetic, Cadastral, Hydro graphic, Photogrammetry and Aerial.
- Principles of Surveying.
- Scales: Engineer's scale, Representative Fraction (RF) and diagonal-scale.

Unit-II: Chain Surveying

- Instruments used in chain survey: Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, offset rod, Open cross staff, Optical square.
- Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.
- Ranging: Direct and Indirect Ranging.
- Methods of Chaining, obstacles in chaining.
- Errors in length: Instrumental error, personal error, error due tonatural cause, random error.
- Principles of triangulation.
- Types of offsets: Perpendicular and Oblique.
- Conventional Signs, Recording of measurements in a field book.

Unit-III: Compass Traverse Survey

- Compass Traversing- open, closed.
- Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to anotherbearing (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.
- Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass-Temporary adjustments and observing bearings.
- Local attraction, Methods of correction of observed bearings -Correction at station and correction to included angles.

- Methods of plotting a traverse and closing error, Graphicaladjustment of closing error.

Unit-IV: Levelling and Contouring

- 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.
- Types of levels: Dumpy, Tilting, Auto level, Digital level,
- Components of Dumpy Level and its fundamental axes, Temporaryadjustments of Level.
- Types of Leveling Staff: Self-reading staff and Target staff.
- Reduction of level by Line of collimation and Rise and Fall Method.
- Leveling Types: Simple, Differential, Fly, Profile and ReciprocalLeveling.
- Contour, contour intervals, horizontal equivalent; Uses of contour maps, Characteristics of contours,
- Methods of Contouring: Direct and indirect.

Unit-V: Measurement of Area and Volume

- Components and use of digital planimeter.
- Measurement of area using digital planimeter.
- Measurement of volume of reservoir from contour map.

List of Experiments

1 Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
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 usingPrismatic Compass.
5 Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct thebearings and included angles for the local attraction.
6 Undertake Survey Project with chain and compass for closed traverse for minimum 5 sidesaround a building.
7 Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Projectmentioned 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 instrumentmethod 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 fora 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 datacollected in Survey Project mentioned at practical No.11.
13 Undertake Survey Project for plotting contour map using block contouring method for ablock of 150m x 150m with grid of 10m x 10m.
14 Plot the contours on A1 size imperial drawing sheet for data collected in SurveyProject mentioned at practical No.13.
15 Measure area of irregular figure using Digital planimeter.

Suggested Learning Resources:

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications,New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi GruhPrakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.

Course Code: CEPC205
Course Title: Mechanics of Materials & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	4	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

Mechanics of Materials deals with the internal behavior of variously loaded solid bodies, such as; shafts, bars, beams, plates, and columns, as well as structures and machines that are assemblies of these components. Mechanics of materials focuses primarily on mechanical properties of materials, analysis of stress, strain and evaluation of deformations. The aim of this course is to develop background of students for taking up engineering subjects like Theory and Design of Structures, Design of Machines etc.

Course Outcomes:

After competing this course, student will be able to:

- Articulate practical applications of moment of inertia of symmetrical andunsymmetrical structural sections.
- Analyze structural behavior of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams andloading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyze the column for various loading and end conditions.

Course Content

Unit-I: Moment of Inertia

- Moment of inertia (M.I.): Definition, M.I. of plane lamina,Radius of gyration, section modulus, Parallel and Perpendicularaxes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations).
- 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.
- Polar Moment of Inertia of solid circular sections.

Unit-II: Simple Stresses and Strains

- 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.
- Type of Stresses-Normal, Direct, Bending and Shear and nature ofstresses i.e. Tensile and Compressive stresses.
- 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.
- Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading.
- Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section)
- Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial Stresses, volumetric strain, change in volume, Bulk modulus (Introduction only).
- Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation)

Unit-III: Shear Force and Bending Moment

- Types of supports, beams and loads.
- Concept and definition of shear force and bending moment, Relationbetween loads, shear force and bending moment (without derivation).

- Shear force and bending moment diagram for cantilever andsimply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.

Unit-IV: Bending and Shear Stresses in beams

- Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram.
- Concept of moment of resistance and simple numerical problems using flexural equation.
- Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.
- 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.

Unit-V: Columns

- Concept of compression member, short and long column, Effectivelength, Radius of gyration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns.
- Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load.
- Rankine's formula and its application to calculate crippling load.
- Concept of working load/safe load, design load and factor of safety.

List of Experiments

1 Study and understand the use and components of Universal Testing Machine (UTM).
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 /cast ironetc. 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 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.
8 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.
9 Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
10 Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.
11 Plot Shear force and Bending Moment diagrams for overhanging beams for different typesof loads including moment loading.
12 Conduct Flexural test on timber beam on rectangular section in both orientations as per IS:1708, IS:2408.
13 Conduct Flexure test on floor tiles IS:1237, IS:13630 or roofing tiles as per IS:654, IS:2690.

Suggested Learning Resources:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6.

Course Code: CEPC207
Course Title: Building Construction

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	2	2	60	40	100	-	-	-
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 100					

Rationale:

The subject of building construction is very important for the diploma holders in civil engineering. The course material has been designed for the students to know the properties of building construction and process as well as strength of material as per IS code of practice. Further, practical input has been given for augmenting the learning by the students.

Course Outcomes:

After competing this course, student will be able to:

- Identify components of building structures.
- Propose suitable type of foundation for building structures.
- Select suitable type of masonry for building structures.
- Propose relevant means of communications for different types of buildings.
- Select relevant material for finishing works.

Course Content

Unit-I: Overview of Building Components

- Classification of Buildings as per National Building Code Group A to I,As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure.
- Building Components - Functions of Building Components, Substructure – Foundation, Plinth.
- Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors andWindows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.

Unit-II: Construction of Substructure

- Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions.
- Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plantsused for earthwork.
- 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).

Unit-III: Construction of Superstructure

- 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.
- Brick masonry: Terms used in brick masonry- header, stretcher, closer,quoins, course, face, back, hearting, bat bond, joints, lap, frog line, leveland 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. Precautionsto 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 compositemasonry.
- 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 Formworks, Removal of formwork.

Unit-IV: Building Communication and Ventilation

- **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.
- **Windows:** Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, SlidingWindows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windowsrecommended by BIS. Ventilators, Fixtures and fastenings for doors and windows- Material used and functions of Window Sill and Lintels, Shed / Chajja.
- **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 staircases (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.

Unit-V: Building Finishes

- **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 Fiber Sheets. Types of Roofs: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.
- **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- Stuccoplaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering. Pointing – Necessity, Types of pointing and procedure ofPointing. Painting –Necessity, Surface Preparation for painting, Methods of Application.

Suggested Learning Resources:

1. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
2. Sushil Kumar., Building Construction, Standard Publication.
3. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
4. Punmia B. C., and Jain A. K., Building Construction, Firewall Media.
5. Sharma S. K., Building Construction, S. Chand and Co. Pvt. Ltd., New Delhi.

Course Code: CEPC209
Course Title: Concrete Technology & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	3	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

One of the most essential and popular building materials is concrete. Cement, fine and coarse aggregate,water, and additives make up concrete. These material's properties and their proportion in the concretehave a direct impact on the concrete strength. Students will study about the numerous characteristics ofconcrete's constituents as well as its own characteristics. Additionally, they will learn how to design concrete using various mix designs for a variety of construction projects. The students will work in various construction industries after passing their diploma, where this knowledge is absolutely necessary.

Course Outcomes:

After competing this course, student will be able to:

- Demonstrate the properties of cement, aggregate and water used in concrete.
- Demonstrate different characteristics of concrete.
- Use of admixtures in concrete.
- Design the concrete mix for various project.

Course Content

Unit-I: Cement, Aggregates and Water

- Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength.Different grades of OPC and relevant BIS codes.
- Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength.Storage of cement and effect of storage on properties of cement.
- BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, sulphateresisting, Blast furnace slag, High Alumina and White cement.
- Aggregates: Requirements of good aggregate, Classification according to size and shape.
- Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zoneof sand, silt content and their specification as per IS 383. Conceptof crushed Sand.
- Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, finenessmodulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarseaggregates with specifications.
- Water: Quality of water, impurities in mixing water &permissible limits for solids as per IS: 456.

Unit-II: Concrete

- Concrete: Different grades of concrete, provisions of IS 456. 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 expo- sure conditions as per IS 456.
- 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.
- Properties of Hardened concrete: Strength, Durability,Impermeability.

Unit-III: Concrete Mix Design and Testing of Concrete

- Concrete mix design: Objectives, methods of mix design, study ofmix design as per IS 10262 (only procedural steps).
- 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 IS13311 (part1 and 2), Importance of NDT tests.

Unit-IV: Quality Control of Concrete

- Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete.
- Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of goodform work. Stripping time for removal of form works per IS 456.
- Waterproofing: Importance and need of waterproofing, methods of waterproofing and materials used for waterproofing.
- Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.

Unit-V: Chemical Admixture, Special Concrete and Extreme Weatherconcreting

- 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. (concepts only)
- Special Concrete: Properties, advantages and limitation offollowing types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self compactingconcrete and light weight concrete.
- Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition. (only concepts), Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition. (only concepts)

List of Experiments

1 Determine fineness of cement by sieving.
2 Determine fineness of cement by Blaine's air permeability apparatus.
3 Determine specific gravity, standard consistency, initial and final setting times of cement.
4 Determine compressive strength of cement.
5 Determine bulking of sand.
6 Determine bulk density of fine aggregates.
7 Determine water absorption of fine and coarse aggregates.
8 Determine Fineness modulus of fine aggregate by sieve analysis.
9 Determine standard consistency of cement.
10 Determine initial and final setting times of cement.
11 Determine bulk density of coarse aggregates.
12 Determine workability of concrete by slump cone test.
13 Determine workability of concrete by compaction factor test.
14 To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
15 Demonstration of NDT equipment.

Suggested Learning Resources:

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

Course Code: CEPC211
Course Title: Geotechnical Engineering & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	4	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

The knowledge and skills of Geo-Technical Engineering help the Practicing Civil Engineers in CivilEngineering Construction Works, especially in the design and construction of building foundation.

Course Outcomes:

After competing this course, student will be able to:

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

Course Content

Unit-I: Overview of Geology and Geotechnical Engineering

- Introduction of Geology, Branches of Geology, Importance ofGeology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode oforigin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.
- Importance of soil as construction material in Civil engineering structures and as foundation bed for structures.
- Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.

Unit-II: Physical and Index Properties of Soil

- Soil as a three-phase system, water content, determination of watercontent by oven drying method as per BIS code, void ratio, porosityand 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. Simple numerical problem.
- Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index along with simple numerical. Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils.
- BIS classification of soil.

Unit-III: Permeability and Shear Strength of Soil

- Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head andfalling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application offlow net, (No numerical problems).
- Shear failure of soil, concept of shear strength of soil. Componentsof 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 (No numerical problems).

Unit-IV: Bearing Capacity of Soil

- Bearing capacity and theory of earth pressure. Concept of bearingcapacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure with simple numerical problem. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity with simple numerical problem.

- Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS: 1888 & IS: 2131 (only concepts).
- 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 (only concept).

Unit-V: Compaction and Stabilization of Soil

- Concept of compaction, Standard and Modified proctor test as per IScode, 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 equipment-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.
- Concept of soil stabilization, necessity of soil stabilization, differentmethods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction
- Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pitsand bores. Field identification of soil – dry strength test, dilatancy test and toughness test.

List of Experiments

1 Identification of rocks from the given specimen.
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 IS2720 (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 perIS 2720 (Part- IV).
9 Use different types of soil to identify and classify soil by conducting field tests-Through Visualinspection, 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 IS2720 (Part-VII).
15 Determination of CBR value on the field as per IS2720 (Part - XVI).

Suggested Learning Resources:

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

Course Code: SI 201
Course Title: Summer Internship-I

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
0	0	0	0	2	-	-	-	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 100					

Rationale:

The rationale for a summer internship is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skillsand knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hand on industry experience.

Course Outcomes:

After competing this course, student will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Develop and refine specific skills relevant to the field.
- Gains hands-on experience in a professional network by interacting with mentors and industry professionals.
- Learn to manage their time effectively.
- Clarify career goals.

Course Content

Unit-I: Orientation

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

Unit-II: Project-Based Learning

- Description of the main project or tasks the intern will be working on during the internship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

Unit-III: Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g.,programming languages, software tools, laboratory techniques).
- Soft skills development, including communication, teamwork, problem-solving, and timemanagement.

Unit-IV: Mentorship and Supervision

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

Unit-V: Professional Development

- Sessions on professional etiquette, networking, and building a personal brand
- Resume writing and interview preparation workshops.

Unit-VI: Industry and Field-Specific Knowledge

- Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and experiences.

Unit-VII: Reporting and Documentation

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other deliverables.

Unit-VIII: Ethics and Professionalism

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making.

Unit-IX: Feedback and Evaluation

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

Unit-X: Networking and Industry Exposure

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

Sample Path: FOURTH Semester

Sl. No.	Category of Course	Course Code	Course Title	Hours per week				Credits
				L	T	P	Total	
1	Program Core	CEPC202	Hydraulics & Lab	2	0	2	4	3
2		CEPC204	Advanced Surveying & Lab	2	0	2	4	3
3		CEPC206	Theory of Structure	3	0	0	3	3
4		CEPC208	Building Planning and Drawing	0	0	4	4	2
5		CEPC210	Water Resource Engineering & Lab	2	0	2	4	3
6		CEPC212	Transportation Engineering & Lab	2	0	2	4	3
7	Program Elective	CEPE206	Rural Construction Technology	3	0	0	3	3
8	Minor Project	PR202	Minor Project	0	0	4	4	2
9	Audit	AU202	Essence of Indian Knowledge & Tradition	2	0	0	2	0
			Total	**16**	**0**	**16**	**32**	**22**

Course Code: CEPC202
Course Title: Hydraulics and Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	3	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:
This course deals with behaviour of fluid at rest and in motion. The Civil Engineering profession is much concerned with subjects like water supply, Sanitary Engineering and Irrigation Engineering, which need a sound knowledge of Hydraulics. Therefore, hydraulics is a very important basic subjectfor students of civil engineering.

Course Outcomes:
After competing this course, student will be able to:

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

Course Content

Unit-I: Pressure measurement and Hydrostatic pressure

- Technical terms used in Hydraulics –fluid, fluid mechanics,hydraulics, hydrostatics and hydrodynamics - ideal and realfluid, application of hydraulics.
- Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, and viscosity-Newton's law of viscosity.
- Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept ofPressure head and its unit, Pascal's law of fluid pressure and its uses.
- Measurement of differential Pressure by different methods.
- Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls.
- Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tankscontaining two liquids, vertical surface in contact with liquid on either side.

Unit-II: Fluid Flow Parameters

- Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number.
- Discharge and its unit, continuity equation of flow.
- Energy of flowing liquid: potential, kinetic and pressureenergy.
- Bernoulli's theorem: statement, assumptions, equation.

Unit-III: Flow through pipes

- Major Head loss in pipe: Frictional loss and its computationby Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.
- Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.
- Flow through pipes in series, pipes in parallel and Dupuit'sequation for equivalent pipe.
- Hydraulic gradient line and total energy line.
- Water hammer in pipes: Causes and Remedial measures.
- Discharge measuring device for pipe flow: Venturimeter - construction and working.
- Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

Unit-IV: Flow through Open Channel

- Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.
- Determination of discharge by Chezy's equation and Manning's equation.
- Conditions for most economical rectangular and trapezoidal channel section.
- Discharge measuring devices: Triangular and rectangular Notches.
- Velocity measurement devices: current meter, floats and Pitot's tube.
- Specific energy diagram, Froudes' Number.

Unit-V: Hydraulic Pumps

- Concept of pump, Types of pumps - centrifugal,reciprocating, submersible.
- Centrifugal pump: components and working
- Reciprocating pump: single acting and double acting,components and working.
- Suction head, delivery head, static head, Manometric head
- Power of centrifugal pump.
- Selection and choice of pump.

List of Experiments

1 Use piezometer to measure pressure at a given point.
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.

Suggested Learning Resources:

1. Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines,Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery,Oxford University Press, New Delhi.

Course Code: CEPC204
Course Title: Advanced Surveying & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	3	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th + Pr.) = 200					

Rationale:

Now-a-days application of advanced survey equipment in Civil Engineering analysis, has become a routine. The diploma level students are directly associated with conduction of field survey. Hence this course will be immensely helpful in their service life.

Course Outcomes:

After competing this course, student will be able to:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Prepare plans using Total Station instrument.
- Locate coordinates of stations using GPS

Course Content

Unit-I: Plane Table Surveying

- Principles of plane table survey.
- Accessories of plane table and their use, Telescopic alidade.
- Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method.
- Methods of plane table surveys- Radiation, Intersection and Traversing.
- Merits and demerits of plane table survey.

Unit-II: Theodolite Surveying

- Types and uses of Theodolite, Components of transitTheodolite and their functions, Reading the Vernier of transit Theodolite.
- Technical terms- Swinging, Transiting, Face left, Face right.
- Fundamental axes of transit Theodolite and their relationship.
- Temporary adjustment of transit Theodolite.
- Measurement of horizontal angle- Direct and Repetitionmethod, Errors eliminated by method of repetition. Measurement of vertical Angle.
- Theodolite traversing by included angle method and Deflectionangle method.
- Checks for open and closed traverse, Calculations of bearingfrom angles.
- Traverse computation-Latitude, Departure, Consecutivecoordinates, independent coordinates, balancing the traverse by Bowditch's rule and Transit rule wit numerical.

Unit-III: Tacheometric surveying and Curve setting

- Principles of Tacheometry, Tacheometer and its componentparts, Anallatic lens.
- Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.
- 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.
- Types of curves used in roads and railway alignments. Designation of curves.
- Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles with simple numerical.

Unit-IV: Advanced surveying equipment's

- Principle of Electronic Distance Meter (EDM), itscomponent parts and their Functions, use of EDM.
- Use of micro-optic Theodolite and Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.
- Measurements of Horizontal angles, vertical angles, distancesand coordinates using Total
- Station, Traversing, Profile Survey and Contouring with TotalStation.

Unit-V: Remote sensing, GPS and GIS

- Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management.
- Use of Global Positioning System (G.P.S.) instruments.
- Geographic Information System (GIS): Over view,Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

List of Experiments

1 Use plane table survey to prepare plans of a plot of seven-sided closed traverse by Radiation Method.
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 sidesaround 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 precedingTheodolite 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 fivesides.
14 Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding TotalStation Survey Project.
15 Use GPS to locate the coordinates of a station.

Suggested Learning Resources:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, PuneVidyarthi Gruh Prakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.

Course Code: CEPC206
Course Title: Theory of Structures

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
3	0	0	3	3	60	40	100	-	-	-
ET: End Term		PA: Progressive Assessment			Total marks (Th) = 100					

Rationale:

Theory of structures is a very important subject for diploma holders in Civil Engineering. Many of them are entrusted with the responsibility to supervise constructions, make minor remedial changes in maintenance work, analyze simple structures etc. An adequate knowledge of behaviour of structures is very essential for developing self-confidence among the diplomats for delivering quality service of work. An understanding of 'why' part of structural behaviour and failures enables them to give adequate comparative weightage of their attention to differentcomponents of construction supervision jobs.

The course content has been designed with a view to enabling students to solve problems of beams related to permissible stresses in bending and shear, check the stability of dams and retaining walls, explain and apply the principle of superposition, analyze the determinate trusses, apply the formulae for deflection to solve the problemsof propped cantilever, understand and draw qualitatively the deflected shapes of beams and frames to identify the positions of main reinforcements and apply the concept of principal stresses and strains to explain and identify different types of cracks in reinforced concrete beams. While teaching the deformation of indeterminate structures without going into theory and analysis, a teacher of the subject is advised to make use of indigenous flexible elastic models.

Course Outcomes:

After competing this course, student will be able to:

- Analyze stresses induced in vertical member subjected to direct and bending loads.
- Analyze slope and Deflection in fixed and continuous beams.
- Analyze continuous beam under different loading conditions using the principlesof Three Moments.
- Analyze continuous beam using Moment Distribution Method under differentloading conditions.
- Evaluate axial forces in the members of simple truss.

Course Content

Unit-I: Direct and Bending Stresses in vertical members

- Introduction to axial and eccentric loads, eccentricity about oneprincipal axis only, nature of stresses, Maximum and minimumstresses, resultant stresses and distribution diagram.
- Condition for no tension or zero stress at extreme fiber, Limit ofeccentricity, core of section for rectangular and circular cross sections, Middle third rule.
- Chimneys of circular cross section subjected to wind pressure,
- Maximum and minimum stresses, resultant stresses and distribution diagram at base.
- Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses, resultant stresses and distribution diagram at base.

Unit-II: Slope and Deflection

- Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation).
- 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.
- Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentratedand uniformly distributed load on entire span.

Unit-III: Fixed and Continuous Beam

- Concept of fixity, effect of fixity, advantages and disadvantagesof fixed beam over simply supported beam.
- Principle of superposition, fixed end moments from first principle for beam subjected to point load, UDL over entire span.
- Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. Diagrams for a fixed beam.
- Definition, effect of continuity, nature of moments induced dueto continuity, concept of deflected shape, practical examples.
- Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spansand 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.

Unit-IV: Moment distribution method

- Introduction to moment distribution method, signconvention, Carry over factor, stiffness factor,distribution factor.
- 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.
- Introduction to portal frames – Symmetrical andunsymmetrical portal frames with the concept of Bays and stories.

Unit-V: Simple trusses

- Types of trusses (Simple, Fink, compound fink, French truss, Pratt truss, Howe truss, North light truss, King postand Queen post truss)
- Calculate support reactions for trusses subjected to pointloads at joints
- Calculate forces in members of truss using Method of joints and Method of sections.

Suggested Learning Resources:

1. Ramamrutham.S, Theory of structures, Dhanpatrai & Sons.
2. Khurmi, R. S., Theory of Structures, S. Chand and Co., New Delhi.
3. Bhavikatti, S S , Structural Analysis Vol-1,, Vikas Publishing House Pvt Ltd., New Delhi.
4. Junnarkar, S. B., Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

Course Code: CEPC208
Course Title: Building Planning and Drawing

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
0	0	4	4	2	-	-	-	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Pr) = 100					

Rationale:
The subject of building planning and drawing deals with different plan, layout of building and drawing of different part of building, sectional views etc. Therefore, building planning and drawing is a very important basic subject for students of civil engineering.

Course Outcomes:
After competing this course, student will be able to:

- Interpret the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential and public buildings using principles of planning.
- Prepare submission and working drawing for the given requirement of Load Bearing Structure.
- Prepare submission and working drawing using CAD for the given requirement of framed structure.
- Draw two-point perspective drawing for given small objects.

Course Content

Unit-I: Introduction to Drawing

- Draw various types of lines, graphical symbols for materials, doorsand windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962.
- Write summary of observations of all technical details from the givendrawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students)
- Draw line plans to suitable scale for any **Five** Public Buildingsfrom the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).

Unit-II: Planning of Building

- Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.
- Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.
- Rules and bye-laws of sanctioning authorities for construction work.
- Plot area, built up area, super built-up area, plinth area, carpet area,floor area and FAR (Floor Area Ratio).
- Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.
- Line plans for public building-school building, primary health center, restaurant, bank, post office, hostel, Function Hall and Library.

Unit-III: Drawing of Load Bearing Structure

- Drawing of Single storey Load Bearing residential building (2 BHK)with staircase.
- Data drawing –plan, elevation, section, site plan, and schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential andpublic building.
- Working drawing – developed plan, elevation, section passing through staircase or WC and bath.
- Foundation plan of Load bearing structure.

Unit-IV: Drawing of Framed Structure

- Drawing of Two storeyed Framed Structure (G+1), residential building (2 BHK) with staircase.
- 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.
- Working drawing of framed structure – developed plan, elevation,section passing through staircase or WC and bath.
- Foundation plan of Framed Structure.
- Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircaseand slab.
- Drawing with CAD- Draw commands, modify commands, layercommands.
- Draw the above-mentioned drawing at serial number (B-2) usingCAD software and enclose the print out.

Unit-V: Perspective Drawing

- Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing
- Two Point Perspective of small objects only such as steps, monuments, pedestals.

Suggested Learning Resources:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishingcompany Ltd. New Delhi.
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd NewAsian Publishers, New Delhi.
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw HillPublishing company Ltd. New Delhi.
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.

Course Code: CEPC210
Course Title: Water Resource Engineering & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	3	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th+Pr) = 200					

Rationale:
This course aims to train the student in methods of developing water supplies and to briefly describe the meansto treat water for consumptive use. It helps them to understand water demand of crops and provisions to meetthe same. It also includes planning of reservoirs / dams and design of irrigation projects, canals and other diversion works.

Course Outcomes:
After competing this course, student will be able to:

- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.
- Design simple irrigation regulatory structures

Course Content

Unit-I: Introduction to Hydrology

- Hydrology: Definition and Hydrological cycle
- Rain Gauge: Symons rain gauge, automatic rain gauge,
- Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method.
- Runoff, Factors affecting Run off, Computation of run–off.
- Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems.
- Introduction to hydrograph and its uses.

Unit-II: Crop water requirement and Reservoir Planning

- Irrigation and its classification.
- Crop Water requirement: Cropping seasons, Crop period, baseperiod, Duty, Delta, CCA, GCA, intensity of irrigation, factorsaffecting duty, Problems on water requirement and capacity ofcanal.
- Methods of application of irrigation water and its assessment.Surveys for irrigation project, data collection for irrigation project.
- Area capacity curve.
- Silting of reservoir, Rate of silting, factors affecting siltingand control measures.
- Control levels in reservoir,

Unit-III: Dams and Spillways

- Dams and its classification: Earthen dams and Gravity dams(masonry and concrete).
- Earthen Dams-Components with function, typical cross section, and seepage through embankment and foundation and its control.
- Methods of construction of earthen dam, types of failureof earthen dam and preventive measures.

- Gravity Dams-Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, jointsin gravity dam, concept of high dam and low dam.
- Spillways-Definition, function, location, types and components, Energy dissipaters.

Unit-IV: Minor and Micro Irrigation

- Bandhara irrigation: Layout, components, construction andworking, solid and open band hara.
- Percolation Tanks – Need, selection of site.
- Lift irrigation Scheme-Components and their functions, Layout.
- Drip and Sprinkler Irrigation- Need, components andLayout.
- Well irrigation: types and yield of wells, advantages anddisadvantages of well irrigation.

Unit-V: Diversion Head Works & Canals

- Weirs – components, parts, types.
- Diversion head works – Layout, components and their function.
- Barrages – components and their functions. Difference between weir and Barrage.
- Canals – Classification according to alignment and positioning the canal network, Cross section of canal in embankmentand cutting, partial embankment and cutting, balancing depth, Design of most economical canal section with numerical examples.
- Canal lining - Purpose, material used and its properties,advantages.
- Cross Drainage works- Aqueduct, siphon aqueduct, superpassage, and level crossing.
- Canal regulators- Head regulator, Cross regulator, Escape,Falls and Outlets

List of Experiments

1 Calculate average rainfall for the given area using arithmetic mean method.
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 materialrequired for lining.

Suggested Learning Resources:

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, LaxmiPublications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S. Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education

Course Code: CEPC212
Course Title: Transportation Engineering & Lab

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
2	0	2	4	3	60	40	100	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Th+Pr) = 200					

Rationale:
Airport Engineering and Railways, as specialized topics of Civil Engineering constitute important components of Transportation Engineering. Many–a-times diploma holders are involved in the construction and/or maintenance of airports, and railways. At the same time a state may not have many airports or the facility of railways. In such a case the subject may be offered as an elective to astudent who plans carrier in line with the subject matter.

Course Outcomes:
After competing this course, student will be able to:

- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Identify the components of railway tracks.
- Identify the defects in railway tracks.

Course Content

Unit-I: Overview of Highway Engineering

- Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics.
- Different modes of transportation – land way, waterway,airway. Merits and demerits of roadway and railway;
- General classification of roads.
- Selection and factors affecting road alignment.

Unit-II: Geometric Design of Highway

- Camber: Definition, purpose, types as per IRC–recommendations.
- Kerbs: Road margin, road formation, right of way.
- Design speed and various factors affecting design speed as perIRC – recommendations.
- Gradient: Definition, types as per IRC – Recommendations.
- Sight distance (SSD): Definition, types IRC – recommendations,simple numerical.
- Curves: Necessity, types: Horizontal, vertical curves.
- Extra widening of roads: numerical examples.
- Super elevation: Definition, formula for calculating minimum andmaximum Super elevation and method of providing super- elevation.
- Standards cross-sections of national highway in embankment andcutting.

Unit-III: Construction of Road Pavements

- Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM & WMM road.
- 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.

- Cement concrete road, methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concreteroads. Types of joints.

Unit-IV: Basics of Railway Engineering

- Classification of Indian Railways, zones of IndianRailways
- Permanent way: Ideal requirement, Components; RailGauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints - requirements, types.
- Creep of rail: causes and prevention.
- Sleepers - functions and Requirement, types - concretesleepers and their density
- Ballast - function and types, suitability.
- Rail fixtures and fastenings – fish plate, spikes, bolts,keys, bearing plates, chairs-types of anchors and anti-creepers.

Unit-V: Track geometrics, Construction and Maintenance

- Alignment- Factors governing rail alignment.
- Track Cross sections – standard cross section of single and doubleline in cutting and embankment. Important terms-permanent land,formation width, side drains,
- 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.
- Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.
- Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station.
- Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards.
- Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organization of track maintenance, Duties of permanent way inspector, gang mate andkey man.

List of Experiments

1 Flakiness and Elongation Index of aggregates.
2 Angularity Number of aggregates.
3 Softening point test of bitumen.
4 Penetration test of bitumen.
5 Flash and Fire Point test of bitumen.
6 Ductility test of Bitumen.
7 Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
8 Prepare the photographic report containing details for experiment No. 7
9 Visit the hill road constructed site to understand its components.
10 Prepare the photographic report containing details for experiment No. 9
11 Visit the road of any one type (flexible or rigid) to know the drainage condition.
12 Prepare the photographic report suggesting possible repairs and maintenance for experiment No. 11
13 Determine impact value of aggregate
14 Determine crushing value of aggregate.
15 Determine abrasion value of aggregate.
16 Determine elongation and flakiness index of coarse aggregates

Suggested Learning Resources:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi(ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, NemChand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.

Course Code: CEPE206
Course Title: Rural Construction Technology

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
3	0	0	3	3	60	40	100	-	-	-
ET: End Term		PA: Progressive Assessment			Total marks (Th) = 100					

Rationale:
This course enables the students to learn development and planning of low cost housing infrastructure, different government schemes for rural development, techniques for rural road construction and watershed managementin rural areas.

Course Outcomes:
After competing this course, student will be able to:

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

Course Content

Unit-I: Rural Development and Planning

- Scope; development plans; various approaches to ruraldevelopment planning.
- Significance of rural development.
- Rural development program/ schemes /projects.

Unit-II: Rural Housing

- Low-cost construction material for housing
- Composite material- ferro-cement & fly ash, autoclaved calciumsilicate bricks and
- Soil-stabilized un-burnt brick; Plinth protection of mud walls.
- Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rattrap bond for walls; Panels for roof, ferro- cement flooring/roofing units.
- Biomass - types of fuels such as firewood, agricultural residues,dung cakes.
- Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions,sources of renewable energy.
- Working of gobar gas and bio gas plants.

Unit-III: Water Supply and Sanitation for Rural Areas

- Sources of water: BIS & WHO water standards.
- Quality, Storage and distribution for rural water supply works.
- Hand pumps-types, installation, operation, and maintenance ofhand pumps.
- Conservation of water - rainwater harvesting, drainage in ruralareas.
- Construction of low-cost latrines: Two pit pour flush water seal,septic tank etc.
- Low-cost community and individual Garbage disposal systems,Ferro-cement storage tanks.

Unit-IV: Low-Cost Rural Roads

- Broad categories of Pavement Layers, types of Granular Sub-Basesand Bases.
- Guidelines for Surfacing of Rural Road as per relevant IRC codes.
- Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights ofScheme.

Unit-V: Low-Cost Irrigation

- Design consideration and construction of tube-well, drip & sprinklerirrigation systems.
- Watershed and catchment area development –problems and featuresof watershed management.
- Watershed management structures - K. T. weir, Gabian Structure,Cement Plug, Contour Bunding, Farm Pond, Bandhara system.

Suggested Learning Resources:

1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low cost HousingOxford and IBH Publishing Co. Pvt. Ltd.
2. CBRI, Roorkee, Advances in Building Materials and Constriction.
3. Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis, HimalayaPublishing House, Delhi.
4. Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.
5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt Ltd.

Course Code: PR202
Course Title: Minor Project

Contact Hours per Week					Evaluation Scheme					
Lecture	Tutorial	Practical	Total	Credits	Theory			Practical		
(L)	(T)	(P)	L+T+P	(C)	ET	PA	Total	ET	PA	Total
0	0	4	4	2	-	-	-	40	60	100
ET: End Term		PA: Progressive Assessment			Total marks (Pr) = 100					

Rationale:
Minor Project offers students an opportunity to apply theoretical knowledge in a practical setting, thereby enhancing their technical skill and problem-solving skill. This course has been designed for students to understand the basics of carrying out any engineering project which includes Literature survey, methodology, setting up objective and scope of the project work.

Course Outcomes:
After competing this course, student will be able to:

- Identify the objective and scope of work
- Undertake interdisciplinary literature survey.
- Prepare methodology of the project work.
- Learn the necessary field and laboratory experiments.
- Learn handling of necessary equipment.

Course Content

Unit-I: Objective and Scope of work

- Introduction to the project.
- Clear statement of project objectives.
- Explanation of the scope and limitations of the project.
- Justification for why the project is important or relevant.

Unit-II: Literature Survey

- Review of existing literature and research related to the project.
- Identification of gaps in current knowledge.
- Discussion of relevant theories, models, and previous work in thefield.
- Proper citations and references to sources.

Unit-III: Methodology

- Detailed explanation of the research methods and approaches to beused.
- Description of data collection techniques (if applicable).
- Explanation of any experiments or simulations to be conducted.
- Ethical considerations and research ethics, if applicable.

Unit-IV: Handling of Instruments and Experiments

- Description of the tools, equipment, or software to be used.
- Details on how experiments or simulations will be conducted.
- Safety precautions and protocols, if relevant.
- Data collection and analysis methods.

Unit-V: Comprehensive Progress Presentation

- Regular progress reports or presentations to track the development ofthe project.
- Presentation of findings, data, and results obtained so far.
- Discussion of any challenges encountered and how they wereaddressed.
- Feedback received from mentors or advisors and any adjustments made to the project plan.