Diploma Engineering

Curriculum Structure

&

Detailed Syllabus

(III to VI Semester)

Civil Engineering

(CE)

(III to VI Semester)

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme corecourse-1	CEPC-301	Building Materials and Construction	3	0	0	3	3
2	Programme corecourse-2	CEPC-302	Surveying	3	0	0	3	3
3	Programme corecourse-3	CEPC-303	Concrete Technology	2	0	0	2	2
4	Programme corecourse-4	CEPC-304	Mechanics of Materials & Theory of Structure	3	0	0	3	3
5	Programme corecourse-5	CEPC-305	Geotechnical Engineering	2	1	0	3	3
6	Programme corecourse-6	CEPC-306	Construction Materials & Mechanics of Materials Lab.	0	0	2	2	1
7	Programme corecourse-7	CEPC-307	Surveying Lab.	0	0	2	2	1
8	Programme corecourse-8	CEPC-308	Concrete Technology Lab.	0	0	2	2	1
9	Programme corecourse-9	CEPC-309	Geotechnical Engineering Lab.	0	0	2	2	1
10	Summer Internship-I (3 to 4 weeks)after IInd Semester	CESI-310	Summer Internship-I	0	0	0	0	2
			Total					**20**

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-10	CEPC-401	Hydraulics	3	0	0	3	3
2	Programme core course-11	CEPC-402	Water Resource Engineering	2	0	0	2	2
3	Programme core course-12	CEPC-403	Transportation Engineering	3	0	0	3	3
4	Programme core course-13	CEPC-404	Hydraulics and Water Resource Engg. Lab.	0	0	2	2	1
5	Programme core course-14	CEPC-405	Transportation Engineering Lab.	0	0	2	2	1
6	Programme core course-15	CEPC-406	Building Planning and Drawing Lab.	0	0	4	4	2
7	Programme Elective course-1 (Anyone to be selected)	CEPE-407/A	Construction Management	3	0	0	3	3
		CEPE-407/B	Rural Construction Technology	3	0	0	3	
		CEPE-407/C	Building Services and Maintenance	3	0	0	3	
8	Humanities & Social Science-4	HS 408	Professional Skill Development	2	1	0	3	3
9	Minor Project	CEPR-409	Minor Project	0	0	4	4	2
10	Mandatory Course-1	AU-410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total					**20**

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	CEPC-501	Design of RCC and Steel Structure	3	0	0	3	3
2	Programme core course-17	CEPC-502	Estimating, Costing and Valuation	3	0	0	3	3
3	Programme core course-18	CEPC-503	Design of RCC and Steel Structure Lab.	0	0	2	2	1
4	Programme core course-19	CEPC-504	Estimating, Costing and Valuation Lab.	0	0	2	2	1
5	Programme core course-20	CEPC-505	Auto CAD Lab.	0	0	2	2	1
6	Programme Elective course-2 (Anyone to be selected)	CEPE-506/A	Traffic Engineering	2	1	0	3	3
		CEPE-506/B	Solid Waste Management	2	1	0	3	
		CEPE-506/C	Advanced Construction Technology	2	1	0	3	
7	Programme Elective course-3 (Anyone to be selected)	CEPE-507/A	Pavement Design & Maintenance	3	0	0	3	3
		CEPE-507/B	Green Building and Energy Conservation	3	0	0	3	
		CEPE-507/C	Precast &Pre-stressed Concrete	3	0	0	3	
8	Open Elective -1	(Anyone to be selected from Annexure-I)		3	0	0	3	3
9	Summer Internship-II (6 weeks) after IVth Semester	CESI-509	Summer Internship-II	0	0	0	0	3
10	Major Project	CEPR-510	Major Project-I	0	0	2	2	1
			Total					**22**

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	CEPC-601	Public Health Engineering	3	0	0	3	3
2	Programme core course-22	CEPC-602	Public Health Engineering Lab.	0	0	4	4	2
3	Programme Elective course-4 (Anyone to be selected)	CEPE-603/A	Airport Engineering	3	0	3	3	3
		CEPE-603/B	Foundation Engineering	3	0	3	3	
		CEPE-603/C	Advanced Design of Structures	3	0	3	3	
4	Humanities and Social Science course-5	HS604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open Elective-2	(Anyone to be selected from Annexure-II)		4	0	0	4	4
6	Mandatory Course-2	AU-606	Indian Constitution	2	0	0	2	0
7	Major Project	CEPR-607	Major Project-II	0	0	6	6	3
8	Seminar	CESE-608	Seminar	2	0	0	2	1
			Total					**20**

DETAILED SYLLABUS

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme corecourse-1	CEPC-301	Building Materials and Construction	3	0	0	3	3
2	Programme corecourse-2	CEPC-302	Surveying	3	0	0	3	3
3	Programme corecourse-3	CEPC-303	Concrete Technology	2	0	0	2	2
4	Programme corecourse-4	CEPC-304	Mechanics of Materials & Theory of Structure	3	0	0	3	3
5	Programme corecourse-5	CEPC-305	Geotechnical Engineering	2	1	0	3	3
6	Programme corecourse-6	CEPC-306	Construction Materials & Mechanics of Materials Lab.	0	0	2	2	1
7	Programme corecourse-7	CEPC-307	Surveying Lab.	0	0	2	2	1
8	Programme corecourse-8	CEPC-308	Concrete Technology Lab.	0	0	2	2	1
9	Programme corecourse-9	CEPC-309	Geotechnical Engineering Lab.	0	0	2	2	1
10	Summer Internship-I (3 to 4 weeks)after IInd Semester	CESI-310	Summer Internship-I	0	0	0	0	2
			Total				**22**	**20**

Building Materials and Construction

Course Code	CEPC-301
Course Title	Building Materials and construction
Number of Credits	3 (L:3, T: 0, P:0)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -Upon completion of the course the students will be able to:

- Identify relevant constructionmaterials.**(K2)**
- Identify relevant natural artificial constructionmaterials. **(K2)**
- Select relevant special and processed type of constructionmaterials. **(K3)**
- Identify components of buildingstructures. **(K2)**
- Propose suitable type of foundation and suitable type of masonry for buildingstructures. **(K3)**

Course Content:-

Module- 1: Overview of Construction Materials

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe the scope of construction materials
2) Select materials for different civil engineering structures
3) Broadly classify building construction materials.

Detailed content of the unit: -

- ScopeofconstructionmaterialsinBuildingConstruction,Transportati onEngineering, Environmental Engineering, Irrigation Engineering (applicationsonly).
- Selectionofmaterialsfordifferentcivilengineeringstructuresonthebas isofstrength, durability, Eco friendly andeconomy.
- Broad classification of materials –Natural, Artificial, special, finishing andrecycled.

Module- 2: Natural and Artificial Construction Materials

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain utilization of stone, timber, asphalt and bitumen etc.

2) Describe soil suitability, use of bricks and flooring tiles.
3) Illustrate manufacturing process of cement.

Detailed content of the unit: -

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools forstone.
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo inconstruction.
- Asphalt, bitumen and tar used in construction, properties anduses, Properties of lime, its types anduses.
- Types of soil and its suitability inconstruction., Properties of sand anduses, Classification of coarse aggregate according tosize
- 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 concreteblocks.
- Flooring tiles – Types,uses
- ManufacturingprocessofCement-dryandwet(onlyflowchart),typesofcementandits uses. field tests oncement.

Module-3: Special and Processed Construction Materials

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain suitability of Water proofing, Termite proofing; Thermal and sound insulating materials.
2) Describe fibers, Geopolymer cement and Plaster of Paris
3) Explain Industrial and Agro waste materials, Specialprocessedconstructionmaterials

Detailed content of the unit: -

- Typesofmaterialandsuitabilityinconstructionworksoffollowingmaterials: Water proofing, Termite proofing; Thermal and sound insulating materials.
- Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (onlyuses).
- Geopolymer cement: Geo-cement: properties,uses.
- Constituents and uses of POP (Plaster of Paris), POP finishing boards,

sizes anduses.

- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and theiruses.
- Agro waste materials - Rice husk, Bagasse, coir fibres and theiruses.
- Specialprocessedconstructionmaterials;Geo-synthetic,FerroCrete,Artificialtimber,Artificial sand and theiruses.

Module-4: Overview of Building Components

Number of class hours: 7-9 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Classify buildings as per NBC
2) Explain different building components
3) Describe Superstructure

Detailed content of the unit:

- ClassificationofBuildingsasperNationalBuildingCodeGroupAtoI,Asper TypesofConstructions- Load Bearing Structure, Framed Structure, CompositeStructure.
- Building Components - Functions of Building Components, Substructure – Foundation, Plinth.
- Superstructure– Walls,Partitionwall,Cavitywall,Sill,Lintel,DoorsandWindows,floor, Mezzanine floor, Roof, Columns, Beams, Parapet

Module- 5: Construction of Substructure and superstructure

Number of class hours: 7-9 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Identify proper job layout
2) Describe earthwork, different foundation types.
3) Explain use of Stone and brick masonry.
4) Illustrate Scaffolding and Shoring

Detailed content of the unit: -

- 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, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).

- **Stone Masonry:** Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry, Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone MasonryConstruction.
- **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 brickmasonry.Junctionsinbrickmasonryandtheirpurposeandprocedure.Precautionsto be observed in Brick Masonry Construction. Comparison between stone and Brick Mason- ry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and compositemasonry.

- **Scaffolding and Shoring:** Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal of formwork.

References: -

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, NewDelhi.
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4. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
5. Duggal, S. K, Building Materials, New International, NewDelhi.
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7. Rangawala, S. C., Building Construction, Charotar Publication,Anand.
8. Punmia B. C., and Jain A. K., Building Construction ,FirewallMedia.

SURVEYING

Course Code	CEPC-302
Course Title	Surveying
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme corecourse-2

Course Outcomes: -

After completing this course, student will be able to:

1) Select the type of survey required for given situation. (K1)
2) Compute area of open field using chain, tape and cross staff and Conduct traversing in the field using chain and compass. (K3)
3) Use levelling instruments to determine reduced level for preparation of contour maps and Use digital planimeter to calculate the areas. (K3)
4) Prepare plans using Plane Table Surveys, Compute horizontal angle and vertical angle using Theodolite and illustrate the use of Total Station. (K3)
5) Solve problems related to simple curve and Compute constants of tacheometer, horizontal and vertical distances. (K3)
6) Find distances and elevations using Tachometer and Locate coordinates of stations and discuss the use and functions of GPS and GIS. (K2)

Course Content:

Module – 1: Overview, Classification of Survey and Chain Surveying

Number of class hours: 6-8 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

1. Know the purpose and use of different types of survey. (K1)
2. Classify the types of survey. (K2)
3. Explain the Principles of Surveying. (K2)
4. Know the various terms related to chain surveying. (K1)
5. Conduct ranging. (K3)
6. Explain the Principles of Chain Surveying. (K2)

Detailed content of the unit: -

• 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.
• 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.

Module-2: Compass Traverse Survey and Plane Table Surveying

Number of class hours: 8-10 hours

Suggestive Learning Outcomes:
At the end of module -2, students will be able to:-

1. Know the various technical terms related to compass surveying. (K1)
2. Conduct traversing using Prismatic compass and Solve problems related to local attraction (K3)
3. Explain principles of plane table surveying and various methods of plane table surveying (K2)
4. Prepare plans using various methods of plane table surveying. (K3)

Detailed content of the unit: -

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

Module-3: Levelling and Contouring

Number of class hours: 7-9 hours

Suggestive Learning Outcomes:

At the end of module -3, students will be able to:-

1. Know the various terminologies related to levelling and contouring. (K1)
2. Solve problems of reduced level by different methods. (K3)
3. Prepare contour maps. (K3)

Detailed content of the unit: -

• Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.

• Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level.

• Types of Leveling Staff: Self-reading staff and Target staff.

• Reduction of level by Line of collimation and Rise and Fall Method.

• Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Leveling.

• Contour, contour intervals, horizontal equivalent.

• Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.

Module-4: Theodolite Surveying, Tacheometric surveying and Curve setting

Number of class hours: 10 hours

Suggestive Learning Outcomes:

At the end of module -4, students will be able to:-

1. Know components and the functions of transit theodolite. (K1)
2. Compute horizontal angle and vertical angle using Theodolite. (K3)
3. Perform theodolite traversing. (K3)
4. Know components and terminology related to Tacheometric surveying and curve setting. (K1)
5. Compute constants of tacheometer, horizontal and vertical distances. (K3)
6. Solve problems related to simple curve by offsets from long chord and Rankine's method. (K3)

Detailed content of the unit: -

• 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.
• Checks for open and closed traverse, Calculations of bearing from angles.
• Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.
• 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 and railway alignments. Designation of curves.
• Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.

Module-5: Measurement of Area and Volume, Advanced surveying equipments and Remote sensing, GPS and GIS

Number of class hours: 8-10 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Know the various components of digital planimeter and define drone surveying. (K1)
2. Use digital planimeter to calculate the areas and volume of reservoir (K3)
3. Know the principle, components and functions related to EDM. (K1)
4. Illustrate the use and functions of Total Station and Compute distances and coordinates using Total Station (K3)
5. Discuss the applications of remote sensing. (K2)
6. Discuss the use and functions of GPS and GIS. (K2)

Detailed content of the unit: -
• Components and use of Digital planimeter.
• Measurement of area using digital planimeter.
• Measurement of volume of reservoir from contour map.
• 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.
• Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.
• Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil Engineering, land use / Land cover, mapping, disaster management.
• Use of Global Positioning System (G.P.S.) instruments.

• Geographic Information System (GIS): Over view, Components, Applications, Software for GIS.
• Introduction to Drone Surveying.

References: -

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II,
Laxmi Publications Pvt. Ltd., New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
4. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
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9. Arora K R , Surveying Vol. I, Standard Book House
10. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
11. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
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CONCRETE TECHNOLOGY

Course Code	:	CEPC-303
Course Title	:	Concrete Technology
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After completing this course, student will be able to:

CO 1. Use different types of cement and aggregates inconcrete(K3)

CO 2. Prepare concrete of desired compressivestrength.(K3)

CO 3. Prepare concrete of requiredspecification.(K3)

CO 4. Categorize the quality of concrete under differentconditions.(K4)

CO 5. Apply relevant admixtures forconcreting.(K3)

Detailed Course Content

Module – I Cement, Aggregates and Water

Number of Class hours: 08-10

Learning Outcomes:

1. Identify the Physical properties of OPC and PPC. Different grades of OPC and relevant

BIS codes.(K1)

2. Discuss the Testing of cement: Laboratory tests-fineness, standard consistency, setting time,soundness,(K2)
   compressive strength. Storage of cement and effect of storage on properties of cement.
3. Discuss the BISSpecificationsandfieldapplicationsofdifferenttypesofcements(K2)
4. Identify the Aggregates: Requirements of good aggregate, Classification according to size andshape.(K1)
5. Discover the FineaggregatesasperIS383. Concept of crushedSand.(K3)
6. Identify the Coarse aggregates and abrasion value of coarse aggregates with specifications.(K1)
7. Discuss the Water:Qualityofwater,impuritiesinmixingwaterandpermissiblelimitsforsolidsasper IS: 456.(K2)

Detailed content of the unit:

1.1 Physical properties of OPC and PPC: fineness, standard consistency, setting time,soundness, compressive strength. Different grades of OPC and relevant BIS codes

1.2 Testing of cement: Laboratory tests-fineness, standard consistency, setting time,soundness, compressive strength. Storage of cement and effect of storage on properties of cement.

1.3 BISSpecificationsandfieldapplicationsofdifferenttypesofcements:Rapidhardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement.

1.4 Aggregates: Requirements of good aggregate, Classification according to size andshape.

1.5 Fineaggregates:Properties,size,specificgravity,bulkdensity,waterabsorptionandbul king,
finenessmodulusandgradingzoneofsand,siltcontentandtheirspecificationasperIS38 3. Concept of crushedSand.

1.6 Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications.

1.7 Water:Qualityofwater,impuritiesinmixingwaterandpermissiblelimitsforsolidsasper IS: 456.

Module– II Concrete

Number of Class hours: 08-10

Learning Outcomes:

1. Discuss the Concrete: Different grades of concrete, provisions of IS456(K2)
2. Discover all about the Duff Abraham water cement (w/c) ratio law(K3)
3. Identify the Propertiesoffreshconcrete:Workability:Factorsaffectingworkabilityofconcrete(k1)
4. Identify the Properties of Hardened concrete: Strength, Durability,Impermeability.(K1)

Detailed content of the unit:

2.1 Concrete: Different grades of concrete, provisions of IS456.
2.2 Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different expo- sure conditions as per IS456.
2.3 Propertiesoffreshconcrete:Workability:Factorsaffectingworkabilityofconcrete.Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer.
2.4 Valueofworkabilityrequirementfordifferenttypesofconcreteworks.
2.5 Segregation,bleeding and preventivemeasures.
2.6 Properties of Hardened concrete: Strength, Durability,Impermeability.

Module– III Concrete Mix Design and Testing of Concrete

Number of Class hours: 08-10

Learning Outcomes:

1. Discuss the Concrete mix design(K2)
2. Identify the methods of Testing of concrete, determination of compressive strength(K1)
3. Discover the Non- destructive testing of concrete, Importance of NDTtests(K3)

Detailed content of the unit:

3.1 Concrete mix design: Objectives, methods of mix design, study of mix design as per IS10262
(only procedural steps).

3.2 Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of testresults.
3.3 Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammerandfactoraffectingthereboundindex,
3.4 UltrasonicpulsevelocitytestasperIS13311 (part 1 and 2)

3.5 Importance of NDTtests.

Module– IV Quality Control of Concrete

Number of Class hours: 06-08

Learning Outcomes:

1. Discuss the ConcretingOperations(K2)
2. Discover the Formsforconcreting(K3)
3. Identify the Waterproofing:Importanceandneed(K1)
4. Analyze the Jointsinconcreteconstruction(K4)

Detailed content of the unit:

4.1 ConcretingOperations:Batching,Mixing,Transportation,Placing,Compaction,Curingan d Finishing of concrete.

4.2 Formsforconcreting:Differenttypesofformworksforbeams,slabs,columns,materia lsused forformwork,requirementofgoodformwork.

4.3 Strippingtimeforremovalofformworksper IS456.

4.4 Waterproofing:Importanceandneedofwaterproofing,methodsofwaterproofingand mate- rials used forwaterproofing.

4.5 Jointsinconcreteconstruction:Typesofjoints,methodsforjoiningoldandnewconcrete, materials used for filling joints.

Module– V Chemical Admixture, Special Concrete and Extreme Weather concreting

Number of Class hours: 06-08

Learning Outcomes:

1. Identify all about the Admixturesinconcrete(K1)
2. Discover all about Special Concrete and its properties(K3)

3. Discuss all about the Cold weather concreting and its effects(K2)
4. Discuss all about Hot weather concreting and its effects(K2)

Detailed content of the unit:

5.1 Admixturesinconcrete:Purpose,propertiesandapplicationfordifferenttypesofadmixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and superplasticizers.

5.2 Special Concrete: Properties, advantages and limitation of following types of Special concrete:ReadymixConcrete,FiberReinforcedConcrete,HighperformanceConcreteSelf-compacting concrete and light weightconcrete.

5.3 Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weathercondition.

5.4 Hot weather concreting: effect of hot weather on concrete, precautions to be taken while oncreting in hot weathercondition.

Suggested learning resources:

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

MECHANICS OF MATERIALS AND THEORY OF STRUCTURES

Course Code	:	CEPC-304
Course Title	:	Mechanics of Materials and Theory of Structures
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After competing this course, student will be able to:

CO 1. Apply the knowledge structural behavior of materials under various loadingconditions(K3).

CO 2. Drawshearforceandbendingmomentdiagramsforvarioustypesofbeamsandloading conditions(K3).

CO 3. Determine the bending and shear stresses in beams under different loadingconditions(K5).

CO 4. Identify various loading and endconditions for column (K3).

CO 5. Analyze statically determinate and indeterminate structures (K5)

Detailed Course Content

Module – 1: Simple Stresses and Strains

Number of Class hours: 08-10

Learning Outcomes:

1. Define the conceptsofrigid, elastic and plastic bodies, stress, strain, elasticity, Hook's

law, Elastic limit, Modulus of elasticity. (K1)
2. Classify Normal, Direct, Bending and Shear and nature of stresses. (K2)
3. Compute Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (K3)

Detailed content of the unit:

1.1 Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity.

1.2 Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses.

1.3 Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety.

1.4 Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading.

1.5 Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only).

1.6 Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

Module – 2: Shear Force and Bending Moment

Number of Class hours: 08-10

Learning Outcomes:

1. Identify different types of supports, beams and loads. (K1)
2. Explain Relation between load, shear force and bending moment. (K2)
3. Draw Shear force and bending moment diagram for cantilever and simply supported beams. (K3)

Detailed content of the unit:

2.1 Types of supports, beams and loads.

2.2 Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation).

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

Module – 3: Bending and Shear Stresses in beams and Theory of Columns

Number of Class hours: 10-12

Learning Outcomes:

1. Discuss concept and theory of pure bending, assumptions, flexural equation, bending stresses and their nature, bending stress distribution diagram (K2)
2. Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram. (K2)
3. Predict buckling load by Eu-ler's equation and crippling load by Rankine' s formula. (K3)

Detailed content of the unit:

3.1 Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram.

3.2 Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.

3.3 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.

3.4 Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load.

3.5 Rankine' s formula and its application to calculate crippling load.

Module – 4: Analysis of Statically Determinate Pin Jointed Structures

Number of Class hours: 06-08

Learning Outcomes:

1. Describe the assumptions made in finding the forces in the members of a Truss. (K1)
2. Calculate forces in the members of a Truss by method of joints and method of section. (K5)

Detailed content of the unit:

4.1 Assumptions made in finding the forces in the members of a Truss.

4.2 Different methods of finding the forces in the members of a Truss – cantilever and simply supported, subjected to loading by: (a) method of joints, (b) method of sections.

Module– 5: Analysis of Statically Indeterminate Structures

Number of Class hours: 08-10

Learning Outcomes:

1. Analyze Fixed beams under different loading conditions. (K5)
2. Analyze Propped Cantilever under different loading conditions.(K5)
3. Analyze Continuous beams under different loading conditions by Theorem of Three Moments and Slope deflectionmethod. (K5)

Detailed content of the unit:

5.1 FIXED BEAMS: Shear Force and Bending Moment diagrams for – (a) uniformly distributed load over whole span, and, (b) point load at any intermediate point within the span.

5.2 PROPPED CANTILEVER**:** Shear Force and Bending Moment diagrams for – (a) uniformly distributed load (partly and fully throughout the span), and, (b) point load at any intermediate position in the span.

5.3 TWO SPAN CONTINUOUS BEAMS**:** Shear Force and Bending Moment diagrams for two equal spans carrying – (a) uniformly distributed load over whole span, and, (b) equal point load at center of each span; using Clapeyron's Theorem of Three Moments and Slope deflectionmethod.

Suggested learning resources:

1. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. NewDelhi..
2. Rattan S.S., Strength of Materials, McGraw Hill Education; NewDelhi.
3. Bansal R K, Strength of Materials, LaxmiPublications.
4. Subramaniam R, Strength of Materials, Oxford UniversityPress.
5. Structural Analysis(Vol.1), S S Bhavikatti Vikas Publishing House
6. Structural Analysis, R.C Hibbeler , Pearson
7. https://nptel.ac.in/courses/105/105/105105166/
8. https://nptel.ac.in/courses/105/105/105105108/

GEOTECHNICAL ENGINEERING

Course Code	CEPC-305
Course Title	Geotechnical Engineering
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -

After completing this course, student will be able to:

1) Identify types of rocks and sub soil strata of earth. (K1)
2) Interpret the physical properties of soil related to given construction activities. (K3)
3) Use the results of permeability and shear strength test for foundation analysis. (K3)
4) Interpret soil bearing capacity results. (K3)
5) Compute optimum values for moisture content for maximum dry density of soil through various tests. (K3)

Course Content:

Module – 1: Overview of Geology and Geotechnical Engineering

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

1. Identify types of rocks and sub soil strata of earth. (K1)
2. Know the Importance of soil as construction material. (K1)
3. Know about the field application of geotechnical engineering. (K1)

Detailed content of the unit: -

• 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, and design of earth retaining structures, design of earthen dam.

Module– 2: Physical and Index Properties of Soil
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -2, students will be able to:-

1. Know Soil in a three phase system. (K1)
2. Define various important terminology related to soil. (K1)
3. Interpret the physical properties of soil. (K3)

Detailed content of the unit: -
• Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.
• 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.

Module-3: Permeability and Shear Strength of Soil
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -3, students will be able to:-

1. Define permeability, seepage and shear strength. (K1)
2. Solve simple problems related to permeability. (K3)
3. Illustrate about shear strength of soil and its components. (K3)

Detailed content of the unit: -
• 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.

Module-4: Bearing Capacity of Soil

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -4, students will be able to:-

1. Define bearing capacity of soil and earth pressure. (K1)
2. Explain the effect of water table on bearing capacity. (K2)
3. Illustrate and solve simple problems related to bearing capacity and earth pressure. (K3)

Detailed content of the unit: -

• 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, Rankine's theory and assumptions made for non-cohesive Soils.

Module-5: Compaction and stabilization of soil

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Know the concept of compaction and various factors affecting compaction. (K1)
2. Discuss about the concept and various methods of soil stabilization. (K2)
3. Compute optimum values for moisture content for maximum dry density of soil through various tests. (K3)

Detailed content of the unit: -

• 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 tyred 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.

References: -

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

CONSTRUCTION MATERIALS & MECHANICS OF MATERIALS LAB.

Course Code	:	CEPC-306
Course Title	:	Construction Materials & Mechanics of Materials Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After completing this course, student will be able to:

- Test different Civil engineering materials on Universal TestingMachine.
- Analyse structural behaviour of materials under various loadingconditions.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loadingconditions.
- Determine bending and shear stresses in beams under different loadingconditions.
- Calculate flexural strength of different types of floortiles.

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 perIS:432(1).
- Perform tension test on Tor steel as per IS:1608,IS:1139.
- Conduct compression test on sample test piece using Compression TestingMachine.
- Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as perIS:1598.
- ConductCharpyImpacttestonthreemetals.e.g.mildsteel/brass/aluminium /copper/cast iron etc as perIS:1757.
- Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tileIS:1237.
- Determine Compressive strength of dry and wet bricks as per IS:3495(part I),IS:1077.
- ConductAbrasionTestonflooringtiles(anyone)e.g.Mosaictiles,CeramicTilesas perIS:
  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 perIS:5242.
- Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
- Plot Shear force and Bending Moment diagrams for cantilever, simply supportedbeams.
- Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including momentloading.
- Conduct Flexural test on timber beam on rectangular section in both orientationas per
  IS:1708, IS:2408.
- Conduct Flexure test on floor tiles IS:1237,IS:13630 or roofing tiles as perIS:654,IS:2690.

Suggested learning resources:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition2018)
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. NewDelhi.

4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, NewDelhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. NewDelhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; NewDelhi.
7. Bansal R K, Strength of Materials, LaxmiPublications.
8. Subramaniam R, Strength of Materials, Oxford UniversityPress.

SURVEYING LABORATORY

Course Code	CEPC-307
Course Title	Surveying Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	Programme corecourse-7

Course Outcomes: -

After completing this course, student will be able to:

1) Select the type of survey required for given situation. (K1)
2) Compute area of open field using chain, tape and cross staff and Conduct traversing in the field using chain and compass. (K3)
3) Use levelling instruments to determine reduced level for preparation of contour maps and use digital planimeter to calculate the areas. (K3)
4) Prepare plans using Plane Table Surveys, Compute horizontal angle and vertical angle using Theodolite and illustrate the use of Total Station. (K3)
5) Solve problems related to simple curve and Compute constants of tacheometer, horizontal and vertical distances. (K3)
6) Find distances and elevations using Tachometer and Locate coordinates of stations and discuss the use and functions of GPS and GIS. (K2)

List of Practicals to be performed

1	Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
2	Undertake reciprocal ranging and measure the distance between two stations.
3	Determine area of open field using chain and cross staff survey.
4	Measure Fore Bearing and Back Bearing of survey lines of open traverse and closed traverse of 5 or 6 sides using Prismatic Compass and correct the bearings and included angles for the local attraction.

5	Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a buildingand Plot the traverse on A1 size imperial drawing sheet for data collected.
6	Undertake simple leveling using dumpy level/ Auto level and leveling staff.
7	Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff.
8	Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff
9	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
10	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
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
12	Measure area of irregular figure using Digital planimeter.
13	Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method, Intersection Method and Traversing Method.
14	Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
15	Use transit theodolite to measure Horizontal and Vertical angle by Direct Method and Plot the traverse on A1 size imperial drawing sheet for the collected data.
16	Use Thedolite as a Tacheometer to compute reduced levels and horizontal distances.
17	Set out a circular curve by Rankine's Method of Deflection Angles.
18	Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
19	Use EDM to measure horizontal distance.
20	Use Total station instrument to measure horizontal distances and vertical angle.
21	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides and Plot the traverse on A1 size imperial drawing sheet for the collected data.
22	Use GPS to locate the coordinates of a station.

References: -

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II,
Laxmi Publications Pvt. Ltd., New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
4. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
9. Arora K R , Surveying Vol. I, Standard Book House
10. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.

11. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
12. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

CONCRETE TECHNOLOGY LAB

Course Code	:	CEPC-308
Course Title	:	Concrete Technology Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After completing this course, student will be able to:

- Identify different types of cement by performing laboratorytests.(K1)
- Discover the physical properties of fine and coarseaggregates.(K3)
- Prepare concrete of requiredspecification.(K3)
- Discover the quality of concrete applying scientificprinciples.(K3)
- Use relevant admixtures for improving the workability ofconcrete.(K3)

List of Practical to be performed:

1	Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.
2	Determine specific gravity, standard consistency, initial and final setting times of cement.
3	Determine compressive strength of cement.
4	Determine silt content in sand.

5	Determine bulking of sand.
6	Determine bulk density of fine and coarse aggregates.
7	Determine water absorption of fine and coarse aggregates.
8	Determine Fineness modulus of fine aggregate by sieve analysis.
9	Determine impact value of aggregate
10	Determine crushing value of aggregate.
11	Determine abrasion value of aggregate.
12	Determine elongation and flakiness index of coarse aggregates
13	Determine workability of concrete by slump cone test.
14	Determine workability of concrete by compaction factor test.
15	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
16	Demonstration of NDT equipments.

Suggested learning resources:

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

GEOTECHNICAL ENGINEERING LABORATORY

Course Code	CEPC-309
Course Title	Geotechnical Engineering Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	Programme corecourse-9

Course Outcomes: -

After completing this course, student will be able to:

1) Identify types of rocks and sub soil strata of earth. (K1)
2) Interpret the physical properties of soil related to given construction activities. (K3)
3) Use the results of permeability and shear strength test for foundation analysis. (K3)
4) Interpret soil bearing capacity results. (K3)
5) Compute optimum values for moisture content for maximum dry density of soil through various tests. (K3)

List of Practicals to be performed

1	Identification of rocks from the given specimen
2	Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
3	Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).
4	Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part-XXIX).
5	Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part-XXVIII).
6	Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).

7	Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
8	Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
9	Use different types of soil to identify and classify soil by conducting field tests-Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
10	Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
11	Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
12	Determine shear strength of soil by direct shear test as per IS 2720 (Part-XIII).
13	Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).
14	Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part- VII).
15	Determination of CBR value on the field as per IS2720 (Part - XVI).

References: -

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

Summer Internship-I

Course Code	CESI-310
Course Title	Summer Internship-I
Number of Credits	2 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

	2nd Semester				

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.
7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Working for consultancy/ research project	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Festival (Technical / Business / Others) Events	Certificate	Programme Head	Satisfactory/ Good/ Excellent

				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent
				Learning at Departmental Lab/Tinkering Lab/ Institutional workshop	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-10	CEPC-401	Hydraulics	3	0	0	3	3
2	Programme core course-11	CEPC-402	Water Resource Engineering	2	0	0	2	2
3	Programme core course-12	CEPC-403	Transportation Engineering	3	0	0	3	3
4	Programme core course-13	CEPC-404	Hydraulics and Water Resource Engg. Lab.	0	0	2	2	1
5	Programme core course-14	CEPC-405	Transportation Engineering Lab.	0	0	2	2	1
6	Programme core course-15	CEPC-406	Building Planning and Drawing Lab.	0	0	4	4	2
7	Programme Elective course-1 (Any one to be selected)	CEPE-407/A	Construction Management	3	0	0	3	3
		CEPE-407/B	Rural Construction Technology	3	0	0	3	
		CEPE-407/C	Building Services and Maintenance	3	0	0	3	
8	Humanities & Social Science-4	HS 408	Professional Skill Development	2	1	0	3	3
9	Minor Project	CEPR-409	Minor Project	0	0	4	4	2
10	Mandatory Course-1	AU-410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total				**28**	**20**

HYDRAULICS

Course Code	CEPC-401
Course Title	Hydraulics
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	Programme core course-10

Course Objectives: -

1) To understand parameters associated with fluid flow and hydrostatic pressure. (K1)
2) To learn the kinematic and dynamics of fluid flow. (K1)
3) To know head loss and water hammer in fluid flowing through pipes. (K1)
4) To recognize different types of pumps and their uses. (K2)
5) To illustrate different parameters of an open channel flow. (K3)

Course Content:-

Module- 1: Pressure measurement and Hydrostatic pressure

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Define the physical properties of fluid.
2) Illustrate various types of pressure and procedure of pressure measurement.
3) Explain hydrostatic law and Solve numerical problems on centre of pressure.

Detail Course Content:

- 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, 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. Total pressure and center of pressure on immersed surfaces.

Module- 2: Fluid Flow Parameters

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Classify different types of fluid flow.
2) Describe potential, kinetic and pressure energy.
3) State and explain Bernoulli's theorem.

Detail Course Content:

- 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.

Module- 3: Flow through pipes

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Estimate major head loss and minor head loss through pipe.
2) Know about water hammer in fluid flowing through pipes
3) Compute discharge using venturimeter and orifice-meter

Detail Course Content:

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

working.
- Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

Module- 4: Flow through Open Channel

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Define the geometrical properties of a channel section.
2) Determine the discharge through an open channel
3) Learn about different velocity and discharge measuring devices.

Detail Course Content:

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

Module- 5: Hydraulic Pumps

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Classify and describe different types of pumps.
2) Estimate the power of centrifugal pump.
3) Select relevant hydraulic pumps.

Detail Course Content:

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

References: -

1) Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2) S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3) Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.

4) Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers.
5) Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

WATER RESOURCE ENGINEERING

Course Code	CEPC-402
Course Title	Water Resource Engineering
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

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

C.O.1.**:** To learn estimation of hydrological parameters. (K1)
C.O.2.**:** To explain water demand of crops and provisions to meet the same. (K2)
C.O.3.**:** To know planning of reservoirs and dams. (K1)
C.O.4.**:** To review minor and macro irrigation processes. (K2)
C.O.5.**:** To illustrate irrigation projects, canals and other diversion head works. (K3)

Detailed Course Content

Module 1 Introduction to Hydrology

Number of class hours: 08

Suggestive Learning Outcomes:

1. Define hydrological parameters.
2. Describe the methods of measuring rainfall.
3. Measure flood discharge.

Detailed content of the unit:

- Hydrology: Definition and Hydrological cycle

- Rain Gauge: Symons rain gauge, automatic rain gauge,
- Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method.
- Runoff, Factors affecting Run off, Computation of run–off.
- Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems.
- Yield and Dependable yield of a catchment, determination of dependable yield.

Module 2 Crop water requirement and Reservoir Planning

Number of class hours: 10

Suggestive Learning Outcomes:

1. Estimate crop water requirements.
2. Classify the methods of irrigation.
3. Solve numerical problems on fixing control level.

Detailed content of the unit:

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

Module 3 Dams and Spillways

Number of class hours: 08

Suggestive Learning Outcomes:

1. Classify dams and spillways.
2. Explain the methods of construction of earthen dam.
3. Recognize spillways and its components.

Detailed content of the unit:

- Dams and its classification: Earthen dams and Gravity dams (masonry and concrete).

- Earthen Dams – Components with function, typical cross section, seepage through embankment and foundation and its control.
- Methods of construction of earthen dam, types of failure of earthen dam and preventive measures.
- Gravity Dams – Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam.
- Spillways-Definition, function, location, types and components, Energy dissipaters.

Module 4 Minor and Micro Irrigation

Number of class hours: 06

Suggestive Learning Outcomes:

1. Describe the methods of irrigation scheme.
2. Execute minor and macro irrigation schemes.
3. Learn about well irrigation.

Detailed content of the unit:

- Bandhara irrigation: Layout, components, construction and working, solid and open bandhara.
- Percolation Tanks – Need, selection of site.
- Lift irrigation Scheme-Components and their functions, Lay out.
- Drip and Sprinkler Irrigation- Need, components and Layout.
- Well irrigation: types and yield of wells, advantages and disadvantages of well irrigation.

Module 5 Diversion Head Works & Canals

Number of class hours: 08

Suggestive Learning Outcomes:

1. Explain diversion head works.
2. Select the relevant cross drainage works for the specific site conditions.
3. Design, construct and maintain simple irrigation regulatory structures.

Detailed content of the unit:

- Weirs – components, parts, types, K.T. weir – components and construction
- Diversion head works – Layout, components and their function.
- Barrages – components and their functions. Difference between weir and Barrage.

- Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section.
- Canal lining - Purpose, material used and its properties, advantages.
- Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing.
- Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets

Suggested Learning Resources:

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

TRANSPORTATION ENGINEERING

Course Code	CEPC-403
Course Title	Transportation Engineering
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	PC

Course Objectives: -

1) To understand the importance of proper highway transportation for development of a nation. (K1)
2) To identify various elements of road geometry and solve engineering problems. (K3)
3) To explore the pavement construction by various materials. (K2)
4) To realize the basic concept of railway engineering and track geometrics. (K1)
5) To classify different types of stations, yard, points and crossings. (K2)

Course Content:-

Module- 1: Overview of Highway Engineering

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Describe the history of Indian roads and road development.
2) Distinguish between different modes of transportation.
3) Understand the importance of road survey.

Detail Course Content:

- History of roads and road development in India
- Mode of transportation – land way, waterway, airway. Merits and demerits of roadway and Role of transportation in the development of nation,
- General classification of roads.
- Highway Surveys: Different types, objects and instruments used.
- Selection and factors affecting road alignment.

Module- 2: Geometric Design of Highway

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Outline different parameters of road geometry.
2) Solve simple numerical problems related to super-elevation and sight distance.
3) Classify different types of vertical and horizontal curves in highway.

Detail Course Content:

- 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.
- Extra widening of roads: numerical examples.
- 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.

Module- 3: Construction of Road Pavements

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Describe different tests of road construction materials.
2) Explain the constructional procedure of WBM, WMM and Bituminous Roads.
3) Distinguish between flexible pavement and rigid pavement.

Detail Course Content:

- Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM & WMM road.
- Construction of Flexible pavement/ Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR.
- Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.

Module- 4: Basics of Railway Engineering

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Define basic terms of railway engineering.
2) Describe different components of permanent way.
3) Write the functions of different rail fixtures and fastenings.

Detail Course Content:

- 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.
- Sleepers - functions and Requirement, types - concrete sleepers and their density
- Ballast - function and types, suitability.
- Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.

Module- 5: Track geometrics, Railway crossings, Station and Yard.

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Explain different elements of track geometry.
2) Name different component parts of railway crossings.

3) Classify Railway stations and Yards.

Detail Course Content:

- 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.

References: -

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

HYDRAULICS AND WATER RESOURCE ENGINEERING LAB

Course Code	CEPC-404
Course Title	Hydraulics and Water Resource Engg. Lab.
Number of Credits	1 (L:0, T:0, P:2)

Prerequisites	NIL
Course Category	Programme core course-13

Course Objectives: -

1) To apply the knowledge of kinematic and dynamics of fluid flow. (K3)
2) To determine different parameters of pipe flow and open channel flow. (K4)
3) To learn estimation of hydrological parameters. (K1)
4) To estimate different parameters of an irrigational project. (K2)
5) To draw leveled sketch of different hydraulic structures. (K3)

Course Content:-

Number of class hours: 25

List of Practicals 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) Use Reynold's apparatus to determine type of flow.
4) 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.
5) Use Pitot tube to measure the velocity of flow of water in open channel.
6) Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
7) Calibrate the Orifice to find out the discharge through a tank.
8) Use rectangular and triangular notch to measure the discharge through open channel.
9) Determine the efficiency of centrifugal pump.
10) Calculate average rainfall for the given area using arithmetic mean method, Isohyetal method and Theissen polygon method.
11) Estimate crop water requirement for the given data.
12) Calculate reservoir capacity from the given data.
13) Draw a labeled sketch of the given masonry/earthen dam section
14) Draw the theoretical and practical profile of the given gravity dam section.
15) Draw a labeled sketch of the given diversion head works and Cross Drainage works.
16) Design a canal section for the given conditions with estimation of the quantity of material required for lining.

References: -

1) Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2) S. S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3) Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4) Khurmi,R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Del- hi.
5) Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6) Punmia, B.C., Pande, B, Lal, Irrigation and water power engineering, Laxmi Publications
7) Subramanayan, Engineering Hydrology, McGraw Hill.
8) Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
9) Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
10) Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
11) Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
12) Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

TRANSPORTATION ENGINEERING LAB

Course Code	CEPC-405
Course Title	Transportation Engineering Lab.
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	NIL
Course Category	Programme core course-14

Course Objectives: -

1) To identify the types of roads as per IRC recommendations.
2) To perform different tests on aggregates.
3) To perform different tests on bitumen.
4) To identify the components of railway tracks.
5) To prepare photographic report containing details of highway and railway track.

Course Content:-

Number of class hours: 25

List of Practicals to be performed:

1) Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR
2) Specific Gravity test of aggregates

3) Aggregate impact test
4) Aggregate crushing test
5) Los Angeles Abrasion test
6) Flakiness and Elongation Index of aggregates
7) Angularity Number of aggregates
8) Specific Gravity test of bitumen
9) Penetration test of bitumen
10) Softening point test of bitumen
11) Ductility test of Bitumen
12) Flash and Fire Point test of bitumen
13) Visit the road of any one type (flexible or rigid) to know the drainage condition and prepare a photographic report containing details of the road.
14) Visit to railway track for visual inspection of fixtures, fasteners and yards and prepare a photographic report containing details of the track.

References: -

1) L. R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018
2) Khanna S. K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth- ers, Roorkee.
3) Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4) Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5) Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.
6) Sharma, S. K., Principles, Practice and Design of Highway Engineering,, S. Chand
7) Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna- tional (P) Limited, Publishers, New Delhi.
8) Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

Building Planning and Drawing Lab.

Course Code	CEPC-406
Course Title	Building Planning and Drawing Lab.
Number of Credits	2 (L : 0, T : 0, P : 4)
Prerequisites	Nil
Course Category	PC

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

C.O.1: Interpret the symbols, signs and conventions from the givendrawing. (K1)

C.O.2: Arrange line plans of residential single storey buildings using Load Bearing wall. (K2)

C.O.3: PrepareworkingdrawingforthegivenrequirementofFramedStructure Building. (K3)

C.O.4: PrepareworkingdrawingforthegivenrequirementofPublic Buildings. (K3)

C.O.5: Illustrate two-point perspective drawing for given smallobjects. (K3)

Detail Course Content

Unit – I

No. of Lectures required: 10

Unit Learning Outcomes:

1. Identify the various symbol of building materials of given drawing.
2. Recognize the abbreviations as per IS 962 for water supply and electrical installations.
3. Summarize the technical details of one/two BHK drawing.

Contents:

Use Sketch Book

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.
Writesummaryofobservationsofalltechnicaldetailsfromthegivendrawing(One/TwoBHK) obtained from the professional Architect or Civil Engineer (Group activity in fourstudents).

Unit – II

No. of Lectures required: 10

Unit Learning Outcomes:

1. Outline and measure the existing building to suitable scale.
2. Relate the plan, foundation plan, elevation and section of a single storey load bearing residential building.
3. State the construction notes, area statement and site plan of a single storey load bearing residential building.

Contents:

Use Sketch Book

Measure the units of existing building (Load Bearing / Framed structure).
Draw line plan of measured existing building to the suitable scale.

Use Full Imperial Size Sheet (A1)

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.

Unit – III

No. of Lectures required: 10
Unit Learning Outcomes:

1. Show the plan of Residential Bunglows and Apartment to suitable scale.
2. Prepare the plan, foundation plan, elevation and section passing through staircase, WC and bathroom of framed structure residential building.
3. Interpret the construction notes, area statement and site plan of framed structure residential building.

Contents:

Use Sketch Book

Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom)

a) Residential Bunglows (Minimum three plans)
b) Apartment (Minimum two plans)

Use Full Imperial Size Sheet (A1)

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.

Draw working drawing for above mentioned drawing at serial number (B-2) showing:

a) Foundation plan to the scale 1:50
b) Detailed enlarged section of RCC column and footing with plinth filling.
c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.
d) Detailed enlarged section of RCC staircase and slab.

Unit – IV

No. of Lectures required: 10
Unit Learning Outcomes:

1. Illustrate the plans of various public buildings like school building, primary health building, post office, bank, hostel, restaurant, library, community hall etc.

2. Prepare the plan, foundation plan, elevation and section of various public buildings.
3. Write the construction notes, area statement and site plan of various public buildings.

Contents:

Use Sketch Book

Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).

Use Full Imperial Size Sheet (A1)

Draw the above mentioned drawing forthegivenrequirementofFramedStructure.

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.

Unit – V

No. of Lectures required: 10

Unit Learning Outcomes:

1. Schedule the two point perspectives drawing of small objects.
2. Relate the plans for Framed Structure (One/Two BHK) buildings.
3. Prepare the plan, elevation, eye level, picture plane and vanishing points of framed structure building.

Contents:

Use Sketch Book

Draw the following plans for a Framed Structure (One/Two BHK) from given line plan.

a. Developed plan, Elevation
b. Section for above developed plan.
c. Site plan for above drawings including area statement, schedule of opening and construction notes.

Use Full Imperial Size Sheet (A1)

Draw two point perspectives drawing of small objects - steps, monuments, pedestals (any one) scale 1:50

a) Draw plan, elevation, eye level, picture plane and vanishing points.
b) Draw perspective view.

Suggested Learning Resources:

1. Shah.M.G.Kale,CM,Patki,S.Y.,BuildingDrawing,McgrawHillPublishing
2. MalikandMayo,CivilEngineeringDrawing,ComputechPublicationLtd

3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, McgrawHill
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publica- tion,Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd.,Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, NewDelhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing companyLtd.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, NewDelhi.

Construction Management

Course Code	CEPE-407/A
Course Title	Construction Management
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1. Understand the contract management and associated labourlaws. **(K2)**
2. Prepare and understand the nuances of executing the sitelayout**.(K3)**
3. Prepare networks and bar charts for the given constructionproject**.(K3)**
4. Understand the intricacies of disputes, related arbitration and settlementlaws. **(K2)**
5. Apply safety measures at constructionprojects. **(K3)**

Course Content:-

Module- 1: Construction industry and management

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe the objectives principals and types of organisation
2) Settle disputes and the role of different personnel in construction organisation.
3) Prepare detailed project report.

Detailed content of the unit: -

- Organization-objectives,principlesoforganization,typesoforganization:government/publicandprivatec onstructionindustry,Roleofvariouspersonnelinconstructionorganization
- Agencies associated with construction work- owner, promoter, builder, designer,architects.
- Roleofconsultantforvariousactivities:PreparationofDetailedProjectReport(DPR),monito ring of progress and quality, settlement of disputes.

Module- 2: Site Layout

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain principles of governing site layout.
2) Prepare the site layout
3) Explain land acquisition procedures

Detailed content of the unit: -

- Principles governing sitelayout
- Factors affecting sitelayout
- Preparation of sitelayout
- Land acquisition procedures and providingcompensation.

Module-3:Planning and scheduling

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Develop bar charts regarding construction activities
2) Explain elements of network, CPM network
3) Describe Material Management, Storemanagement

Detailed content of the unit: -

- Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of barchart.
- Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering theevents.
- CPMnetworks,activitytimeestimate,EventTimesbyforward&backwardpasscal culation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and criticalpath,
- Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost andduration.
- Material Management- Ordering cost, inventory carrying cost, Economic

OrderQuantity

- Storemanagement,variousrecordsrelatedtostoremanagement,inventorycontrol byABC technique,Introductiontomaterialprocurementthroughportals(e.g.www.inampro.nic.in)

Module-4: Construction Contracts and Specifications

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Illustrate types of construction contracts
2) Explain contract documents, specifications, general special conditions
3) Describe the procedures involved in arbitration and settlement

Detailed content of the unit:

- Types of Constructioncontracts
- Contract documents, specifications, general specialconditions
- Contract Management, procedures involved in arbitration and settlement (Introduction only)

Module- 5: Safety in Construction

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain causes of accidents
2) Describe remedial and preventive measures of accidents
3) Apply the labour laws and acts pertaining to civil construction activities.

Detailed content of the unit: -

- Safety in Construction Industry—Causes of Accidents, Remedial and PreventiveMeasures.
- Labour Laws and Acts pertaining to Civil construction activities (Introductiononly)

References: -

1. SharmaSCandDeodharSV,ConstructionEngineeringandManagement,KhannaBookPublishing, NewDelhi
2. Gahlot,P.S. and Dhir, B.M Construction planningandmanagement New AgeInternational (P) Ltd. Publishers, New Delhi.
3. Shrivastava,U.K.,Constructionplanningandmanagement,GalgotiaPublicationPvtLtd.New Delhi

4. Mantri,S.,TheAToZofPracticalBuildingConstructionanditsManagement,SatyaPrakashan, New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai NewDelhi
6. Punmia,B.C.andKhandelwal,K.K.,ProjectPlanningandControllingwithPERTAndCPM, Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGrawHill.
8. Harpal, Singh, Construction Management and accounts, Mc-GrawHill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, NewDelhi

Rural Construction Technology

Course Code	CEPE-407/B
Course Title	Rural Construction Technology
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1) Plan low cost housing using ruralmaterials.**(K3)**
2) Make use of relevant government schemes for construction of roads andhousing. **(K3)**
3) Use guidelines for rural roadconstruction. **(K3)**
4) Implement different irrigation systems for ruralareas. **(K3)**
5) Identify the need of watershed management in ruralareas. **(K2)**

Course Content:-

Module- 1: Rural Development and Planning

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe various approaches to rural development planning
2) Explain the significance of rural development
3) Prepare rural development programmes,

Detailed content of the unit: -

- Scope; development plans; various approaches to rural developmentplanning.
- Significance of ruraldevelopment.
- Rural developmentprogramme/projects.

Module- 2: Rural Housing

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain low cost materials for housing construction
2) Apply different composite materials, roof treatment and biomass
2) Explain the objectives and different sources of renewal energy, and Bio gas.

Detailed content of the unit: -

- Low cost construction material forhousing
- Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricksand soil-stabilized un-burnt brick; Plinth protection of mudwalls.
- Water-proofandfire-retardantrooftreatmentforthatchroofs.Pre-caststonemasonry,rat- trap bond for walls; Panels for roof, ferro-cement flooring/roofingunits.
- Biomass - types of fuels such as firewood, agricultural residues, dungcakes.
- Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewableenergy.
- Working of gobar gas and bio gasplants.

Module-3:Water Supply and Sanitation for Rural Areas

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Utilize BIS & WHO water standards
2) Describe quality, Storage and distribution for rural water supplyworks.
3) Explain conservation of water in rural areas
4) Construct low cost latrines and garbage disposal systems

Detailed content of the unit: -

- Sources of water: BIS & WHO waterstandards.
- Quality, Storage and distribution for rural water supplyworks.
- Hand pumps-types, installation, operation, and maintenance of handpumps.
- Conservation of water - rainwater harvesting, drainage in ruralareas.
- Construction of low cost latrines: Two pits pour flush water seal, septic tanketc.

- LowcostcommunityandindividualGarbagedisposalsystems,Ferro-cementstoragetanks.

Module-4: Low Cost Rural Roads

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe categories of Pavement layers.
2) Illustrate guidelines for surfacing rural road as per IRC codes
3) Explain the highlights of Pradhan Mantri Gram Sadak Yojna (PMGSY)-scheme.

Detailed content of the unit:

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

Module- 5: Low Cost Irrigation

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1. Design tube well, drip & sprinkler irrigation system
2. Describe watershed and catchment area development
3. Explain different watershed management structures,

Detailed content of the unit: -

- Design consideration and construction of tube-well, drip & sprinkler irrigationsystems.
- Watershedandcatchmentareadevelopment– problemsandfeaturesofwatershedmanagement.
- Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm pond, Bandharasystem.

<u>References:</u> -

1) MadhovRaoAG,andRamachandraMurthy,DS,AppropriateTechnologiesforlow costHousing Oxford and IBH Publishing Co. Pvt. Ltd.
2) CBRI, Roorkee, Advances in Building Materials andConstriction.
3) Desai,Vasant,RuralDevelopmentinIndia:Past,PresentandFuture:aChallen geintheCrisis, Himalaya Publishing House,Delhi.
4) Rastogi, A.K.Rural Development Strategy, Wide Vision,Jaipur.

5) Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India PvtLtd.
6) Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications,Delhi.
7) Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

Building Services and Maintenance

Course Code	CEPE407/C
Course Title	Building Services and Maintenance
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1) Classify various types of building services as per functionalrequirements.**(K2)**
2) Propose the fire safety requirements for multi-storeyedbuilding. **(K3)**
3) Devise suitable water supply and sanitation system for given type ofbuilding. **(K3)**
4) Evaluate the potential of rain water harvesting and solar water heater system for the given type ofbuilding. **(K3)**
5) Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type ofbuilding. **(K2)**

Course Content:-

Module- 1: Overview of Building Services

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Classify buildings as per National Building code.
2) Describe RoleandresponsibilityofBuildingServiceEngineer.
3) Explain role of BMS and concept of smart building.

Detailed content of the unit: -

- Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of buildingservicesi.e.HVAC(Heat,VentilationandAirConditioning),Escalatorsandlifts,firesafety, protectionandcontrol,plumbingservices,rainwaterharvesting,solarwaterheatingsystem, lighting, acoustics, sound insulation and electric installationetc.
- RoleandresponsibilityofBuildingServiceEngineer,IntroductiontoBMS(BuildingManagement Services), Role of BMS, concept of smartbuilding.

Module- 2: Modes of vertical communication

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain objectives and modes of vertical communication in building
2) Describe the design provisions for basic size calculation of space to accommodate lift services, safety measures.
3) Illustrate Escalators and ramp.

Detailed content of the unit: -

- Objectives and modes of vertical communication inbuilding.
- Lifts**:**Differenttypesofliftsanditsuses,ComponentpartsofLift-LiftWell,Travel,Pit,Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommodate lift services, Safetymeasures.
- Escalators**:** Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safetymeasures.
- Ramp: Necessity, design consideration, gradient calculation, layout and Special features required for physically handicapped andelderly.

Module-3:Fire Safety

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain fire protection systems.
2) Explain causes and requirements of fire protection.
3) Describe National Building code provision for fire safety

Detailed content of the unit: -

- Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and various extinguishing systems, Working

principles of various fire protection systems.

- Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing buildings, Provisions forevacuation.

Module-4: Plumbing Services

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain plumbing and its types.
2) Describe system of plumbing like storage of water, hot and cold water supply system.
3) Describe different types of drainage system.
4) Explain different materials used in plumbing

Detailed content of the unit:

- Importanceofplumbing,AHJ(AuthorityHavingJurisdiction)approval,PlumbingTerminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps,Interceptors.
- System of plumbing for building water supply: storage of water, hot and cold water supply system.
- System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimedwater.
- Different pipe materials, and jointing methods, fittings, hanger, supports and valves usedin plumbing and their suitability.

Module- 5: Lighting, Ventilation and Acoustics

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1.Describe the concepts of solar water heating.
2.Explain the concepts of lighting and ventilation
3.Describe acoustic control in a building.

Detailed content of the unit: -

- Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), installation

andmaintenance.

- Concept of lighting, types of lighting (natural and artificial), factors influencing the brightness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct,indirect,half-indirectanddirect-indirect),typesoflightcontrol(manualswitch, remote switch, timer switch and photo-electric cell switch), typesof lamps(incandescent,tungstenhalogenandelectricdischarge),Lampselecti onasperroom sizes.
- Concept of ventilation, necessity and Types ofventilation.
- Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavityresonator)

References: -

1. Patil, S. M., Building Services, Seema Publication,Mumbai.
2. MantriandSandeep.,TheAtoZofPracticalBuildingConstructionanditsMan agement,Satya Prakashan, NewDelhi**.**
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publica- tions, NewDelhi.
4. Deolalikar,S. G., Plumbing Design and Practice,McGraw-Hill,
5. AkhilKumarDas.,PrinciplesofFireSafetyEngineering:UnderstandingFire andFireProtec- tion, PHI Learning Pvt. Ltd, NewDelhi.
6. Shraman N L, Solar panel installation guide & user manual**,** The Memory Guru ofIndia.
7. Gupta M K, Practical handbook on building maintenance - Civil works, NabhiPublications.
8. BIS., National Building Code Part1, 4, 8, 9., Bureau of Indian Standard, NewDelhi
9. BIS., IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, NewDelhi
10. BIS., 2008 Uniform plumbing code – India (UPC-I)., Bureau of IndianStandard

Professional Skill Development

Course Code	:	HS 408
Course Title	:	Professional Skill Development (Theory)
Number of Credits	:	3 (L: 2, T: 1, P:0)
Prerequisites	:	NIL
Course Category	:	HS

Course Outcomes:

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

CO1: Understand the importance of soft skills and personality in a person's career growth. K2

CO2: Communicate uprightly while looking for a job. K3

CO3: Learn and utilize the key skills while facing job interview. K2 & K3

CO4: Demonstrate effective writing skills for professional excellence. K2

CO5: Explore ways to make oral communications interesting and captivating. K3

Unit – 1Soft Skills & Personality Development

Number of Class Hours: 06 **Marks: 08**

Learning Outcomes:

1) Get acquainted with the details of soft skills and the importance of personality K1
2) Understand the importance of communication skills in developing one's personality. K2
3) Understand the importance of soft skills and personality in a person's career growth K2

Detailed Content:

1. **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

2. **Personality Development – A must for career Growth:** Grooming one's personality as a signal that others read, mapping different personality types – Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Unit – 2 Looking for a Job

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data K2

2) Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

1. Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs
2. Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.
3. Group Discussion : A test of soft skills

Unit – 3 Job Interviews

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Understand the importance of Job interviews in the selection procedure K2
2) Comprehend and Adapt to various types, stages and processes of job interviews K1&K3
3) Demonstrate appropriate body language in interviews K3

Detailed Content

1. Job Interviews: Definition, processes of Interviews, Types of Interviews
2. Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
3. Importance of Body language in Interviews: : Facing an interview, Using proper verbal and non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
4. Probable interview questions and answers.
5. Mock interviews to be conducted by mock interview boards.

Unit – 4 Enhancing Writing skills

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1) Write dialogues on given topics / situations K3
2) Express facts & ideas effectively in written form K3
3) Learn to write formal and informal letters & emails. K2

Detailed Content

1) **Art of Condensation**: Principles to increase clarity of written communication.
2) **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
3) **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seeking permission.
4) **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Unit – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1. Speak persuasively on a given topic fluently and clearly. K3
2. Participate in formal and informal conversations. K3
3. Express ideas and views on given topics. K3

Detailed Content

1) **Conversation & Dialogue Practice:**
   a) Introducing oneself
   b) Introduction about family
   c) Discussion about the weather
   d) Seeking Permission to do something
   e) Seeking Information at Railway Station/ Airport
   f) Taking Appointments from superiors and industry personnel
   g) Conversation with the Cashier- College/ bank
   h) Discussing holiday plans
   i) Asking about products in a shopping mall
   j) Talking over the Telephone

2) **Panel Discussion:** Act of a moderator - ways to respond to audience questions.
Suggested topics: Current Affairs

3) **Public Speaking**: Art of Persuasion, Making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Reference Books:

(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

1) Sanjay Kumar &PushpLata Communications Skills , 2nd Edition,Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) M. Raman & S. Sharma Technical Communication Oxford University Press
4) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

Minor Project

Course Code	CEPR-409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project (K3).

Course Content:-

The minor project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act within a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a minor project work.

Essence of Indian Knowledge and Tradition

Course Code	AU 410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0
Prerequisites	NA
Course Category	Audit

Course Outcomes: -

After completion of the course the students will be able to-

CO 1: Understand the essence of Indian tradition and the importance of carrying them forward. (**K_2**)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. (**K_2**)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. (**K_1**)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modern knowledge systems. (**K_1**)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. (**K_4**)

Module- 1

Name of the Module: Introduction to Vedic Literature

Number of class hours: **05**

Content:

- General structure of Vedic Literature,
- Different theories on the age of the Vedas,
- Educational system in the Vedic times
- subject-matter of Ṛgveda-samhitā, *Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda-Saṁhitā, Brāhmaṇa* and *Āraṇyaka* literature, Upaveda

Learning outcomes of the Module

1	Describe the Vedic literature (K1)
2	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module- 2

Name of the Unit: Fundamental doctrines of the *Upaniṣad*s

Number of class hours:**05**

Content:

- General introduction of Upaniṣadic literature
- Philosophical ideas and ethics in Upaniṣadas

Learning outcomes of the Module

1.	Understand Upaniṣads and its significance as the perennial source Indian philosophy (K2)
2.	Explain the scientific temperament, knowledge and methods of scientific enquiry that is embedded in the Upaniṣadas (K2)

Module- 3

Name of the Unit: *Vedāṅga*s, Purāṇas and Dharmaśāstra Literature

Number of class hours:**05**

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra

Learning outcomes of the Module

1.	Describe various scientific and academic disciplines of ancient India along with scientific knowledge that is rooted in the Puranic literature (K1)
2.	Remember ancient system of Law and Governance in a nutshell especially the principles and philosophy behind the ancient constitutions (K1)

Module- 4

Name of the Module: Introduction to Indian Philosophical Systems, Scientific aspects of Indian knowledge systems

Number of class hours:**05**

Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module- 5

Name of the Unit: Introduction to Yoga & Āyurveda

Number of class hours:**05**

Content:

- General ideas about Yoga,
- Origin and Development of Pātañjala Yoga,
- Origin and Development of Āyurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcare systems (K4)

References: -

1) Capra, Fritjof. *The Tao of Phisics*. New York: Harpercollins, 2007.
2) Capra, Fritjof. *The Web of Life*. London: Harpar Collins Publishers, 1996.
3) Dasgupta, Surendranath & De, Sushil Kumar. *A History of Sanskrit Literature.* Delhi: Motilal Banarsidass, 2017.
4) Dasgupta, Surendranath. *A History of Indian Philosophy*. Delhi: Motilal Banarsidass, 1991.
5) Gonda, Jan. *A History of Vedic Literature*. Delhi: Monohar Publishers and Distributors, 2020.
6) Jha, R.N. *Science and Consciousness Psychotherapy and Yoga Practices*. Delhi: Vidyanidhi Prakashan, 2016.
7) Kane. P.V. *History of Dharmasastra*, Poona: Bhandarkar Oriental Research Institute, 1930.
8) Max Muller. *Ancient Sanskrit Literature*, London: Spottiswoode and Co., 1859.
9) *Pride of India*,New Delhi: Samskrita Bharati, 2006.
10) Shastri, Gourinath. *A History of Vedic Literature*, Kolkata: Sanskrit Pustak Bhandar, 2006.
11) Sinha, Jadunath. *Indian Philosophy*. Delhi: Motilal Banarsidass,1938.
12) Wujastiyk, Dominik. *The Roots of Ayurveda*. India: Penguin India, 2000.

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	CEPC-501	Design of RCC and Steel Structure	3	0	0	3	3
2	Programme core course-17	CEPC-502	Estimating, Costing and Valuation	3	0	0	3	3
3	Programme core course-18	CEPC-503	Design of RCC and Steel Structure Lab.	0	0	2	2	1
4	Programme core course-19	CEPC-504	Estimating, Costing and Valuation Lab.	0	0	2	2	1
5	Programme core course-20	CEPC-505	Auto CAD Lab.	0	0	2	2	1
6	Programme Elective course-2 (Any one to be selected)	CEPE-506/A	Traffic Engineering	2	1	0	3	3
		CEPE-506/B	Solid Waste Management	2	1	0	3	
		CEPE-506/C	Advanced Construction Technology	2	1	0	3	
7	Programme Elective course-3 (Any one to be selected)	CEPE-507/A	Pavement Design & Maintenance	3	0	0	3	3
		CEPE-507/B	Green Building and Energy Conservation	3	0	0	3	
		CEPE-507/C	Precast &Pre-stressed Concrete	3	0	0	3	
8	Open Elective -1	(Any one to be selected from Annexure-I)		3	0	0	3	3
9	Summer Internship-II (6 weeks) after	CESI-509	Summer Internship-II	0	0	0	0	3

	IVthSemester							
10	Major Project	CEPR-510	Major Project-I	0	0	2	2	1
			Total					**22**

Design of RCC and Steel Structures

Course Code	CEPC-501
Course Title	Design of RCC and Steel Structures
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

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

C.O.1.**:** The design of singly and doubly RCbeam with shear, bond & developmentlength. (K2)
C.O.2.**:** The design of short and long RCC columns with column foundation. (K3)
C.O.3.**:** The design of one, two way RCC slab and the design of staircase. (K3)
C.O.4.**:** The design of riveted connection, welded connection and steel beam. (K2)
C.O.5.**:** The design of steel tension and compressionmember. (K3)

Detailed Course Content

Unit–I: Design of Reinforced Concrete Beams by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Illustrate the analysis of reinforced concrete rectangular beam by limit state method.
2. Describe the various steps for the design of singly and doubly RC beam.
3. Compute the minimumshearreinforcement and development length of beam.

Detailed content of the unit:

- Concept of limit state method and working stress method, Stress block diagram, Introduction to singly and doubly reinforced sections, IS456.
- Designofsinglyreinforcedbeam,conceptofunderreinforced,overreinforcedandbalanced section,

Simple numerical problem on ultimate moment of resistance and design of beam section.

- Designofdoublyreinforcedsections,stressandstraindiagrams,depthofneutralaxis,simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of A_{st} andA_{sc}. Design for RC flanged beam.
- Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement of beam and lintel,MinimumShearReinforcement,ProvisionsofIS456,formsofshearreinforcement.
- Types of bond, bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90^0 hook, Lapping ofbars.

Unit–II Design of axially loaded RCC Column and Column Foundation by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Classification of column and describe the various steps for the design of RCC column.
2. Compute the reinforcement and dimensions for the column as per load acting on structure.
3. Demonstrate the structure of reinforcement for column foundation.

Detailed content of the unit:

- Definition and classification of column, Limit state of compression members,Effective length of column. Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of tiesetc.
- Design of axially loaded short column - Square, Rectangular, and Circularonly.
- Functions of foundation, Classification of foundation, Design of isolated column foundation under axial load resting directly on bearing soil, for uniform thickness of the footing slab.

Unit–III Design of RCC Slab and Staircase by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Distinguish between one way slab and two-way slab.
2. Explain the various types and terminology of staircase.
3. Interpret and draw the design steps of RCC slab and staircase.

Detailed content of the unit:

- Definition of one way slab and two-way slab, Provisions of IS 456 for the slabs.
- Designs of one way slab – simply supported on either end, and also cantilever for flexure.
- Design of two way slab (a) with the edges not held down, (b) with the edges held down by using moment coefficient as per table 26 & 27 of IS 456.

- Definition of staircase, different types of stairs, terminology of staircase, Design of Simply supported on edges at landing levels and Supported on landing panels which spans transversely to the flight.

Unit–IV Design of Riveted Connection, Welded Connection and Steel Beam by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Interpret the types and failure of riveted joints.
2. Label the classification of welded joints with their symbols.
3. Compute the design of riveted, welded, I-section and channel section.

Detailed content of the unit:

- Different types of riveted joint, failure of riveted joints, design of riveted joint for axial tension, Eccentric riveted connection – application to bracket connected to steel columns with moment in the plane of river and in perpendicular plane, permissible stress in rivet – shearing and bearing.
- Types of weld and their symbols, permissible stresses, fillet weld – throat thickness, size of weld, length of weld. Design of simple lap and butt joints subjected to axial load. Design of eccentric welded connection with moment in the plane of weld and in perpendicular plane.
- Standard beam sections, bending stresscalculations. Design of simple I and Channelsection. Check for shear as per IS800.

Unit–V Design of Steel Tension and Compression Members by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Distinguish between steel tension and compression members.
2. Define the effective length, radius of gyrationandslendernessratio for steel column.
3. Explain the built–up sections, lacing and battening.

Detailed content of the unit:-

- Types of sections used for Tensionmembers. Designofaxiallyloadedsingleangleanddoubleangletensionmemberswithboltedand welded connections.
- Types of sections used as compression member, Calculation of effective length, Radius of gyrationandslendernessratio,PermissiblevaluesofslendernessratioasperIS800,Design compressivestress.

- Introduction to built–up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numericalproblems).
- Designofaxiallyloadedsingleanddoubleanglestrutsconnectedbyboltedandwelded connections with gusset plate.

Suggested Learning Resources:

- Shah,V.L.,andKarve,S.R.,LimitStateTheoryandDesignofReinforcedConcreteStructures, Structures Publications,Pune,2014.
- Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., NewDelhi.
- KrishnaRaju,andN.Pranesh,R.N.,ReinforcedConcreteDesignPrinciplesandPractice,New Age International,Mumbai.
- Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
- Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri- vate Limited,Delhi.
- Shah,V.L.,andGore,V.,LimitStateDesignofSteelStructures,StructuresPublications,Pune.
- Dayarathnam P., Design of Steel Structures, S. Chand and Company,Delhi.
- Subramanian N., Design of Steel Structures, Oxford UniversityPress.
- Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai,Delhi.

ESTIMATING, COSTING AND VALUATION

Course Code	CEPC-502
Course Title	Estimating, Costing and Valuation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -

After completing this course, student will be able to:

1) Select modes of measurements for different items ofworks. **(K3)**
2) Prepare approximate estimate of a civil engineeringworks. **(K3)**
3) Prepare detailed estimate of a civil engineeringworks. **(K3)**
4) Use relevant software for estimating the quantities and cost of items ofworks. **(K3)**
5) Justify rate for given items of work using rate analysistechniques. **(K2)**

Course Content:-

Module- 1: Fundamentals of Estimating and Costing

Number of class hours: : 08-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe different types and uses of estimates
2) Describe the procedure for estimating and costing of Civil Engineeringworks
3) Understand roles and responsibility of estimator
4) Prepare standard formats of measurement sheet, Abstract sheet, Face sheet.

Detailed content of the unit:

- EstimatingandCosting– Meaning,purpose,Administrativeapproval,TechnicalSanctionand Budgetprovision.
- Types of estimates – Approximate and Detailedestimate.
- TypesandUsesofEstimates:Revisedestimate,Supplementaryestimate,Repairan dmaintenance estimate, renovationestimate.
- Roles and responsibility ofEstimator.
- Checklist of items in load bearing and framedstructure.
- Standard formats of Measurement sheet, Abstract sheet, Facesheet.
- Modes of measurement and desired accuracy in measurements for different items of work as perIS:1200.
- Rules for deduction in different category of work as perIS:1200.
- Description / specification of items of building work as per PWD/DSR.

Module- 2: Approximate Estimates

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain definition and purpose of approximate estimate
2) Describe different methods of approximate estimate

- 3) Solve numerical problems for roads, railways, bridges/culvert,irrigationprojectsandwater Supply projects using approximate estimate.

Detailed content of the unit:

- Approximate estimate- Definition,Purpose.
- Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numerical)
- Approximateestimateforroads,Railways,bridges/culvert,irrigationprojectsandwater Supply projects.

Module-3:Detailed Estimate

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe the purpose of detailed estimate and different data required for detailed estimate

2) Explain long wall and short wall method, centre line method

3) Develop bar bending schedule for footing, column, beam, Lintel, chajja and slabelements

Detailed content of the unit: -

- Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities andAbstracting.
- MethodsofDetailedEstimate-Unitquantitymethodandtotalquantitymethod(withsimple numericals)
- Long wall and Short wall method, Centre linemethod.
- Bar bending schedule for footing, column, beam, Lintel, chajja and slabelements
- Provisions in detailed estimate: contingencies, work charged establishment,percentage charges, water supply and sanitary Charges and electrification charges etc.
- Primecost,Provisionalsum,Provisionalquantities,Billofquantities,SpotitemsorSiteitems.

Module-4: Estimate for Civil Engineering Works

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe different methods for calculating earthwork of roads, embankment and canal.

2) Explain detailed estimate for septic tank

3) Know the use of computer/ softwares/programmes for detailed estimate.

Detailed content of the unit:

- Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formulamethod.
- Detailed estimate for septic tank, Communitywell.
- Use of computer /softwares / programmes for detailed estimate Preparation of Civil EngineeringWorks.

Module- 5: Rate Analysis
Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1. Explain the procedure for rate analysis
2. Describe lead, lift, overhead charges, water charges and contractors' profit.
3. Know the categories of labours and also types and numbers of labours for different items of works.
4. Prepare rate analysis of different items of work for building and roads

Detailed content of the unit: -

- Rate Analysis: Definition, purpose and importance.
- Lead (Standard and Extra), lift, overhead charges, water charges and contractors'profit,
- Procedure for rateanalysis.
- Task work- Definition, types. Task work of different skilled labour for differentitems.
- Categories of labours, their daily wages, types and number of labours for different items of work.
- Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments.
- Preparing rate analysis of different items of work pertaining to buildings androads.

References: -

1. Datta,B.N.,EstimatingandCostinginCivilengineering,UBSPublishersDistributorsPvt.Ltd. New Delhi.
2. Peurifoy,RobertL.Oberlender,Garold,Estimatingconstructioncost(fifthedition), McGraw Hill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House PVT. LTD.,Anand.
4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. NewDelhi.
5. Patil,B.S., Civil Engineering Contracts and Estimates, Orient

Longman,Mumbai.
6. Chakraborti,M., Estimating and costing, specification and valuation in civilengineering,
Monojit Chakraborti, Kolkata.
7. PWD Schedule ofRates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Sched- ule ofRates.
9. Manual of Specifications and Standards for DBFOT projects, EPCworks.

DESIGN OF RCC AND STEEL STRUCTURE LAB.

Course Code	CEPC-503
Course Title	Design of RCC and Steel Structure Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

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

C.O.1.**:** Design of steel tension and compressionmember. (K2)
C.O.2.**:** Design of steel beams including check forshear. (K2)
C.O.3.**:** Design of singly and doubly reinforced RCCbeam. (K3)
C.O.4.**:** Design of shear reinforcement in RCbeams. (K3)
C.O.5.**:** Design of RCC column as per IS456. (K3)

List of Practical to be performed:

1	Draw any five commonly used rolled steel sections and five built up sections.
2	Summarize the provisions of IS 800 required for the design of tension member and compression member in report form.
3	Draw sketches for battening, single & double lacing of given built up columns.
4	Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.
5	Draw cross section, strain diagram & stress diagram for singly and doubly reinforced section.
6	Draw sketches of different types of column footings.
7	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details

	of various structural elements.
8	Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
9	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
10	Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.

Suggested Learning Resources:

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

ESTIMATING, COSTING AND VALUATION LAB.

Course Code	CEPC-504
Course Title	Estimating, Costing and Valuation Lab.
Number of Credits	1 (L: 0, T: 0, P:2)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -

After completing this course, student will be able to:

1) Select modes of measurements for different items ofworks. **(K3)**
2) Prepare approximate estimate of a civil engineeringworks. **(K3)**
3) Prepare detailed estimate of a civil engineeringworks. **(K3)**

4) Use relevant software for estimating the quantities and cost of items ofworks. **(K3)**
5) Justify rate for given items of work using rate analysistechniques. **(K2)**

Course Content:-

Number of class hours: 25 Hours

List of Practical to be performed:

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

References: -

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS PublishersDistributors
2. Peurifoy, Robert L. Oberlender,Garold, Estimating construction cost (fifth edition),McGraw Hill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House,Anand.
4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd.Delhi.
5. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman,Mumbai.

6. Chakraborti,M., Estimating and costing, specification and valuation in civilengineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule ofRates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Sched- ule ofRates.
9. Manual of Specifications and Standards for DBFOT projects, EPCworks.

AUTO CAD LAB.

Course Code	:	CEPC- 505
Course Title	:	Auto Cad Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After completing this course, student will be able to:

- Discover the basic dimensioning (K3)
- Discuss Editing Dimensions (K2)
- Modify Blocks(K3)
- Discover the process of Plotting drawings in AutoCad (K3)
- Express by practicing with complete drawing(K2)

D E T A I L C O U R S E C O N T E N T

1. GETTING STARTED– I

Starting AutoCAD – AutoCAD screen components – Starting a drawing: Open drawings, Create drawings (Start from scratch, Use a template & Use a wizard) – Invoking commands in AutoCAD – Drawing lines in AutoCAD – Co- ordinate systems: Absolute co-ordinate system, Relative co-ordinate system – Direct distance method –

Saving a drawing: Save & Save As – Closing a drawing – Quitting AutoCAD

2. GETTING STARTED – II

Opening an existing file – Concept of Object – Object selection methods: Pick by box, Window selection, Crossing Selection, All, Fence, Last, Previous, Add, Remove – Erasing objects: OOPS command, UNDO / REDO commands – ZOOM command – PAN command, Panning in real time – Setting units – Object snap, running object snap mode – Drawing circles

3. DRAW COMMANDS

ARC command – RECTANG command – ELLIPSE command, elliptical arc – POLYGON command (regularpolygon)
–PLINEcommand–DONUTcommand–POINTcommand–ConstructionLine: XLINEcommand,RAYcommand– MULTILINE command

4. EDITING COMMANDS

MOVE command – COPY command – OFFSET command – ROTATE command – SCALE command – STRETCH command – LENGTHEN command –TRIM command – EXTEND command – BREAK command – CHAMFER command – FILLET command – ARRAY command – MIRROR command –MEASURE command – DIVIDE command – EXPLODE command – MATCHPROP command – Editing with grips: PEDIT

5. DRAWING AIDS

Layers – Layer Properties Manager dialog box – Object Properties: Object property toolbar, Properties Window – LTSCALE Factor – Auto Tracking – REDRAW command, REGEN command

6. CREATING TEXT

Creating single line text – Drawing special characters – Creating multiline text – Editing text – Text style

7. BASIC DIMENSIONING

Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centrelines, alternate units – Associative dimensions – Dimensioning methods – Drawing leader

8. INQUIRY COMMANDS

AREA – DIST – ID – LIST – DBLIST – STATUS – DWGPROPS

9. EDITING DIMENSIONS

Editing dimensions by stretching – Editing dimensions by trimming & extending – Editing dimensions: DIMEDIT command – Editing dimension text: DIMTEDIT command – Updating dimensions – Editing dimensions using the properties window – Creating and restoring Dimension styles: DIMSTYLE

10. HATCHING

BHATCH, HATCH commands – Boundary Hatch Options: Quick tab, Advance tab – Hatching around Text, Traces, Attributes, Shapes and Solids – Editing Hatch Boundary

– BOUNDARY command

11. BLOCKS

The concept of Blocks – Converting objects into a Block: BLOCK, _BLOCK commands – Nesting of Blocks – Inserting Blocks: INSERT, MINSERT commands – Creating drawing files: WBLOCK command – Defining Block Attributes – Inserting Blocks with Attributes – EditingAttributes

12. PLOTTING DRAWINGS IN AUTOCAD

PLOT command – Plot Configuration – Pen Assignments – Paper Size & Orientation Area – Plot Rotation & Origin – Plotting Area – Scale

13. PRACTICE WITH COMPLETE DRAWING

Each student is required to prepare a set of orthographic projections of a building designed by himself / herself in the First Year Second Semester in the subject "BASIC DESIGN" or of any other design approved by the teacher-in-charge

Suggested learning resources:

- https://www.autodesk.in/campaigns/education/cam?mktvar002=4246616%7CSEM%7C12897660219%7C124481664151%7Ckwd-212065034
- https://www.thesourcecad.com/autocad-tutorials/
- https://nptel.ac.in/courses/105/104/105104148/

TRAFFIC ENGINEERING

Course Code	CEPE-506/A
Course Title	Traffic Engineering
Number of Credits	3 (L:2, T:1, P:0)
Prerequisites	NIL
Course Category	Programme Elective course-2

Course Objectives: -

1) To recognize the issues involved in traffic flow. (K1)
2) To identify the tools and methods of traffic studies. (K2)
3) To delineate various traffic control measures. (K3)

4) To illustrate the measures for preventing road accidents. (K3)
5) To know about arboriculture. (K1)

Module- 1: Fundamentals of Traffic Engineering.

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Know about the objectives of traffic engineering.
2) Establish the relationship between speed, volume and density of traffic.
3) Describe different vehicular characteristics and road characteristics.

Detail Course Content:

- Traffic engineering- Definition, objects, scope
- Relationship between speed, volume and density of traffic
- Road user's characteristics-physical, mental, emotional factors.
- Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks.
- Road characteristics - gradient, curve of a road, design speed, friction between road and tire surface.
- Reaction time - factors affecting reaction time. PIEV Theory.

Module- 2: Traffic Studies

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Explain the methods of traffic count.
2) Recognise traffic speed studies
3) Know about parking studies

Detail Course Content:

- Traffic volume count data- representation and analysis of data.
- Necessity of Origin and Destination study and its methods.
- Speed studies - Spot speed studies, and its presentation.
- Need and method of parking study.

Module- 3: Road Signs and Traffic Markings

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Identify traffic control devices
2) Name different road signs
3) Recognise traffic markings

Detail Course Content:

- Traffic control devices –definition, necessity, types.
- Road signs - definition, objects of road signs.
- Classification as per IRC: 67-Mandatory or Regulatory, Cautionary or warning, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Points to be considered while designing and erecting road signs.
- Traffic markings- definition, classification, carriage way, kerb, object marking and reflector markers.

Module- 4: Traffic Signals and Traffic Islands

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Know about traffic signals
2) Explore different traffic islands
3) Illustrate road intersections

Detail Course Content:

- Traffic signals- Definition, Types, Traffic control signals, pedestrian signals.
- Types of traffic control signals - Fixed time, manually operated, traffic actuated signals and location of signals.
- Compute signal time by fix time cycle, Webster's and IRC method and sketch timing diagram for each phase.
- Traffic islands –Definition, advantages and disadvantages of providing islands.
- Types of traffic islands - rotary or central, channelizing or Refuge Island.
- Road intersections or junctions - Definition, Types of road intersection.
- Intersection at grade- Types, basic requirements of good intersection at grade.
- Grade separated intersection- advantages and disadvantages, types - flyovers- partial and full Cloverleaf pattern, Diamond intersection, Trumpet type, and underpass.

Module- 5: Road Accident Studies and Arboriculture

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Identify the causes of road accidents
2) Classify different street lightings
3) Know about arboriculture

Detail Course Content:

- Road Accidents-Definition, types and causes for collision and non-collision accidents.
- Measures to prevent road accidents.
- Collision and condition diagram.
- Street lighting –definition, necessity, types- luminaire, foot candle, lumen, factors affecting their utilization and maintenance.
- Arboriculture- definition, objectives, factors affecting selection of type of trees.
- Maintenance of trees-protection and care of road side trees.

Suggested learning resources:

1. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi
3. Vazirani, V N , Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.
4. Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
5. Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

SOLID WASTE MANAGEMENT

Course Code	CEPE-506/B
Course Title	Solid Waste Management
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	Programme Elective course-2

Course Outcomes: -

After completing this course, student will be able to:

1. Identify the sources of solid waste. (K1)
2. Select the relevant method of collection and transportation of solid waste. (K2)
3. Suggest an action plan for composting of solid waste. (K3)

4. Devise suitable disposal technique for solid waste. (K5)
5. Use the relevant method for disposal of Bio-medical and E-waste. (K3)

Course Content:
Module – 1: Introduction

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -1, students will be able to:-

1. Define different types of solid waste. (K1)
2. Classify the types of solid waste. (K2)
3. Know the characteristics of municipal solid waste. (K1)

Detailed content of the unit: -

• 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.

Module– 2: Storage, Collection and Transportation of Municipal Solid Waste
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -2, students will be able to:-

1. Know about collection, segregation, storage and transportation and its tools and equipments related to solid waste. (K1)
2. Select the relevant method of collection and transportation of solid waste. (K2)
3. Know the various transportation vehicle. (K1)

Detailed content of the unit: -

• 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.

Module-3: Composting of Solid Waste
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -3, students will be able to:-

1. Distinguish the various methods for composting of solid waste. (K2)
2. Suggest an action plan for composting of solid waste. (K3)
3. Know the concepts of composting solid waste. (K1)

Detailed content of the unit: -

• 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.

Module-4: Techniques for Disposal of Solid Waste

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -4, students will be able to:-

1. Know the solid waste management and its reduction techniques. (K1)
2. Illustrate various methods of solid waste . (K3)
3. Devise suitable disposal technique for solid waste. (K5)

Detailed content of the unit: -

• 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

Module-5: Biomedical and E-waste management

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Define biomedical waste and E waste. (K1)
2. Illustrate the ill effects of E-waste. (K3)
3. Use the relevant method for disposal of Bio-medical and E-waste. (K3)

Detailed content of the unit: -

• Definition of Bio medical Waste.

• Sources and generation of Biomedical Waste and its classification
• Bio medical waste Management technologies.
• Definition, varieties and ill effects of E- waste,
• Recycling and disposal of E- waste.

References: -

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

ADVANCED CONSTRUCTION TECHNOLOGY

Course Code	CEPE-506/C
Course Title	Advanced Construction Technology
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	Programme Elective course-2

Course Outcomes: -

After completing this course, student will be able to:

1. Use relevant materials in advanced construction of structures. (K3)
2. Use relevant method of concreting and equipment according to type of construction. (K3)
3. Apply advanced construction methods for given site condition. (K3)
4. Select suitable hoisting and conveying equipment for a given situation. (K2)
5. Identify advanced equipment required for a particular site condition. (K1)

Course Content:

Module – 1: Advanced Construction Materials

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

1. Know the properties of advance construction materials such as fibres, plastics, etc. (K1)
2. Use relevant materials in advanced construction of structures. (K3)
3. Know the properties and use of various other miscellaneous construction materials.(K1)

Detailed content of the unit: -

• Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
• Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
• Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, waterproofing materials, adhesives.
• Use of waste products and industrial by products in bricks, blocks, concrete and mortar.

Module– 2: Advanced Concreting Methods and Equipment

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -2, students will be able to:-

1. Know the necessity and use of ready mix concrete. (K1)
2. Illustrate the underwater concreting procedures and equipments. (K3)
3. Use relevant method of concreting and equipment according to type of construction. (K3)

Detailed content of the unit: -

• Ready Mix Concrete: Necessity and use of ready mix concrete. Products and equipments for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
• Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
• Underwater Concreting: Procedure and equipments required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.
• Special concrete: procedure and uses of special concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, shotcreting.

Module-3: Advanced Technology in Constructions

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -3, students will be able to:-

1. List the equipments required for construction of bridges, flyover and multi-storied building. (K1)
2. Explain the Prefabricated construction. (K2)
3. Use geosynthetics to strengthen embankments. (K3)
4. Apply advanced construction methods for given site condition. (K3)

Detailed content of the unit: -

• Construction of bridges and flyovers: Equipments and machineries required for foundation

and super structure.
• Construction of multi-storeyed Building: Equipments and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
• Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.
• Strengthening of embankments by soil reinforcing techniques using geo-synthetics

Module-4: Hoisting and Conveying Equipments
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -4, students will be able to:-

1. Explain the working principle of various hoisting equipments. (K2)
2. Explain the working of conveying equipments. (K2)
3. Select suitable hoisting and conveying equipment for a given situation. (K2)

Detailed content of the unit: -
• Hoisting Equipments: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.
• Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

Module-5: Miscellaneous Machineries and Equipments
Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Identify advanced equipment required for a particular site condition. (K1)
2. Name and define various excavation and compacting equipments. (K1)

Detailed content of the unit: -
• Excavation Equipments: Use, working and output of following machinery – bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines.
• Compacting Equipments: Output of different types of rollers such as plain rollers, ship footed rollers, vibratory, pneumatic rollers rammers.
• Miscellaneous Equipments: Working and selection of equipments: Pile driving equipments, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equipments, floor polishing and cutting machine selection of drilling pattern for blasting, Bentonite/

mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

References: -

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
3. Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
4. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
5. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
6. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
7. Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.
8. Rangawala,S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
9. Ghose,D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

PAVEMENT DESIGN AND MAINTENANCE

Course Code	CEPE-507/A
Course Title	Pavement Design & Maintenance
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	Programme Elective course-3

Course Objectives: -

1) To know types of pavements and their uses. (K1)
2) To learn about pavement material characteristics and drainage factors. (K1)
3) To recognize the issues in design of flexible and rigid pavements. (K2)
4) To review the methods of pavement evaluation. (K2)
5) To apply pavement maintenance methods. (K3)

Course Content:

Module- 1: Basics of pavement Design

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Identify the components of the given type of pavement.
2) Suggest the type of pavement for the given situation.
3) Illustrate the characteristics of pavement materials.

Detail Course Content:

- Types of pavement - Flexible, Rigid and Semi Rigid.
- Comparison of Rigid and flexible pavement according to Design precision, stages of construction of Flexible pavement and Rigid Pavement, surface characteristics.
- Functions of pavement, characteristics and tests of pavement materials, Bituminous mixes.
- Factors affecting selection of type of pavement.

Module- 2: Fundamentals of pavement design

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Explore the factors affecting pavement design
2) Define CBR
3) Demonstrate soil stabilization

Detail Course Content:

- Factors affecting pavement design – design wheel load, Traffic factors, Environmental factors, Road geometry and material properties, Characteristics of soil, CBR and Drainage situation.
- Soil stabilization, Methods of Soil Stabilization.

Module- 3: Design overview of Flexible and Rigid pavement

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Explore the theoretical and empirical methods of pavement design
2) Identify the design guidelines of pavement as per the provisions of IRC
2) Use different types of pavement joints.

Detail Course Content:

- Methods of flexible and rigid pavement design-Theoretical method, Empirical

method.

- IRC37 guidelines for design of flexible pavement (overview only)
- IRC58 guidelines for design of concrete pavement (overview only)
- Joints-Need, Types, requirements, spacing of joints, Dowel bar, Tie bar.

Module- 4: Pavement evaluation

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Apply the methods of pavement evaluation.
2) Explain visual rating system.
3) Interpret different roughness measurement system.

Detail Course Content:

- Definition and purpose of pavement evaluation
- Methods of Pavement evaluation – Visual rating system, Present serviceability index, Roughness measurements, Skid Resistance, Non-destructive evaluation – Benkelmen Beam Method and Falling Weight Deflectometer Method.

Module- 5: Pavement Maintenance

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Decide the type of maintenance required under different damaged conditions
2) Identify the causes of flexible pavement failure.
3) Apply the methods of repair for rigid pavement structure.

Detail Course Content:

- Types of pavement maintenance - routine, periodic, and special. Need for inspection and maintenance schedule. Causes of pavement failure and remedial measures. Typical flexible and rigid pavement failures
- Types and causes of damages in flexible pavement, surface defects, cracks. Deformations - Rutting, fatigue, corrugation and heave. Disintegration- loss of aggregate, stripping, pothole. Remedial measures - slurry seal, liquid seal, fog seal, patching.
- Types and causes of damages in rigid pavement - cracking, spalling, blowup, pumping and bleeding, joint salient failure. Methods of repair - repair of spalled joints, full depth reconstruction, and replacement of dowel bars.

Suggested learning resources

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

GREEN BUILDING AND ENERGY CONSERVATION

Course Code	:	CEPE-507/B
Course Title	:	Green Building and Energy Conservation
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	PE

Course outcomes:

After completing this course, student will be able to:

CO 1. Identify the various requirements for greenbuilding(K3).

CO 2. Analyze the different steps in the environmental impactassessment(K4).

CO 3. Examine the construction of green building with prevailing energy conservation policy and regulations(K4).

CO 4. Explain the construction of green building construction using greenmaterials(K3).

CO 5. Focus on criteria related to particular rating system for assessment of particular Green building(K2).

Detailed Course Content:

Module -1: Introduction to Green Building and Design Features

Number of Class hours:08

Learning Outcomes:

1. Define the concept, benefits, components/features of Green Building, site selection, energy, water and material efficiency, Indoor Air Quality (K1)
2. Classify the site selection strategies, buildingform,orientation,buildingenvelopeandfenestration (K2)
3. Discover the materialandconstructiontechniques,roofs,walls,fenestrationandshadedfinishes,advancedpassiveheatingandcoolingtechniques, wastereductionduringconstruction(K3)

Detailed content of the unit:

1.1 Definition of Green Building, Benefits of Green building, Components/features of Green Building,

1.2 Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.

1.3 Siteselectionstrategies,Landscaping,buildingform,orientation,buildingenvelopeandfenestration.

1.4 Materialandconstructiontechniques,roofs,walls,fenestrationandshadedfinishes.

1.5 Advancedpassiveheatingandcoolingtechniques.

Module-2: Energy Audit and Environmental Impact Assessment (EIA)

Number of Class hours: 08

Learning Outcomes:

1. Identify the energy Audit: Meaning, Necessity, Procedures, Types, Energy ManagementPrograms(K2)
2. Analyze the Environmental Impact Assessment(EIA): Introduction, EIA regulations, Steps in environmentalimpactassessmentprocess(K4)
3. List the benefitsand LimitationsofEIA(K1)
4. Identify the Environmentalclearance for the civil engineeringprojects.(K2)

Detailed content of the unit:

2.1 Energy Audit: Meaning, Necessity, Procedures, Types.

2.2 Energy ManagementPrograms.

2.3 Environmental Impact Assessment(EIA): Introduction, EIA regulations, Steps in environmentalimpactassessmentprocess.

2.4 BenefitsofEIA,LimitationsofEIA.

2.5 Environmentalclearance for the civil engineeringprojects.

Module-3: Energy and Energy conservation

Number of Class hours: 08

Learning Outcomes:

1. Identify the RenewableEnergyResources:SolarEnergy,WindEnergy,OceanEnergy,HydroEnergy,Bio-massEnergy(K2)
2. Identify the Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen,Biofuels.(K2)
3. Discover the Energy conservation: Introduction, Specific objectives, present scenario, Need of energy conservation(K3)
4. Examine the LEED, India Rating System and EnergyEfficiency.(k4)

Detailed content of the unit:

3.1 RenewableEnergyResources:SolarEnergy,WindEnergy,OceanEnergy,HydroEnergy,Bio-massEnergy

3.2 Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy,

3.3 Chemical Sources of Energy, Fuel Cells, Hydrogen,Biofuels.

3.4 Energy conservation: Introduction, Specific objectives, present scenario,

3.5 Need of energy conservation

3.6 LEED, India Rating System and EnergyEfficiency.

Module-4: Green Building

Number of Class hours: 08

Learning Outcomes:

1. Define the Green building, Benefits of Greenbuilding(K1)
2. Identify the Principles and planning of Greenbuilding(K2)

3. Discover the SalientfeaturesofGreenBuilding,Environmentaldesign(ED)strategiesforbuilding construction(K3)
4. Explain the process of Improvement in environmental quality in civilstructure(K3)
5. Classify the Green building materials and products(K2)

Detailed content of the unit:

4.1 Introduction: Definition of Green building, Benefits of Greenbuilding,

4.2 Principles: Principles and planning of Greenbuilding

4.3 Features:SalientfeaturesofGreenBuilding,Environmentaldesign(ED)strategiesforbuilding construction.

4.3 Process: Improvement in environmental quality in civilstructure

4.5 Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board.
4.6 Insulated concrete forms.
4.7 reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Greenroofing

Module-5: Rating System
Number of Class hours: 08

Learning Outcomes:

1. Describe the (LEED)criteria, Indian Green Building council (IGBC) Greenrating, Green Rating for Integrated Habitat Assessment. (GRIHA)criteria(K1)
2. Discuss the Heating Ventilation Air Conditioning (HVAC) unit in greenBuilding(K2)
3. Focus on the Functions of Government organization working for Energy conservation andAudit(ECA)-National Productivitycouncil(NPC), Ministry of New and Renewable *Energy*(MNRE), Bureau of Energy efficiency(BEE)(K2)

Detailed content of the unit:

5.1 Introduction to (LEED)criteria,

5.2 Indian Green Building council (IGBC) Greenrating,

5.3 Green Rating for Integrated Habitat Assessment. (GRIHA)criteria

5.4 Heating Ventilation Air Conditioning (HVAC) unit in greenBuilding

5.5 Functions of Government organization working for Energy conservation andAudit(ECA)-

5.6 National Productivitycouncil(NPC)

5.7 Ministry of New and Renewable *Energy*(MNRE)

5.8 Bureau of Energy efficiency(BEE)

Suggested learning resources:

1 Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hobo-u ken, New Jersey.

2 Chauhan,DSSreevasthava,SK.,Non-conventionalEnergyResources,NewAgeInternational Publishers, New Delhi.

3 O.P. Gupta, Energy Technology, Khanna Publishing House, NewDelhi

4 Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers,Delhi.

5 SamKubba.,HandbookofGreenBuildingDesignandConstruction,Butterworth-Heinemann.

6 Means R S, Green Building - Project Planning and Cost Estimating, John Wiley &Sons

7 Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IKInternational.

Precast & Pre-stressed Concrete

Course Code	CEPE-507/C
Course Title	Precast & Pre-stressed Concrete
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

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

C.O.1.: Select the relevant precast concrete element for a given type ofconstruction. (K1)

C.O.2.: Use relevant components for prefabricatedstructures. (K2)

C.O.3.: Justify the relevance of pre-stressed element in a givensituation. (K2)

C.O.4.: Select relevant methods / systems for given constructionwork. (K3)

C.O.5.: Propose suitable cable profile for the given pre-stressed concretemembers. (K2)

Detailed Course Content

Unit – I: Precast concrete Elements

Number of class hours: 08

Learning Outcomes:

4. Define the Precast concretemembers.
5. Illustrate the advantages and disadvantages of precast concretemembers
6. Explain the structural and non-structuralprecast elements.

Detailed content of the unit:

- Advantages and disadvantages of precast concretemembers
- Non-structuralPrecastelements-Paverblocks,FencingPoles,TransmissionPoles,Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications
- Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheetpiles
- Testing of Precast components as per BISstandards

Unit– II: Prefabricated building

Number of class hours: 08

Learning Outcomes:

1. Identify the precast structural building components.
2. Choose to use the relevant components for prefabricatedstructures.
3. Label the design considerations for structural joints.

Detailed content of the unit:

- Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircaseelements,
- Prefabricated building using precast load bearing and non-load bearing wall panels, floor systems - Material characteristics, Plans & Standardspecifications
- Modular co-ordination, modular grid, andfinishes
- Prefab systems and structural schemes and their classification including design considerations
- Joints – requirements of structural joints and their designconsiderations
- Manufacturing, storage, curing, transportation and erection of above elements, equipment needed

Unit– III: Introduction to Prestressed Concrete

Number of class hours: 08

Learning Outcomes:

1. Relate the basic concept of pre-stressed concrete.
2. Describe the various applications of pre-stressedconcrete.
3. Use of pre-stressing steels.

Detailed content of the unit:

- Principles of pre-stressed concrete and basicterminology.
- Applications, advantages and disadvantages of prestressedconcrete
- Materials used and their properties, Necessity of high-grademater ials
- Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits andapplications

Unit– IV: Methods and systems of prestressing

Number of class hours: 08

Learning Outcomes:

1. Interpret the various methodsofprestressing.
2. Demonstrate the pre-tensioning and post-tensioning.
3. Summarize the loss of pre-stressing.

Detailed content of the unit:

- Methodsofprestressing–InternalandExternalpre-stressing,PreandPosttensioning applications
- Systems for pre tensioning – process, applications, merits and demerits - Hoyersystem
- Systems for post-tensioning - process, applications, merits and demerits - Freyssinet sys- tem, Magnel Blaton system, Gifford Udallsystem.
- Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoringstage.
- Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss ofpre-stress).
- BIS recommendations for percentage loss in case of Pre and Posttensioning.

Unit– V: Analysis and design of Prestressed rectangular beam section

Number of class hours: 08

Learning Outcomes:

1. Illustrate the assumptions in analysis of pre-stressed concretebeams.
2. Relate the effect of cable profile on maximum stresses at mid span and atsupport.
3. Describe the various steps for the design of Prestressed rectangular beam section.

Detailed content of the unit:

- Basic assumptions in analysis of pre-stressed concretebeams.
- Cable Profile in simply supported rectangular beam section – concentric, eccentricstraight and parabolic
- Effect of cable profile on maximum stresses at mid span and atsupport.
- Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profilesonly.
- Simple steps involved in Design of simply supported rectangular beam section (No numericalproblems)

Suggested Learning Resources

1. Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, NewDelhi.
2. Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, NewDelhi
3. Marzuki,NorAshikin,PreCastandPreStressTechnology:Process,MethodandFutureTechnology, Createspace IndependentPublication.
4. Indian Concrete Institute., Handbook on Precast Concretebuildings.
5. Elliott, Kim S., Precast Concrete Structures, CRC Press, NewYork.
6. Lin, T.Y., Design of Pre-Stressed Concrete Structures, John Wiley and Sons, New York Nagarajan, Pravin., Pre-stressed Concrete Structures, Pearson EducationIndia
7. BIS,NewDelhi.IS12592PrecastConcreteManholeCoverandFrame,BIS,NewDelhi
8. BIS,NewDelhi.IS15658Precastconcreteblocksforpaving-CodeofPractice,BIS,NewDelhi
9. BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete Code of Practice, BIS, NewDelhi
10. BIS,NewDelhi.IS15917BuildingDesignandErectionUsingMixed/CompositeConstruction Code of Practice, BIS, New Delhi
11. BIS,NewDelhi.IS458PrecastConcretePipes(withandwithoutreinforcement)—Specification, BIS, NewDelhi.

Summer Internship-II

Course Code	SI-509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: Describe a better understanding of the engineering / technological workplace(K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	**Credit**	**Schedule**	**Total Duration**	**Sub Activity Head**	**Proposed Document as Evidence**	**Evaluated by**	**Performance appraisal/ Maximum points/ activity**
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent

				workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.			
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.

c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Major Project - I

Course Code	CEPR-510
Course Title	Minor Project
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.

6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	CEPC-601	Public Health Engineering	3	0	0	3	3
2	Programme core course-22	CEPC-602	Public Health Engineering Lab.	0	0	4	4	2
3	Programme Elective course-4 (Anyone to be selected)	CEPE-603/A	Airport Engineering	3	0	0	3	3
		CEPE-603/B	Foundation Engineering	3	0	0	3	
		CEPE-603/C	Advanced Design of Structures	3	0	0	3	
4	Humanities and Social Science course-5	HS604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open Elective-2	(Anyone to be selected from Annexure-II)		4	0	0	4	4
6	Mandatory Course-2	AU-606	Indian Constitution	2	0	0	2	0
7	Major Project	CEPR-607	Major Project-II	0	0	6	6	3
8	Seminar	CESE-608	Seminar	2	0	0	2	1
			Total					**20**

PUBLIC HEALTH ENGINEERING

Course Code	CEPC-601
Course Title	Public Health Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -

After completing this course, student will be able to:

1) Know the procedure to identify the sources of surface and subsurfacewater. **(K2)**
2) Estimate the quantity of drinking water required for apopulation.**(K3)**
3) Draw layout for water supplyscheme. **(K2)**
4) Device suitable water treatmenttechnique. **(K3)**
5) Evaluate the characteristics and suggest treatment ofsewage. **(K3)**

Course Content:-

Module- 1: Sources, Demand and Quality of water

Number of class hours: : 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Know the procedure to identify the sources of surface and subsurfacewater
2) Describe the demand of water also factors affecting rate of demand
3) Examine the quality of water with respect to physical, chemical and biological characteristics
4) Estimate the quantity of water supply required for city of town

Detailed content of the unit:

- Water supply schemes - Objectives,components,
- Sourcesofwater:SurfaceandSubsurfacesourcesofwater,IntakeStructures,Definitionand types, Factors governing the location of an intake structure, Types of intakes.
- Demand of water: Factors affecting rate of demand, Variations of water demands, Forecastingofpopulation,Methodsofforecastingofpopulation,(Simpleproblemsonforecastingof population),Designperiod,Estimatingofquantityofwatersupplyrequiredforcityortown.
- Qualityofwater**:**Needforanalysisofwater,Characteristicsofwater-Physical,Chemicaland Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride,Nitrogenanditscompounds,Bacteriologicaltests,Ecoli,Bcoliindex,MPN,Sampling of water, Water quality standards as per IS10500.

Module- 2: Purification of water

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain objectives of water treatment
2) Describe the procedure of water treatment process
3)Know about water softening and defluoridation techniques

Detailed content of the unit:

- Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration,Plainsedimentation,Sedimentationwithcoagulation,principlesofcoagulation,types ofcoagulants,JarTest,processofcoagulation,typesofsedimentationtanks, Clariflocculator.
- Filtration - mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operationalproblemsinfiltration.Disinfection:Objects,methodsofdisinfection,Chlorination-Applicationofchlorine,formsofchlorination,typesofchlorinationpractices,residualchlorine and its importance, Flow diagram of water treatmentplants.
- Miscellaneous water Treatments: Introduction to water softening, Defluoridation techniques.

Module-3:Conveyance and Distribution of water

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe conveyance of water, types of pipes, joints and valves .
2) Explain methods used for distribution of water
3) Develop layouts of distribution of water

Detailed content of the unit: -

- Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on apipeline.
- Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system,Servicereservoirs-functionsandtypes,LayoutsofdistributionofWater-Deadend system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

Module-4: Domestic sewage and System of Sewerages

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe building sanitation
2) Illustrate different plumbing system
3) Explain systems of sewerage and sewer appurtenances

Detailed content of the unit:

- BuildingSanitation:**N**ecessityofsanitation,Necessitytotreatdomesticsewage, Definitions - Sewage,sullage,typesofsewage.DefinitionofthetermsrelatedtoBuildingSanitation- Waterpipe,Rainwaterpipe,Soilpipe,Sullagepipe,Ventpipe.BuildingSanitaryfittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types,qualitiesofgoodtrap.Systemsofplumbing-onepipe,twopipe,singlestack,choiceof system.Principlesregardingdesignofbuildingdrainage,inspectionandjunctionchambers, their necessity, location, size andshape.

  Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts,

location, spacing, construction details, Sewer Inlets, StreetInlets.

Module- 5: Characteristics and treatment of Sewage

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1. Explain B.O.D.,C.O.D.anditssignificance
2. Apply central pollution control norms for discharge of treated sewage.
3. Develop flow diagram of conventional sewage treatment plant
4. Illustrate treatment of swage process

Detailed content of the unit: -

Analysisofsewage:Characteristicsofsewage,B.O.D.,C.O.D.anditssignificance,CentralPollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatmentplant.

Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domesticwaste.

References: -

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, NewDelhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, KhannaPublishers
3. Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, DhanpatRai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House,Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New AgeInternational
6. Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering,McGraw
8. Basak N N, Environmental Engineering, McGraw HillPublishers.

PUBLIC HEALTH ENGINEERING LAB

Course Code	CEPC-602

Course Title	Public Health Engineering Lab
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	NIL
Course Category	PC

Course Outcomes: -

After completing this course, student will be able to:

1) Perform various tests to assess quality ofwater. **(K3)**
2) Estimate dissolved solids as per BIScodes. **(K3)**
3) Measure BOD and COD of sewagesample. **(K2)**
4) Draw line diagram of water pipeline system for alocality.**(K3)**
5) Explain different methods used in water supply system. **(K2)**

Course Content:-

Number of class hours: 25 Hours

List of Practical to be performed:

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

References: -

1. Sharma S.C, Environmental Engineering, Khanna Publishing House,

NewDelhi

2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, KhannaPublishers
3. Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, DhanpatRai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House,Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New AgeInternational
6. Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering,McGraw
8. Basak N N, Environmental Engineering, McGraw HillPublishers.

AIRPORT ENGINEERING

Course Code	CEPE-603/A
Course Title	Airport Engineering
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	Programme Elective course-4

Course Objectives: -

1) To describe the important milestones of air transportation. (K2)
2) To apply the methods of airport regional planning and development. (K3)
3) To prepare the elements of runway orientation and taxiway layout. (K3)
4) To describe airport pavements and drainage systems. (K2)

5) To name different visual aids required for safe landing and takeoff operating of airport. (K1)

Course Content:

Module- 1: Introduction

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Classify different airports
2) Define airport terminologies
3) Explain airport surveys

Detail Course Content:

- Modes of transportation, Introduction to air transportation and its challenges, Advantages of air transportation, History of aviation, Development of air transportation in India, ICAO,
- Components of aeroplane, Classification of aerodrome and air ports (International and domestic).
- Airport terminology – aerodrome, airfield and airport, airport capacity, runway, taxiway, hanger, terminal building, apron, control tower, approach zone, obstruction clearance line, landing area, instrument landing system, take off distance.
- Airport Surveys

Module- 2: Airport Layout

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Select the site for an airport
2) Explore aircraft characteristics
3) Identify the role of an airport

Detail Course Content:

- Airport Planning, selection of site, Airport size, factors affecting the site selection of airport, Development of existing airport, recommendation for airport development.
- Aircraft characteristics, Air traffic forecasting.
- Role of an airport, Airport obstructions, clear zone, turning zone.
- Regional planning, Airport architecture.

Module- 3: Runway and Taxiway

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Outline the runway orientation
2) Solve simple numerical on runway length correction
3) Plan the layout of taxiway

Detail Course Content:

- Runway orientation, runway patterns, runway lengths and widths for various airports, correction for runway length with simple numerical.
- Elements of runway geometric design
- Layout of Taxiway, Geometric standards of Taxiway,
- Exit Taxiways, Turn-around Taxiway, Loading Apron, Holding Apron, Fillets, Separation Clearance.

Module- 4: Airport Pavements and Drainage

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Name the types of airport pavement
2) Summarize the design factors of airport pavement
3) Classify different airport drainage system

Detail Course Content:

- Flexible and rigid pavements.
- Design factors of airport pavement, Design of flexible pavement, Design of rigid pavement, LCN for flexible and rigid pavements.
- Airport drainage and its necessity, factors affecting the drainage system & capacity.
- Types of drains – only name with brief description.

Module- 5: Airport Visual Aids

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Name different airport markings and lightings
2) Identify different air traffic signs

3) Explore the use of heliport

Detail Course Content:

- Airport Markings – Runway markings, Taxiway Markings, Other Markings.
- Airport Lightings – Lights at an airport, Azimuth guidance unit, Light fixtures and Light intensity.
- Air Traffic Sign – Types of sign and their uses, wind direction indicator, landing direction indicator.
- Heliport – Advantages of helicopter, Site Selection for heliport, Classification of heliport, Elevated Heliport.

Suggested learning resources

1. Khanna S. K., Arora M. G. and Jain S. S., "Airport Planning and Design", 1st Edition, Mench and Bros. Roorkee, 2009.
2. Virender Kumar and Satish Chandra. "Airport Planning and Design", - Galotia Publication press.
3. Rangwala, S. C. "Airport Engineering", Charotar Publishing House pvt. Ltd.

Saxena, S. C., "Airport Engineering Planning and Design", CBS Publishers & Distributors pvt. Ltd.

FOUNDATION ENGINEERING

Course Code	CEPE-603/B
Course Title	Foundation Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme Elective course-4

Course Outcomes: -

After completing this course, student will be able to:

1. Define and distinguish types of foundation .(K2)
2. Illustrate the consolidation characteristics of laterally confined soil and solve simple problems related to pile foundations. (K3)
3. Define and explain the subsurface exploration, soil samples (K2)

4. Solve simple numerical problems related to Stress Distribution in Soils using Boussinesq's equation. (K3)
5. Solve simple numerical problems related to settlement of foundation. (K3)

Course Content:

Module – 1: General Considerations for Design of Foundations and Types of Foundation

Number of class hours: 6 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

1. List various types of loads that come to the foundation. (K1)
2. Distinguish between shallow and deep foundation. (K2)
3. Illustrate problems related to foundation in shrinkable soils .(K3)

Detailed content of the unit: -

•Loads on foundation, Depth of foundation.

•Shallow and deep foundations and their differences. Types of shallow foundation (names only), their specific uses. Types of deep foundation (names only), their specific uses.

•Selection of foundation type, problems of foundation in shrinkable soils.

Module– 2: Consolidation and Pile foundation

Number of class hours: 12 hours

Suggestive Learning Outcomes:

At the end of module -2, students will be able to:-

1. Explain consolidation and various stages of consolidation. (K1)
2. Illustrate the consolidation characteristics of laterally confined soil. (K3)
3. Solve simple numerical problems for pile foundation. (K3)

Detailed content of the unit: -

• Definition consolidation, Principle of consolidation spring analogy, stages of consolidation, definition of compression index; co efficient of compressibility; coefficient of consolidation, consolidation characteristics of laterally confined soil, Determination of pre-consolidation pressure.

• Definition of pile foundation, places of application, classification of piles based on functions and materials.

•Formula related to pile foundations – static formula, dynamic-engineering news formula and Hiley's formula, - solution of simple problems

Module-3: Soil exploration

Number of class hours: 6 hours

Suggestive Learning Outcomes:

At the end of module -3, students will be able to:-

1. Describe various works related to soil exploration such as Preliminary work, site reconnaissance, etc. (K2)
2. Define and explain the subsurface exploration, soil samples (K2)

Detailed content of the unit: -

• Preliminary work, site reconnaissance, trial pits, boring.
• Excavation and boring methods of subsurface exploration.
• Types of soil samples, Procuring and handling of disturbed and undisturbed samples.

Module-4: Stress Distribution in Soils

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -4, students will be able to:-

1. Define various terms related to Stress Distribution in Soils. (K1)
2. State Boussinesq's equation and its assumptions . (K1)
3. Solve simple numerical problems related to Stress Distribution in Soils using Boussinesq's equation. (K3)

Detailed content of the unit: -

• Definition of point load, strip load, isobar, pressure bulb.
• Boussinesq's equation only, Boussinesq's assumptions and its application to solve simple numerical problem for determining vertical stress at a depth below the bottom of foundation.

Module-5: Settlement of foundation

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Identify primary causes of simple settlement and differential settlement. (K1)
2. State permissible limits of differential settlement as per IS:1904. (K1)
3. Solve simple numerical problems related to settlement of foundation. (K3)

Detailed content of the unit: -

• Primary causes of settlement, permissible settlement and differential settlement as per IS:1904.
• Computation of consolidation settlement – (i) when initial void ratio, final void ratio & thickness of the consolidating layer are known, (ii) when increment of pressure, coefficient of volume compressibility & thickness of the consolidating layer are known, (iii) when initial void ratio, initial pressure, increment of pressure, compression index and thickness of consolidating layer are known – simple numerical problems with solution.

References: -

1. Punmia B.C., Jain A.K. and Jain A.K., Soil Mechanics and foundations, Laxmi Publications (P) Ltd, New Delhi
2. Ranjan G. and Rao A.S.R. Basic and Applied Soil Mechanics, New Age Internationals P. Ltd.
3. Venkatramaiah C., Geotechnical Engineering, New Age Internationals P. Ltd.
4. Murthy V.N.S, Textbook of Soil Mechanics and Foundation Engineering , CBS Publishers & Distributors.
5. Modi P.N., Soil Mechanics and Foundation, Standard Book House.
6. Kumar Garg Santosh, Soil Mechanics and Foundation Engineering, Khanna Publishers.

ADVANCED DESIGN OF STRUCTURES

Course Code	CEPE-603/C
Course Title	Advanced Design of Structures
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

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

C.O.1.: Design of riveted and weldedconnections. (K2)

C.O.2.: Design of built upsections. (K2)

C.O.3.: Design of T and L shaped beamsections. (K3)

C.O.4.: Design of one way and two wayslabs. (K3)

C.O.5.: Design of RCC column and isolated footings. (K3)

Detailed Course Content

Unit – I: Design of connections in steel structures

Number of class hours: 08

Learning Outcomes:

7. Illustrate the classification, strength and design of rivetedjoints.
8. Describe the various types, advantages, disadvantages and design of weldedconnections.
9. Compute the design of column bases for axially loaded columns.

Detailed content of the unit:

- Typesofrivets,Rivetedconnections,Strengthofrivetedjoints,Designofrivetedjointsfor axially loaded members.
- Typesofweld,weldedconnections,Permissiblestressesinweld,Strengthofweld.Advantages and disadvantages of weld, Design of fillet weld and butt weld for axial load.
- Design of column bases for axially loaded columnsonly.

Unit– II: Steel Beams

Number of class hours: 08

Learning Outcomes:

1. Label the different steel sections, simple and built up sections.
2. Explain the designofbuiltupsectionsincluding shear and deflection.
3. Outline the components and functions of plate girder.

Detailed content of the unit:

- Different steel sections, Simple and built up sections, Permissible bendingstresses,
- Designofbuiltupsections(symmetricalIsectionwithcoverplatesonly),checkforshear and deflection
- Introduction to plate girder: Components and functions (nonumericals)

Unit– III: Design of RC flanged beam

Number of class hours: 08

Learning Outcomes:

1. Generalize the features of T and L beams.
2. Express the designof RC flanged beam.
3. Sketch the reinforcement details of T and L beams.

Detailed content of the unit:

- General features of T and L beams, Advantages, Effective width as per BIS456
- DesignofsinglyreinforcementTbeam,StressandStraindiagram,Depthofneutralaxis,Moment of resistance, T and L beams with neutral axis in flangeonly.
- Simple numerical problems on location of neutral axis, Effective width offlange.

Unit– IV: Design of slab

Number of class hours: 08

Learning Outcomes:

1. Distinguish between different types of RC slab.
2. Compute the design of one-way cantilever slab and two-way simply supportedslab.
3. Illustrate the design of dog-leggedstaircases.

Detailed content of the unit:

- Design of simply supported one-way slab for flexure, shear and deflection and checks, asper the provisions of BIS 456
- Design of one-way cantilever slab, Chajjas, Flexure including checks for Developmentlength and Shear stress.
- Design of two-way simply supportedslab,
- Introduction to design of dog-leggedstaircases.

Unit– V: Design of RCC Column and Footing design: Uni-axial bending

Number of class hours: 08

Learning Outcomes:

1. Define Effectivelength for various conditions of column.
2. Discuss the IS456provisions for column with uni-axial bending.
3. Calculate the design of footing for axially loaded column.

Detailed content of the unit:

- IS456provisions,Columnwithuni-axialmoment,Effectivelengthcalculations,Minimum eccentricity.
- Design of footing for axially loaded columnonly.

Suggested Learning Resources:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications,Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, NewDelhi.
3. Subramanian N., Design of Steel Structures, Oxford UniversityPress.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai,Delhi.
5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications,Pune.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand &Co.,
7. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International,Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGrawHill
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited,Delhi.

ENTREPRENEURSHIP AND START-UPS

Course Code	:	HS 604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	4 (L: 3, T:1 , P: 0)
Prerequisites (Course code)	:	None
Course Category	:	HS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur

Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk

Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.

- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974
4.	Entrepreneurship	Alpana Trehan	Dreamtech PressISBN: 978-93-5004-026-3
5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**

6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing
9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5
12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press
14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S S khanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNINGWEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

INDIAN CONSTITUTION

Course Code	:	AU-606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites (Course code)	:	None
Course Category	:	AU

Course Outcomes:

CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).

CO2. Discuss the Structure of The Indian Union Government (K2).

CO3. Memorize the Role andPower of Governor, Chief Minister and Council ofMinisters and explain the role of State Secretariat (K2).

CO4. Describe the role of Local Administration (K2).

CO5. Explain the Role andFunctioning of Election Commission (K2).

Detailed Course Content:

Unit 1 – **The Constitution – Introduction**

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the IndianConstitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

Detailed content of the unit:

1. The History of the Making of the IndianConstitution
2. Preamble and the Basic Structure, and itsinterpretation

3. Fundamental Rights and Duties and theirinterpretation
4. State PolicyPrinciples

Unit 2 – **Union Government**

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the IndianUnion Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and RajyaSabha (K2)

Detailed content of the unit:

1. Structure of the IndianUnion
2. President – Role andPower
3. Prime Minister and Council ofMinisters
4. Lok Sabha and RajyaSabha

Unit 3 – **State Government**

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council ofMinisters of a state(K1)
2. Explain the role of StateSecretariat (K2)

Detailed content of the unit:

1. Governor – Role andPower
2. Chief Minister and Council ofMinisters
3. StateSecretariat

Unit 4 – **Local Administration**

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)

2. Explain the role of MunicipalCorporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. DistrictAdministration
2. MunicipalCorporation
3. Zila Panchayat

Unit 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role andFunctioning of Election Commission (K2)
2. Classify the role and functioning of Chief ElectionCommissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role andFunctioning of Election commission
2. Chief ElectionCommissioner
3. State ElectionCommission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the In- dian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Consti- tution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

Major Project - II

Course Code	CEPR-607
Course Title	Major Project
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms (K3).

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should provide the scope to develop the following by the students-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Seminar

Course Code	CESE608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar presentation

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Develop the communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For

example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

7) Practice speaking in front of a scientific audience.
8) Explore topics in detail.
9) Research topics and organize presentations.
10) To improve as speakers, each student will receive feedback from the fellow students and the instructor.
11) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
12) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
13) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.
- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.

Explain the significance of your findings (or potential future findings).

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