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	CAPC-504	Revit Architecture	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	Manufacturing system 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 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**

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:

CO-1**:** The design of singly and doubly RC beam with shear, bond & development length. (K2)

CO-2.**:** The design of short and long RCC columns with column foundation. (K3)

CO-3: The design of one, two-way RCC slab and the design of staircase. (K3)

CO-4.**:** The design of riveted connection, welded connection and steel beam. (K2)

CO-5.**:** The design of steel tension and compression member. (K3)

Detailed Course Content

Module–1: 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 minimum shear reinforcement 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.
- Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section.
- Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of A_{st} and A_{SC}. Design for RC flanged beam.
- Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement of beam andlintel, Minimum Shear Reinforcement, Provisions of IS 456(2000), forms of shear reinforcement.
- 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 of bars.

Module-2 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 ofcolumn. Provisions of IS 456(2000) for minimum steel, cover, maximum steel, spacing of ties etc.
- Design of axially loaded short column - Square, Rectangular, and Circular only.
- 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.

Module-3 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 (2000) 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(2000).
- 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.

Module-4 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 columnswith 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 stress calculations. Design of simple I and Channel section. Check for shear as per IS800.

Module-5 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 gyration and slenderness ratio for steel column.
3. Explain the built–up sections, lacing and battening.

Detailed content of the unit:-

- Types of sections used for Tension members.Design of axially loaded single angle and double angle tension members with bolted and welded connections.
- Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800(2007), Design compressive stress.
- Introduction to built–up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).
- Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.

Suggested Learning Resources:

- Shah, V.L.,and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune, 2014.
- Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co.,New Delhi.
- Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New AgeInternational, 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 University Press.
- Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

- Uniform Building Code (UBC-97)
- British Standard (BS-8500-2)

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 of works. **(K3)**

2) Prepare approximate estimate of a civil engineering works. **(K3)**

3) Prepare detailed estimate of a civil engineering works. **(K3)**

4) Use relevant software for estimating the quantities and cost of items of works. **(K3)**

5) Justify rate for given items of work using rate analysis techniques. **(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 Engineering works
3) Understand roles and responsibility of estimator
4) Prepare standard formats of measurement sheet, Abstract sheet, Face sheet.

Detailed content of the unit:

- Estimating and Costing– Meaning, purpose, administrative approval, Technical Sanction and Budget provision.
- Types of estimates – Approximate and Detailed estimate.
- Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate.
- Roles and responsibility of Estimator.
- Checklist of items in load bearing and framed structure.

- Standard formats of Measurement sheet, Abstract sheet, Face sheet.
- Modes of measurement and desired accuracy in measurements for different items of work as per IS: 1200 (1992).
- Rules for deduction in different category of work as per IS: 1200 (1992).
- 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, irrigation projects and water 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)
- Approximate estimate for roads, Railways, bridges/ culvert, irrigation projects and water 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 slab elements

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 and Abstracting.
- Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numerical)
- Long wall and short wall method, Centre line method.
- Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements
- Provisions in detailed estimate: contingencies, work charged establishment, percentagecharges, water supply and sanitary Charges and electrification charges etc.
- Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

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 formula method.
- Detailed estimate for septic tank, Community well.
- Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.

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 rate analysis.
- Task work- Definition, types. Task work of different skilled labour for different items.
- 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 and roads.

References: -

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt.Ltd. New Delhi.
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 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 civil engineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specificationsand Analysis of Schedule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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 compression member. (K2)

C.O.2.**:** Design of steel beams including check for shear. (K2)

C.O.3.**:** Design of singly and doubly reinforced RCC beam. (K3)

C.O.4.**:** Design of shear reinforcement in RC beams. (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 (2007) required for the design of tension member and compressionmember in report form.
3	Draw sketches for battening, single & double lacing of given built up columns.
4	Prepare a report on the IS 800 (2007) provisions pertaining to design of lacing & battening along with itssignificance.
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 University Press.
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 ConcreteStructures, Structures Publications, Pune,2014.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
7. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, NewAge International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, NewDelhi.
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

REVIT ARCHITECHTURE LAB.

Course Code	CAPC-504
Course Title	Revit architecture 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)
- 3D model (K3)
- Discover the process of Plotting drawings in revit (K3)
- Express by practicing with complete drawing (K2)

Course Content:-

Number of class hours: 25 Hours

List of Practical to be performed:

1. Introduction to Revit Architecture, User Interface, Options and Help, Starting an Architectural Project, Starting a New Architectural Project, Navigation Tools, Creating Walls, Creating Architectural Walls, Creating Architectural Walls II.
2. Using Basic Building Components: Adding Doors, Adding Window and Wall Openings, Using the Editing Tools: Working with Selection Sets, Editing Tools, Editing Tools II, Grouping, Retrieving Information about Elements.
3. Datum Planes and Creating Standard Views: Working with Reference Planes, Working with Levels, Working with Grids, Working with Project Views.

4. Using Basic Building Components II: Creating Floors, Creating Roofs, Shape Editing Tools, Creating Ceilings, Adding Rooms.
5. Using Basic Building Components III: Working with Components, Adding Stairs, Adding Railings and Ramps, Creating Curtain Walls.

References: -

1. Student version Autodesk product as REVIT Architechture.

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 (regular polygon)
–PLINE command–DONUT command–POINT command–Construction Line: XLINE command, RAY command– 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 centre lines, 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 – Editing Attributes

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) Recognize 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) Recognize 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.
6. Roger P.Roess, Traffic Engineering, Pearson, 4th Edition.

MANUFACTURING SYSTEM MANAGEMENT

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

Course Objectives: -

CO1: Learn about location, layout and organization principle of production plant. (K1)
CO2: Discus about production planning and control. (K2)
CO3: Classify the analysis techniques of manufacturing system. (K2)
CO4: Discuss about work measurement of manufacturing system. (K2)
CO5: Discus about industrial maintenance and development of management principles. (K2)

Detail course:

Module 1

Introduction

Production functions Plant Organization: Organization principles of organization, Organization structure-line and staff organization. Plant Location, Layout: Process layout product layout and combination – methods of layout, economics of layout; group technology.

Module 2

Production planning & control

Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling production control.

Module 3

Method Study: Definition and concepts, method study procedures, symbols, advantages, Flow process charts, Motion study, micro motion, SIMO charts, Systems Concepts, Classification analysis techniques.

Module 4

Work measurement

Definition, objectives & techniques, Time study equipment, performance rating, allowances, standard time, work sampling, PMTS.

Module 5

Industrial maintenance

Types, organization for maintenance department, Breakdown and preventive maintenance.

Inventory control and replacement analysis: Introduction replacement policy and method adopted, EOQ. Development of management principles, scientific management, human relation aspects.

References: -

- Ravi Shankar, ―Industrial Engg. & Management‖, Galgotia Publications
- S.K. Sharma, ―Industrial Engg. & Operation Management‖, S.K. Kataria & Sons.
- Joseph S. Martinich, ―Production & Operation Management‖, John Wiley & SonsSharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand

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 green building(K3).

CO 2. Analyze the different steps in the environmental impact assessment(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 green materials(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, building form, orientation, building envelope and fenestration (K2)
3. Discover the Material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction (K3)

Detailed content of the unit:

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

Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor AirQuality.

Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration.

Material and construction techniques, roofs, walls, fenestration and shaded finishes.

Advanced passive heating and cooling techniques.

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

Number of Class hours: 08

Learning Outcomes:

Identify the energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs (K2)

1. Analyze the Environmental Impact Assessment (EIA): Introduction, EIA regulations, Steps inenvironmental impact assessment process(K4)
2. List the benefits and Limitations of EIA(K1)
3. Identify the Environmental clearance for the civil engineering projects.(K2)

Detailed content of the unit:

Energy Audit: Meaning, Necessity, Procedures, Types.

Energy Management Programs.

Environmental Impact Assessment (EIA): Introduction, EIA regulations, Steps in environmental impact assessment process.

Benefits of EIA, Limitations of EIA.

Environmental clearance for the civil engineering projects

Module-3: Energy and Energy conservation

Number of Class hours: 08

Learning Outcomes:

1. Identify the Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Bio-mass Energy (K2)
2. Identify the Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Bio-fuels. (K2)
3. Discover the Energy conservation: Introduction, Specific objectives, present scenario, Need of energy conservation(K3)
4. Examine the LEED, India Rating System and Energy Efficiency. (k4)

Detailed content of the unit:

Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Bio-mass Energy

Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, NuclearEnergy,

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

Energy conservation: Introduction, Specific objectives, present scenario,

Need of energy conservation

LEED, India Rating System and Energy Efficiency.

Module-4: Green Building

Number of Class hours: 08

Learning Outcomes:

1. Define the Green building, Benefits of Green building(K1)
2. Identify the Principles and planning of Green building(K2)
3. Discover the Salient features of Green Building, Environmental design (ED) strategies for building construction (K3)
4. Explain the process of Improvement in environmental quality in civil structure(K3)
5. Classify the Green building materials and products(K2)

6. **Detailed content of the unit:**

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

Principles: Principles and planning of Green building

Features: Salient features of Green Building, Environmental design (ED) strategies for building construction.

Process: Improvement in environmental quality in civil structure

Materials: Green building materials and products- Bamboo, Rice husk ashconcrete,

plastic bricks, Bagasse particle board.
Insulated concrete forms.
reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing

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

Learning Outcomes:

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

Detailed content of the unit:

Introduction to (LEED)criteria,

Indian Green Building council (IGBC) Green rating,

Green Rating for Integrated Habitat Assessment. (GRIHA)criteria

Heating Ventilation Air Conditioning (HVAC) unit in green Building

Functions of Government organization working for Energy conservation and Audit (ECA)-

National Productivity council (NPC)

Ministry of New and Renewable *Energy* (MNRE)

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, DS Sreevasthava, SK., Non- conventional Energy Resources, New Age International Publishers, NewDelhi.

3 O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

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

5 Sam Kubba., Hand book of Green Building Design and Construction, 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 of construction. (K1)

C.O.2.: Use relevant components for pre-fabricated structures. (K2)

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

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

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

Detailed Course Content

Module-1: Precast concrete Elements

Number of class hours: 08

Learning Outcomes:

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

Detailed content of the unit:

- Advantages and disadvantages of precast concrete members
- Non-structural Precast elements-Paver blocks, Fencing Poles, Transmission Poles, 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, sheet piles
- Testing of Precast components as per BIS standards

Module-2: Prefabricated building

Number of class hours: 08

Learning Outcomes:

1. Identify the precast structural building components.
2. Choose to use the relevant components for pre-fabricated structures.
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, staircase elements,
- Prefabricated building using precast load bearing and non-load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications
- Modular co-ordination, modular grid, and finishes
- Prefab systems and structural schemes and their classification including design considerations
- Joints – requirements of structural joints and their design considerations
- Manufacturing, storage, curing, transportation and erection of above elements, equipment needed

Module-3: 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-stressed concrete.
3. Use of pre-stressing steels.

Detailed content of the unit:

- Principles of pre-stressed concrete and basic terminology.
- Applications, advantages and disadvantages of pre stressed concrete
- Materials used and their properties, Necessity of high-grade materials
- Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications

Module-4: Methods and systems of prestressing

Number of class hours: 08

Learning Outcomes:

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

Detailed content of the unit:

- Methods of prestressing–Internal and External pre-stressing, Pre and Posttensioning 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 anchoring stage.
- 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 of (pre-stress).

- BIS recommendations for percentage loss in case of Pre and Posttensioning.

Module– 5: Analysis and design of Prestressed rectangular beam section

Number of class hours: 08

Learning Outcomes:

1. Illustrate the assumptions in analysis of pre-stressed concrete beams.
2. Relate the effect of cable profile on maximum stresses at mid span and at support.
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 concrete beams.
- Cable Profile in simply supported rectangular beam section – concentric, eccentric straightand parabolic
- Effect of cable profile on maximum stresses at mid span and at support.
- Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only.
- Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)

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, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Technology, Create space Independent Publication.
4. Indian Concrete Institute., Handbook on Precast Concrete buildings.
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 Education India
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. IS 458 (2003) Precast Concrete Pipes (with and without reinforcement)—Specifica- tion, 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 simulatedin 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 newproduct/ Business Plan/ registration ofstart-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all theactivities 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 accountof 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 utilizing 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.