CURRICULUM

FOR

DIPLOMA PROGRAMME

IN

CIVIL ENGINEERING

2nd Year

FOR THE STATE OF HIMACHAL PRADESH

(N-2022 SCHEME)

Session 2022-23

Prepared by:-
Composite Curriculum Development Centre
Directorate of Technical Education,
Vocational & Industrial Training, Sundernagar (H.P.)

INDEX

SALIENT FEATURES

Programme	Three Year Diploma in Civil Engineering
Duration	Three years (Six Semesters)
Entry Qualification	As prescribed by H.P. Takniki Shiksha Board /AICTE
Intake	As approved by H.P. Takniki Shiksha Board
Pattern	Semester System
Curriculum for	Second Year for Civil Engg. Branch

Course Code & Definitions:

L	Lecture
T	Tutorial
P	Practical
BS	Brain Storming Session
CE	Civil Engineering
PCC	Program Core Courses
PE	Program Elective
AU	Audit Courses
OE	Open Elective
CEOE	Open Electives offered by Civil Engg. Deptt.
SI	Summer Internship
PR	Project
SE	Seminar
HS	Humanities & Social Sciences Courses

Programme Outcome (PO_s) for Diploma in Civil Engineering

Basic and Discipline Specific Knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

Problem Analysis: Identify and analyze well-defined engineering problems using codified standard methods.

Design/ Development of Solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

Engineering Practices for Society, Sustainability and Environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

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.

Life-long Learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

PSOs - Programme Specific Outcomes

The Program Specific Outcomes broadly describe the overall capabilities a student is expected to possess at the end of the undergraduate program. On completion of the Diploma (Civil Engineering) the graduates will be able to:

PSO	**Statement**
PSO_1	Plan, analyse, design, prepare cost estimates and execute all kinds of Civil Engineering Projects.
PSO_2	Apply modern construction techniques, equipment, and management tools to complete the project within specified time and funds.
PSO_3	Demonstrate professional engineering approach, including application of principles and utilization of technical resources such as software's towards solving technical problems requiring Civil Engineering interventions

Diploma in Civil Engineering

3rd Semester

Study and Evaluation Scheme – 3rd Semester

S. No.	Sub. Cat.	Subject Code	Course Title	Hours per Week					Marks Distribution in Evaluation Scheme								Credits
									Internal Assessment			External Assessment					
				L	T	P	BS	Total	Th.	Pr.	Total	Th.	Hrs.	Pr.	Hrs.	Total Marks (Int. & Ext)	
1	PCC	CEPC201	Construction Materials	3	0	0		3	40		**40**	60	3			**100**	3
2	PCC	CEPC203	Basic Surveying	2	0	0	1	3	40		**40**	60	3			**100**	2
3	PCC	CEPC205	Mechanics of Materials	2	0	0	2	4	40		**40**	60	3			**100**	2
4	PCC	CEPC207	Building Construction	2	0	0	1	3	40		**40**	60	3			**100**	2
5	PCC	CEPC209	Concrete Technology	2	0	0	1	3	40		**40**	60	3			**100**	2
6	PCC	CEPC211	Geotechnical Engineering	3	0	0	1	4	40		**40**	60	3			**100**	3
7	PCC	CEPC213	Construction Material Lab	0	0	2		2		40	**40**			60	3	**100**	1
8	PCC	CEPC215	Basic Surveying Lab	0	0	2	2	4		40	**40**			60	3	**100**	1
9	PCC	CEPC217	Mechanics of Materials Lab	0	0	2		2		40	**40**			60	3	**100**	1
10	PCC	CEPC219	Concrete Technology Lab	0	0	2		2		40	**40**			60	3	**100**	1
11	PCC	CEPC221	Geotechnical Engg. Lab	0	0	2		2		40	**40**			60	3	**100**	1
12	-	-	SCA			2		2		25	**25**					**25**	0
Total				**14**	**0**	**12**	**8**	**34**	**240**	**225**	**465**	**360**		**300**		**1125**	**19**

The students shall undergo Internship-I at the end of 3rd semester (During semester break after board examinations of duration 04 weeks) which will be evaluated and reflected in study and evaluation scheme of 4th semester.

Course Code	:	CEPC201
Course Title	:	Construction Materials
Number of Credits	:	3 (L:3, T: 0, P: 0, BS:0)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:
Following are the objectives of this course:

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

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 based on 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, defects in 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, Classification of 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 their uses.
- 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; Thermal and sound insulating materials.
- Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (only uses).
- Geo polymer cement: Geo-cement: properties, uses.

Unit– V: Processed Construction Materials

- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes, and uses.
- Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used).
- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials - Rice husk, Bagasse, coir fibers and their uses.
- Special processed construction materials; Geo synthetic, Ferro Crete, Artificial timber, Artificial sand, and their uses.

References:

- Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
- S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
- Varghese, P.C., Building Materials, PHI learning, New Delhi.
- Rangwala, S.C., Engineering Materials, Charator publisher, Ahmedabad.
- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**5**	**10**
2	**10**	**20**
3	**13**	**25**
4	**8**	**20**
5	**12**	**25**
TOTAL	**48**	**100**

Course Outcomes

After completing 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 Code	:	CEPC203
Course Title	:	Basic Surveying
Number of Credits	:	2 (L: 2, T: 0, P: 0, BS:1)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To understand types of surveying works required.
- To know the types of method and equipment to be used for different surveys.
- To know the use and operational details of various surveying equipment.

Course Content:

Unit –1 Overview and Classification of Survey

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

Unit– 2 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 to natural cause, random error.
- Principles of triangulation.
- Types of offsets: Perpendicular and Oblique.
- Conventional Signs, Recording of measurements in a field book.

Unit– 3 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 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.
- 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.

Unit– 4 Leveling and Contouring

- Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Benchmarks- 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, Temporary adjustments of Level.
- Types of Levelling Staff: Self-reading staff and Target staff. Reduction of level by Line of collimation and Rise and Fall Method.
- Levelling Types: Simple, Differential, Fly, Profile and Reciprocal Levelling. Contour, contour intervals, horizontal equivalent.
- Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect

Unit– 5 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.

Suggested learning resources

- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**6**	**10**
2	**11**	**20**
3	**12**	**25**
4	**13**	**30**
5	**6**	**15**
TOTAL	**48**	**100**

Course Outcomes

After completing 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 Code	:	CEPC205
Course Title	:	Mechanics of Materials
Number of Credits	:	2 (L: 2, T: 0, P: 0, BS:2)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.

Course Content

Unit – 1 Moment of Inertia

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). M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections about centroidal axes. Polar Moment of Inertia of solid circular sections.

Unit– 2 Simple Stresses and Strains

Definition of rigid, elastic and plastic bodies, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity. Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses 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, volumetric strain, change in volume, Bulk modulus (Introduction only). Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

Unit– 3 Shear Force and Bending Moment

Types of supports, beams, and loads. Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation). Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads (combination of any two types of loading), point of contra flexure.

Unit– 4 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, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.

Unit– 5 Columns

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. 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.

Suggested learning resources:

- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**10**	**20**
2	**15**	**20**
3	**17**	**25**
4	**12**	**20**
5	**10**	**15**
TOTAL	**64**	**100**

Course outcomes:

After competing this course, student will be able to:

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

Course code	:	CEPC207
Course Title	:	Building Construction
Number of Credits	:	2 (L:2, T:0, P:0, BS:1)
Prerequisites	:	Nil
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To identify different components of building.
- To understand different types of foundation and their significance.
- To know different types of masonry and their construction.
- To highlight the importance of communications in building planning.

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 and Windows, 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 plants used 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.

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, 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.
- 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 – Horizontal Communication: Doors – Components of Doors, Full Panelled Doors, Partly Panelled 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 Panelled, Partly Panelled and Glazed, wooden, Steel, Aluminium windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators.
- Vertical Communication: Means of Vertical Communication- Stair Case, Terms used in staircase-steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, handrails, 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, 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 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- Stucco plaster, sponge finish, pebble finish. Plaster. Precautions 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.

Suggested learning resources:

- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**8**	**15**
2	**8**	**15**
3	**11**	**25**
4	**11**	**25**
5	**10**	**20**
TOTAL	**48**	**100**

Course outcomes: After completing 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 Code	:	CEPC209
Course Title	:	Concrete Technology
Number of Credits	:	2 {L:2, T:0, BS:1}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

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

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
- 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, Sulphate resisting, 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 zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand.
- 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.
- Water: Quality of water, impurities in mixing water and 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 exposure 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 of mix design as per IS 10262 (only procedural steps).
- Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation, and co-relation of test results.
- 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.

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 good form 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 Weather concreting

- Admixtures in concrete: Purpose, properties and application for different types of admixtures such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers.
- Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fibre Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete.
- Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition.
- Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.

Suggested learning resources:

- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**10**	**20**
2	**7**	**15**
3	**7**	**15**
4	**12**	**25**
5	**12**	**25**
TOTAL	**48**	**100**

Course outcomes:

After completing this course, student will be able to:

- Use different types of cement and aggregates in concrete
- Prepare concrete of desired compressive strength.
- Prepare concrete of required specification.
- Maintain quality of concrete under different conditions.
- Apply relevant admixtures for concreting.

Course Code	:	CEPC211
Course Title	:	Geotechnical Engineering
Number of Credits	:	3 {L:3, T:0, P:0, BS:1}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

Course Content:

Unit – I Overview of Geology and Geotechnical Engineering

- 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.
- 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 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,
- Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.
- 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 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).
- 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 Bearing Capacity of Soil

- 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.

- Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.
- Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure

Unit– V Compaction and stabilization of soil

- 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 equipment -smooth wheel roller, sheep foot roller, pneumatic tyre roller, Rammer and Vibrator, Difference between compaction and consolidation.
- Concept of soil stabilization, necessity of soil stabilization, different methods 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 pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.

Suggested learning resources:

- Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
- Murthy, V.N.S., A textbook 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**8**	**10**
2	**13**	**20**
3	**16**	**25**
4	**14**	**25**
5	**13**	**20**
TOTAL	**64**	**100**

Course outcomes:

After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Use the results of permeability and shear strength test for foundation analysis.
- Interpret soil bearing capacity results.
- Compute optimum values for moisture content for maximum dry density of soil through various tests.

Course Code	:	CEPC213
Course Title	:	Construction Materials Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2, BS:0)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

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

List of practicals to be performed:

- Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
- Identify the available construction materials in the laboratory based on their sources.
- 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)
- Prepare the lime putty by mixing lime (1 kg) with water in appropriate proportion and pre-pare report on slaking of lime.
- 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 of photographs and samples. Part I
- 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 of photographs and samples. Part II
- Select first class, second class and third-class bricks from the stake of bricks
- and prepare report on the basis of its properties.
- 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.
- Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti-skid tiles, checkered tiles, paving blocks and prepare report about the specifications.
- Apply the relevant termite chemical on given damaged sample of timber.
- Identify the type of glasses from the given samples.
- 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

- 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 II
- Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special processed construction material.
- Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.

Suggested learning resources:

- 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, NewDelhi.
- Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
- Duggal, S. K, Building Materials, New International, New Delhi.

Course outcomes:

After completing 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 Code	:	CEPC215
Course Title	:	Basic Surveying Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2, BS:2)
Prerequisites	:	Nil
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To understand types of surveying works required
- To know the type of method and equipment to be used for different surveys
- To know the use and operational details of various surveying equipment.

List of Practicals to be performed

- Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter-visible.
- Undertake reciprocal ranging and measure the distance between two stations.
- Determine area of open field using chain and cross staff survey.
- Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
- 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.
- Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.
- Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical No.6.
- Undertake simple levelling using dumpy level/ Auto level and levelling staff.
- Undertake differential levelling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and levelling staff.
- Undertake fly levelling with double check using dumpy level/ Auto level and levelling staff.
- Undertake Survey Project with Levelling instrument for Profile levelling and cross- sectioning for a road with cross-section.
- 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.
- Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m.
- Plot the contours on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical No.13.
- Measure area of irregular figure using Digital planimeter.

Suggested learning resources:

- 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, Text book of Surveying, PHI Learning
- Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
- Arora K R, Surveying Vol. I, Standard Book House

Course Outcomes:

After completing 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 to prepare contour maps
- Use digital planimeter to calculate the areas.

Course Code	:	CEPC217
Course Title	:	Mechanics of Materials Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2, BS:0)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To know the procedure for the conduct of tensile and compressive strength.
- To understand the concept of stress and strain through testing of different materials.
- To calculate shear force, bending moment and their corresponding stresses.
- To understand flexural strength and abrasive properties of floor tiles.

List of Practicals to be performed:

- Study and understand the use and components of Universal Testing Machine (UTM).
- Perform Tension test on mild steel as per IS:432(1).
- Perform tension test on Tor steel as per IS:1608, IS:1139.
- Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tile IS:1237.
- Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.
- Conduct Abrasion Test on flooring tiles (anyone) e.g., Mosaic tiles, Ceramic Tiles as per IS: 13630 (part7), Cement Tile as per IS: 1237.
- Perform Single Shear and double shear test on any two metals e.g., Mild steel/ brass/aluminium/copper / cast iron etc as per IS:5242.
- Plot Shear force and Bending Moment diagrams for simply supported beams.
- Conduct Flexural test on timber beam on rectangular section in both orientations as per IS:1708, IS:2408.
- Conduct Flexure test on floor tiles IS:1237, IS:13630 or roofing tiles as per IS:654, IS:2690.

Suggested learning resources:

- Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition 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.

Course outcomes:

After completing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Analyse structural behavior of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
- Determine bending and shear stresses in beams under different loading conditions.
- Calculate flexural strength of different types of floor tiles.

Course Code	:	CEPC219
Course Title	:	Concrete Technology Lab.
Number of Credits	:	1 {L:0, T:0, P:2}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.

List of Practicals to be performed:

- Determine fineness of cement by Blaine's air permeability apparatus or by sieving.
- Determine specific gravity, standard consistency, initial and final setting times of cement.
- Determine compressive strength of cement.
- Determine silt content in sand.
- Determine bulking of sand.
- Determine bulk density of fine and coarse aggregates.
- Determine water absorption of fine and coarse aggregates.
- Determine Fineness modulus of fine aggregate by sieve analysis.
- Determine elongation and flakiness index of coarse aggregates
- Determine workability of concrete by slump cone test.
- Determine workability of concrete by compaction factor test.
- To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
- Demonstration of NDT equipment.

Suggested learning resources:

- 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.

Course outcomes:

After completing this course, student will be able to:

- Identify different types of cement by performing laboratory tests.
- Know the physical properties of fine and coarse aggregates.
- Prepare concrete of required specification.
- Maintain the quality of concrete applying scientific principles.

Course Code	:	CEPC221
Course Title	:	Geotechnical Engineering Lab.
Number of Credits	:	1 {L:0, T:0, P:2, BS:0}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To understand and determine physical and index properties of soil.
- To estimate the permeability of soil.
- To learn various compaction methods for soil stabilization.

List of Practicals to be performed:

- Identification of rocks from the given specimen.
- Determine water content of given soil sample by oven drying method as per IS: 2720 (PartII).
- Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).
- Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part- XXIX).
- Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part XXVIII).
- Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part-V).
- Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
- Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part-IV).
- 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.
- Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
- Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part VII).

Suggested learning resources:

- 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.

Course outcomes: After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Compute optimum moisture content values for maximum dry density of soil through various Tests.

Study & Evaluation Scheme

4TH SEMESTER (CIVIL ENGINEERING)

SR. No.	Sub Cat.	Subject code	Course Title	STUDY SCHEME Hrs/Week				Total contact hrs/ week	EVALUATION SCHEME								Total Marks of Int.& Ext.	Credits
									INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
				L	T	P	BS		Th	Pr	Total	Th	Hrs	Pr	Hrs	Total		
1	PCC	CEPC202	Hydraulics	2	0	0	2	4	40	-	40	60	3	-	-	**60**	100	2
2	PCC	CEPC204	Advanced Surveying	2	0	0	1	3	40	-	40	60	3	-	-	**60**	100	2
3	PCC	CEPC206	Building Planning & Drawing	1	0	0	0	1	40	-	40	60	3	-	-	**60**	100	1
4	PCC	CEPC208	Transportation Engineering	3	0	0	0	3	40	-	40	60	3	-	-	**60**	100	3
5	PE		**Elective-I**	3	0	0	0	3	40	-	40	60	3	-	-	**60**	100	3
		CEPE210 - *(I)*	Construction Management															
		CEPE210 –(*II)*	Rural Construction Technology															
6	PE		**Elective-II**	3	0	0	0	3	40	-	40	60	3	-	-	**60**	100	3
		CEPE212 –*(I)*	Solid Waste Management															
		CEPE212 –*(II)*	Railways, Bridges & Tunnels															
7	PCC	CEPC214	Hydraulics Lab	0	0	2	0	2	-	40	40	-	-	60	3	**60**	100	1
8	PCC	CEPC216	Advanced Surveying Lab	0	0	2	2	4	-	40	40	-	-	60	3	**60**	100	1
9	PCC	CEPC218	Building Planning & Drawing Lab	0	0	4	0	4	-	40	40	-	-	60	3	**60**	100	2
10	PCC	CEPC220	Transportation Engineering Lab	0	0	2	0	2	-	40	40	-	-	60	3	**60**	100	1
11	PR	PR222	Minor Project	0	0	2	0	2	-	40	40	-	-	60	-	**60**	100	2
12	AU	AU202	Essence of Indian Knowledge and Tradition	2	0	0	0	2	40	-	40	60	-	-	3	**60**	100	0
13	SI	SI-I	Internship-I (4 weeks) after 3rd Sem.	0	0	0	0	0	-	40	40	-	-	60	-	**60**	100	2
14			SCA	0	0	2	0	2	-	25	25	-	-	-	-	-	25	0
		Total		**16**	**0**	**14**	**5**	**35**	**280**	**265**	**545**	**420**	**-**	**360**	**-**	**780**	**1325**	**23**

* CEPE210 – *I & II, CEPE212– I&II (Elective I&II)* students have the option to choose one subject each under both the Electives.

The students shall undergo Internship-II at the end of 4th semester (During semester break after board examinations of duration 06 weeks) which will be evaluated and reflected in study and evaluation scheme of 5th semester.

Course Code	:	CEPC202
Course Title	:	Hydraulics
Number of Credits	:	2 (L: 2, T: 0, P: 0, BS:2)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

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

Course Content

Unit – 1 Pressure measurement and Hydrostatic pressure

- Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics, and hydrodynamics - ideal and real fluid, 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 of Pressure 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 tanks containing two liquids, vertical surface in contact with liquid on either side

Unit– 2 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 pressure energy.
- Bernoulli's theorem: statement, assumptions, equation.

Unit– 3 Flow through pipes

Major Head loss in pipe: Frictional loss and its computation by Darcy's Welsbach equation.

- Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement, and fittings.
- Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe.
- Hydraulic gradient line and total energy line.

Unit– 4 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, Froude's Number.

Unit– 5 Hydraulic Pumps

- Concept of pump, Types of pumps - centrifugal, reciprocating, submersible.
- Suction head, delivery head, static head, Manometric head.
- Selection and choice of pump.

RECOMMENDED BOOKS

- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**16**	**25**
2	**12**	**20**
3	**16**	**25**
4	**15**	**20**
5	**5**	**10**
TOTAL	**64**	**100**

Course outcomes:

After competing this course, student will be able to:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand 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 Code	:	CEPC204
Course Title	:	Advanced Surveying
Number of Credits	:	2 (L: 2, T: 0, P: 0, BS:1)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To know methods of plane surveying and Theodolite surveying and their uses
- To learn tacheometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
- To know the concept of remote sensing, GPS, and GIS

Course Content

Unit – 1 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.
- Methods of plane table surveys- Radiation, Intersection and Traversing.
- Merits and demerits of plane table survey.

Unit– 2 Theodolite Surveying

- Types and uses of Theodolite, Components of transit Theodolite 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 Repetition method, Errors eliminated by method of repetition.
- Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.
- Measurement of vertical Angle.
- Theodolite traversing by included angle method and Deflection angle method.
- Traverse Computation-Latitude, Departure, Consecutive coordinates, independent coordinates.

Unit–3 Tacheometric surveying and Curve setting

- Principles of Tacheometry, Tacheometer, and its component parts, 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. Designation of curves.
- Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.

Unit– 4 Advanced surveying equipment

- Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
- Use of micro-optic Theodolite and Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.

Unit– 5 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): Overview, Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

Suggested learning resources:

- Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi GruhPrakashan, 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.
- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**8**	**20**
2	**13**	**25**
3	**14**	**30**
4	**7**	**15**
5	**6**	**10**
TOTAL	**48**	**100**

Course outcomes:

After completing 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 Code	:	CEPC206
Course Title	:	Building Planning and Drawing
Number of Credits	:	1 {L:1, T:0, P:0, BS:0}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

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

Course Content:

Unit – I Conventions and Symbols

- Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork, and glass.
- Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations.
- Types of lines-visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrowhead, or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes, and dimensions.
- Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing.
- Sizes of various standard papers/sheets.
- Reading and interpreting readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer).

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 byelaws 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 centre, 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, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public 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 stair- case.
- 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, Staircase, and slab.
- Drawing with CAD- Draw commands, modify commands, layer commands.

Suggested learning resources:

- Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, McGraw Hill Publishing company Ltd. New Delhi.
- 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. 7. 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**2**	**15**
2	**4**	**25**
3	**5**	**30**
4	**5**	**30**
TOTAL	**16**	**100**

Course outcomes:

After completing 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 Code	:	CEPC208
Course Title	:	Transportation Engineering
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

Course Content:

Unit – 1 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– 2 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 per IRC –recommendations.
- Gradient: Definition, types as per IRC – Recommendations.
- Sight distance (SSD): Definition, types IRC – recommendations, simple numerical.
- Curves: Necessity, types: Horizontal, vertical curves.
- Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.
- Standards cross-sections of national highway in embankment and cutting.

Unit– 3 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 proper- ties, 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 concrete roads. Types of joints.

Unit– 4 Basics of Railway Engineering

- Classification of Indian Railways, zones of Indian Railways.
- Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints - requirements, types.
- Creep of rail causes and prevention.

Unit-5 Track geometrics, Construction and Maintenance

- Alignment- Factors governing rail alignment.
- Track Cross sections – standard cross section of single and double
- line 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 rail- way 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 and Key man.

RECOMMENDED BOOKS

- 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, A., 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, Practice and Design of Highway Engineering, S Chand Publication New Delhi.
- Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International
- (P) Limited, Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**5**	**10**
2	**11**	**25**
3	**13**	**25**
4	**5**	**10**
5	**14**	**30**
TOTAL	**48**	**100**

Course outcomes:

After completing 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.

Elective- I (Anyone to be selected)

S. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
Elective I (Anyone to be selected)							
1	CEPE210-(*I*)	Construction Management	3	0	0	IV	3
2	CEPE210-(*II*)	Rural Construction Technology	3	0	0	IV	3

Course Code	:	CEPE210- (*I)*
Course Title	:	Construction Management
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To understand the contract management and associated labour laws.
- To prepare and understand the principals involved in site layout.
- To know the procedure for scheduling of various activates in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

Course Content

Unit – I Construction industry and management

- Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization
- Agencies associated with construction work- owner, promoter, builder, designer, architects.
- Role of consultant for various activities: Preparation of Detailed Project Report (DPR), Monitoring of progress and quality, settlement of disputes.

Unit – II Site Layout

- Principles governing site layout.
- Factors affecting site layout.
- Preparation of site layout.
- Land acquisition procedures and providing compensation.

Unit- III Planning and scheduling

- Identifying broad activities in construction work & allotting time to it, Methods of Scheduling,
- Development of bar charts, Merits & limitations of bar chart.
- Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events.
- CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent, and total floats, critical activities and critical path,
- Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope,
- Optimization of cost and duration.
- Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in)

Unit IV Construction Contracts and Specifications

- Types of Construction contracts
- Contract documents, specifications, general special conditions
- Contract Management, procedures involved in arbitration and settlement (Introduction only)

Unit– V Safety in Construction

- Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures.
- Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

Suggested learning resources

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
- Gahlot,P.S. and Dhir, B.M Construction planning and management New Age International
- (P) Ltd. Publishers, New Delhi.
- Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
- Mantri, S., The A to Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
- Khanna, O.P., Industrial Engineering and management, Dhanpat Rai New Delhi
- Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT and CPM, Laxmi Publications (P)Ltd.
- Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
- Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
- Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**9**	**20**
2	**8**	**20**
3	**14**	**25**
4	**9**	**20**
5	**8**	**15**
TOTAL	**48**	**100**

Course outcomes:

After competing this course, student will be able to:

- Understand the contract management and associated labour laws.
- Prepare and understand the nuances of executing the site layout.
- Prepare networks and bar charts for the given construction project.
- Understand the intricacies of disputes, related arbitration and settlement laws.
- Apply safety measures at construction projects.

Course Code	:	CEPE210-(*II)*
Course Title	:	Rural Construction Technology
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To learn development and planning of low cost housing infrastructure.
- To know about different government schemes for rural development.
- To understand techniques for rural road construction as per IRC stipulations.
- To learn rural irrigation techniques and watershed management.

Course Contents:

Unit I - Rural Development and Planning

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

Unit II -Rural Housing

- Low-cost construction material for housing
- Composite material- ferro-cement & fly ash, autoclaved calcium silicate 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 biogas 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 of hand pumps.
- Conservation of water - rainwater harvesting, drainage in rural areas.
- 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-Bases and Bases.
- Guidelines for Surfacing of Rural Road as per relevant IRC codes.
- Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.

Unit V - Low-Cost Irrigation

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

Suggested learning resources:

- 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.
- 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.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**4**	**10**
2	**14**	**30**
3	**14**	**30**
4	**8**	**15**
5	**8**	**15**
TOTAL	**48**	**100**

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.

Elective II (Anyone to be selected)

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
Elective II (Anyone to be selected)							
1	CEPE212-(*I*)	Solid Waste Management	3	0	0	IV	3
2	CEPE212-(*II*)	Railways Bridges and Tunnels	3	0	0	IV	3

Course Code	:	CEPE212-(*I)*
Course Title	:	Solid Waste Management
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To know various sources of solid.
- To learn techniques of collection and transportation of solid waste.
- To know various methods of disposal of solid waste.
- To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

Course Content:

Unit – I Introduction

- 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.
- Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste.
- Physical and chemical characteristics of municipal solid waste.

Unit– II Storage, Collection and Transportation of Municipal Solid Waste

- Collection, segregation, storage and transportation of solid waste.
- Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical Road sweepers, Community bin - like movable and stationary bin.
- Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location.
- Role of rag pickers and their utility for society.

Unit– III Composting of Solid Waste

- Concept of composting of waste, Principles of composting process. Factors affecting the composting process.
- Methods of composting – Manual Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting.

Unit IV Techniques for Disposal of Solid Waste

- Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques.
- 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.
- 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

RECOMMENDED BOOKS:

- 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 Delhi.
- Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
- Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**10**	**20**
2	**15**	**25**
3	**12**	**30**
4	**11**	**25**
TOTAL	**48**	**100**

Course outcomes:

After competing this course, student will be able to:

- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste.
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Bio-medical and E-waste.

Course Code	:	CEPE212 – (*II)*
Course Title	:	Railways Bridges and Tunnels
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To gain knowledge pertaining to different railways terminology.
- To know different types of rail Gauge, sleepers and ballast.
- To know the classification of bridges and concept of maintenance of bridges.
- To know the tunnelling process.

Course Content:

PART–1: RAILWAYS

- Introduction to Indian Railways
- Railways surveys: Factors influencing the railways route, brief description of various types of railway survey
- Classification of permanent way describing its component part
- Rail Gauge; Definition, types, practice in India
- Rail – types of rails
- Rail Fastening: Rail joints, types of rail joints, fastening for rails, Fish plates, spikes bearing plates
- Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material of Sleepers.
- Ballast: Function of ballast, requirements of an ideal material of ballast
- Crossing and signalling: Brief description regarding different types of crossing/signalling
- Maintenance of track: Necessity, track fixtures; maintenance and boxing of ballast, maintenance gauges, tools.
- Drains, methods of construction.

PART-II: BRIDGES

- Introduction
- Bridge–its function and component parts, difference between a bridge and A culvert
- Classification of Bridges
- Their structural elements and suitability:
- According to life-permanent and temporary
- According to deck level–Deck, through and semi-through
- According to material–timber, masonry, steel, RCC, pre-stressed
- IRC classification
- Bridge Foundations: Introduction to open foundation pile foundation, Well foundation
- Piers, Abutments and Wing walls
- Piers–definition, parts; types–solid (masonry and RCC), open
- Abutment sand wing walls–definition, types of abutment (straight and tee), abutment with wing walls

(straight, splayed, return and curved)

- Bridge bearings Purpose of bearing; types of bearing–fixed plate, rocker and roller,
- Maintenance of Bridges
- Inspection of bridges
- Routine maintenance

PART–III: TUNNELS

- Definition and necessity of tunnels
- Typical section of tunnels for a national highway and single and double broad gauge railway track.
- Ventilation-necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust
- Drainage method of draining water in tunnels
- Lighting in tunnels & lining of tunnels.

RECOMMENDED BOOKS

- Vaswani, NK; " Railway Engineering", Roorkee Publishing House
- Rangwala,SC; " Railway Engineering", Anand Charotar Book Stall
- Deshpande, R: " A Text Book of Railway Engineering", Poonam United Book Corporation
- Algaia, JS "Bridge Engineering", Anand Charotar Book Stall
- Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH
- Rangwala, "Bridge Engineering", Anand Charotar Book Stall
- IRC Bridge Codes
- MORTH drawings for various types of bridges
- MORTH pocketbooks for bridge Engineering, 2000 (First Revision)
- Subhash C Saxena "Tunnel Engineering Dhanpat Rai and Sons

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**16**	**35**
2	**18**	**35**
3	**14**	**30**
TOTAL	**48**	**100**

Course outcomes:

After completing this course, student will be able to:

- Classify different types of railways sections.
- Identify different parts of Bridges.
- Draw typical sections of tunnels.
- Know the drainage method of draining water in tunnels.

Course Code	:	CEPC214
Course Title	:	Hydraulics Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

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

List of Practical to be performed:

1. Use piezometer to measure pressure at a given point.
2. Use U tube differential manometer to measure pressure difference between two given points.
3. Find the resultant pressure and its position for given situation of liquid in a tank.
4. Use Reynold's apparatus to determine type of flow.
5. 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.
6. Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
7. Determine minor losses in pipe fitting due to Bend and Elbow.
8. Calibrate Venturimeter to find out the discharge in a pipe.
9. Calibrate the Orifice to find out the discharge through a tank
10. Use Current meter to measure the velocity of flow of water in open channel.
11. Use Pitot tube to measure the velocity of flow of water in open channel.
12. Use triangular notch to measure the discharge through open channel.
13. Use Rectangular notch to measure the discharge through open channel.

RECOMMENDED BOOKS

- 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.

Course Code	:	CEPC216
Course Title	:	Advanced Surveying Lab
Number of Credits	:	2 (L: 0, T: 0, P: 2, BS:2)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To know methods of plane surveying, Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of Remote Sensing, GPS and GIS.

List of the Practical to be performed.

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 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 Theodolite 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. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station 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, Pune Vidyarthi 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.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

Course outcomes:

After completing this course, student will be able to:

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

Course Code	:	CEPC218
Course Title	:	Building Planning and Drawing Lab.
Number of Credits	:	2 {L:0, T:0, P:4, BS:0}
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

- To learn the basic principles of building planning and drawing.
- To make graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

List of Practical/Drawings to be completed:

1. Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962.
2. Draw line plan to suitable scale (1BHK, staircase, WC and Bathroom)
3. Draw line plans to suitable scale for the following Public Buildings (School Building and Community Hall).
4. 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.
5. 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 Staircase, WC and Bath
    d. Site plan (1:200) and area statement
    e. Schedule of openings and Construction Notes.
6. Draw working drawing for above mentioned drawing at serial number 5 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.
7. Draw the above-mentioned drawing at serial number 5 using CAD software and enclose the printout.
    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 and construction notes.

Suggested learning resources:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, McGraw Hill Publishing
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, McGraw Hill
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., Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, working with Auto CAD 2000, McGraw Hill Publishing company Ltd.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

Course outcomes:

After completing 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 working drawing for the given requirement of Load Bearing Structure.
- Prepare working drawing using CAD for the given requirement of Framed Structure.
- Draw two-point perspective drawing for given small objects.

Course Code	:	CEPC220
Course Title	:	Transportation Engineering Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PCC

Course Objectives:

Following are the objectives of this course:

To identify the types of roads as per IRC recommendations.

- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

List of Practical's to be performed:

1. Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR
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 measures.
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**

RECOMMENDED BOOKS

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Vee Ragavan, A., Highway Engineering, Nem Chand, and Brothers, Roorkee. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
3. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
4. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, Delhi.
5. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand
6. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
7. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

Course outcomes:

After completing 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 Code	:	PR222
Course Title	:	Minor Project
Number of Credits	:	2 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PR

Minor project work aims at exposing the students to field practices, size and scale of operations and work culture at works sites. For this purpose, students during middle of course, are required to be sent at different work sites where some construction activities are in progress, or some operations are going on.

LEARNING OUTCOMES

- After undergoing the subject, students will be able to:
- Apply concepts, principles and practices taught in the classroom in solving field problems.

GENERAL GUIDELINES

- Depending on the interests of the students, they may be sent to following (or any other field project related to Civil Engineering:
- Building construction sites
- Water treatment plant, Sewage treatment plant
- Crusher plant, Cement Manufacturing Plant, Brick kiln
- Highway construction site
- Material and Soil testing laboratory, Soil investigation projects
- Hydel Power Project
- Land surveying projects
- Community development works
- Constructional site like building, bridge, tunnel, canal lining, highway, railway track, irrigation works etc.
- Low costing Housing
- As a minor project activity, each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes seen by him/her and give seminar using computer aided

presentation slides using photographs. These students should be guided by respective subject teachers. Each teacher may guide a group of 10 – 15 students.

- The teachers along with field supervisors will conduct performance assessment of students. Some of the projects are suggested below:

1. Survey of a village approach road, drawings of L-section and x-sections
2. Estimation of white washing and distempering in hostel building
3. Preparation of detailed estimate with drawings of septic tank for 30-40 users
4. Plumbing work and installation of PVC over-head water tank on a toilet block and then prepare report.
5. Construction of different components of a building
6. Identification of water-supply fittings and replacement of defective fittings and then prepare report.
7. Construction of a pipe/slab culvert
8. Ferro-cement construction techniques
9. Low-cost housing
10. New construction materials
11. Study and preparation of models of hydraulic pumps.

A group of students not exceeding 5 may work on any one project. Each student will prepare the project report of the activities observed by him. They will study the whole process of the plant and explain the same in their project report. Further they are required to present the Project Report of work done by them through seminar in the class for internal assessment. External examiner will ask the questions on the construction, working, processes observed by the students during their project work: Shortcomings in the works (site) and their remedial measures may be suggested by the students.

Course Code	:	AU202
Course Title	:	Essence of Indian Knowledge and Tradition
Number of Credits	:	0 (L: 2, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	AU (Audit Course)

Course Learning Objectives

The objective of this course is to expose the students with the concepts of Indian traditional knowledge and to make them appreciate the importance of the roots of indigenous knowledge system.

Course Outcomes

After completing this course, the students will be able to:

CO-1. Identify the concept of Indian Knowledge System (IKS).

CO-2. Understand the need for and importance of protecting traditional knowledge.

CO-3. Compare the Indian traditional knowledge and modern science.

CO-4. Understand the use of Yoga in stress management, mental health, mindfulness, healthy eating, weight loss and quality sleep.

CO-5. Aware of the general knowledge of Himachal Pradesh.

Course Contents

Unit 1: Indian Knowledge System (IKS): ----------25% Marks

- Introduction and Function of Indian Knowledge System (IKS).
- The Basic Structure of Indian Knowledge System (IKS) (only Introduction)
    1. The 4 Vedas, Namely ऋग्वेद (Rigveda), यजुर्वेद (Yajurveda), सामवेद (Samaveda), अथर्ववेद (Atharvaveda) .
    2. The 4 UpVedas, namely आयुर्वेद (Ayurveda (healthcare)), धनुर्वेद (Dhanurveda (archery)), गंधर्ववेद (Gandharva-veda (dance, music etc.)) and स्थापत्यवेद (Sthapatyaveda (architecture)).
    3. The 6 Vedagangs, namely Shiksha (शिक्षा), Kalpa (कल्प), Vykaraṇa (व्याकरण), Chhandas छंदस्), Nirukta (निरुक्त), and Jyotisha (ज्योतिष).
    4. Itihasa (इतिहास) (Ramayana रामायण and Mahabharata महाभारत) and Purana पुराण (Vishnupurana विष्णुपुराण, Bhagavata Purana (भागवत पुराण) etc.)

5. Dharmashastra धर्मशास्त्र (Manusmriti मनुस्मृति, Yajnavalkya-smriti यज्ञावल्क्य स्मृति etc.).
6. Darshan दर्शन (आस्तिक तथा नास्तिक).
7. Nyaya न्याय (Logic तर्कशास्त्र) and Epistemology ज्ञानमीमांसा).

Unit 2: Modern science ----------20% Marks

- Modern science: Introduction, Characteristics, importance and Example
- Difference between modern Science and Indian knowledge system
- Role of IKS in modern science

Unit 3: Traditional Knowledge ----------15% Marks

- Traditional knowledge: Definition, nature, characteristics, scope and importance
- Indigenous Knowledge (IK): characteristics
- Traditional knowledge vis-a-vis Indigenous knowledge
- Traditional knowledge Vs western knowledge
- The need for protecting traditional knowledge.

Unit 4: Yoga and Holistic Health care ----------25% Marks

- Yoga: Meaning and Importance of Yoga
- Yoga and physical health, Yoga and psychological health, Yoga and intellectual health, Yoga and spiritual health, Yoga and social approach.
- Introduction to Ashtanga Yoga, Yogic Kriyas (Shat Karma)
- Pranayama and its types; Active lifestyle and stress management through Yoga
- Physical Fitness, Health and wellness: Meaning and Importance of Wellness,
- Components of Wellness, Health and physical Fitness.
- Traditional sports & Regional Games for promoting wellness:
- Leadership through Physical Activity and Sports; Introduction to First Aid.

Unit 5: Himachal Pradesh: A Basic Information ----------15% Marks

- History, Culture, Heritage/ Tradition, Customs & Manners,
- Regional Knowledge, Geographical Features, Constitutional History
- Tourism Place & Scope
- Festivals and Fairs

Suggested Text/ Reference Books

1. Cultural Heritage of India-Course Material by V. Sivaramakrishna Bharatiya, Vidya Bhavan, Mumbai, 5th Edition, 2014

2. Modern Physics and Vedant by Swami Jitatmanand Bharatiya, Vidya Bhavan
3. The wave of Life by Fritz of Capra
4. Tao of Physics Fritz of Capra
5. Tarkasangraha of Annam Bhatta, International by V N Jha, Chinmay Foundation, Velliarnad, Ernakulam
6. Science of Consciousness Psychotherapy and Yoga Practices by RN Jha, Vidyanidhi Prakashan, Delhi, 2016
7. Himachal Pradesh History, Culture & Economy by Mian Goverdhan Singh & Prof. Dr. C.L. Gupta.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	**Time Allotted**	**Marks Allotted (%)**
1	**8**	**25**
2	**6**	**20**
3	**5**	**15**
4	**8**	**25**
5	**5**	**15**
TOTAL	**32**	**100**

Course Code	:	**SI-I**
Course Title	:	**Internship-I**
Number of Credits (Teaching Load)	:	2 (L: 0; T:0; P:0)
Prerequisites	:	-
Course Category	:	SI (Internship)

Guidelines

An internship of four weeks after 3rd semester during vacations should be undertaken in an industry/ Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/ Institutes/ Schemes. The assessment of internship will be carried out in 4th semester. The faculty members must visit the internship site during the course of internship to monitor the progress of the students.

Evaluation Criteria

The internal assessment of internship is to be carried out by the Industry/ Organization where the students have undergone the internship. The internal assessment done by the industry/ organization may be rationalized by the Department, if needed. The external assessment is to be done at the Institute. The department shall finalize external assessment within a month of the beginning of the 4th semester. The students have to prepare a daily diary of their internship period and the same has to be submitted at the institute after completion of the internship. The students have also to present the experience gained during internship in a seminar for the purpose of external evaluation.

(a) The assessment criteria (Internal Assessment) by the industry/ organization where the students have undergone the internship is as follows:

- Attendance and general behavior : 20%
- Daily diary maintenance : 20%
- Initiative and participative attitude during internship : 20%
- Performance in the assigned activities by the industrial supervisor : 40%

(b) The assessment criteria (External Assessment) by the institute is as follows:

- Presentation : 60%
- Report : 20%
- Viva : 20%

Course Code	:	**SI-II**
Course Title	:	**Internship-II**
Number of Credits (Teaching Load)	:	3 (L: 0; T:0; P:0)
Prerequisites	:	-
Course Category	:	SI (Internship)

Guidelines

An internship of Six weeks after 4th semester during vacations should be undertaken by the students in relevant Industry. The objective of this mandatory internship is to expose the students to the real world of work and get experience with the latest tools, best practices, work & culture, etiquettes and ethics followed in modern industries. The assessment of internship will be carried out in 5th semester. The faculty members must visit the internship site during the course of internship to monitor the progress of the students.

Evaluation Criteria

The internal assessment of internship is to be carried out by the Industry/ Organization where the students have undergone the internship. The internal assessment done by the industry/ organization may be rationalized by the Department, if needed. The external assessment is to be done at the Institute. The department shall finalize external assessment within a month of the beginning of the 5th semester. The students have to prepare a daily diary of their internship period and the same has to be submitted at the institute after completion of the internship. The students have also to present the experience gained during internship in a seminar for the purpose of external evaluation.

(a) The assessment criteria (Internal Assessment) by the industry/ organization where the students have undergone the internship is as follows:

- Attendance and general behavior : 20%
- Daily diary maintenance : 20%
- Initiative and participative attitude during internship : 20%
- Performance in the assigned activities by the industrial supervisor : 40%

(b) The assessment criteria (External Assessment) by the institute is as follows:

- Presentation : 60%
- Report : 20%
- Viva : 20%