

West Bengal State Council of Technical &
Vocational Education and Skill
Development
(Technical Education Division)



Syllabus
of
Diploma in Civil Engineering [CE]

Part-III (5th Semester)

Revised 2022

**CURRICULAR STRUCTURE FOR PART – III FIRST SEMESTER
(FIFTH SEMESTER) OF THE
FULL-TIME DIPLOMA COURSE IN CIVIL ENGINEERING**

S L. N O.	SUBJECT CODE	SUBJECT OF STUDY	HOURS PER WEEK			CREDI TS	Marks	Page No.
		THEORETICAL PAPERS	LECT URE	TUTO RIAL	PRAC TICAL			
1	CEPC501	Water Resource Engineering	2	0	0	2	100	
2	CEPC502	Estimating, Costing and Valuation	3	0	0	3	100	
		LABORATORY/SESSIONAL PAPERS						
3	CEPC503S	Design of RCC and Steel Structure Practices	0	0	2	1	100	
4	CEPC504S	Estimating, Costing and Valuation Practices	0	0	2	1	100	
5	CEPC505S	Water Resource Engineering Practices	0	0	2	1	100	
		ELECTIVE, PROJECT AND INTERNSHIP						
6	CEPE506	Elective - II: one subject out of Advanced Design of Structures (CEPE506/I) / Traffic Engineering (CEPE506/II)	3	0	0	3	100	
7	CEPE507	Elective - III: one subject out of Building Services and Maintenance (CEPE507/I) / Repair and Maintenance of Structures (CEPE507/II)	3	0	0	3	100	
8	CEI508	Internship-II after fourth Semester	0	0	0	1	100	
9	CEPR509S	Major Project I	0	0	4	2	100	
10	CEPC510	Safety Engineering & Management in the Construction Sector	2	0	0	2	100	
		TOTAL	13	0	10	19	1000	

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Water Resource Engineering	Course Code	CEPC501
Subject offered in Semester	Fifth	Number of Credits	2 (L:2, T: 0, P: 0)
Prerequisites	NIL	Course Category	PC
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

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

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Course Content:

Unit – I Introduction to Hydrology

- Hydrology: Definition and Hydrological cycle
- Rain Gauge: Symons rain gauge, automatic rain gauge
- Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Thiessen polygon method.

- Runoff, concept of hydrograph, Factors affecting Run off, Computation of run-off [using runoff coefficient method]
- Maximum Flood Discharge measurement: Rational methods, Simple numerical problems.
- Simple numerical problems.

Unit- II Crop water requirement and Reservoir Planning

- Irrigation and its classification
- Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, methods for improving duties, Problems on water requirement and capacity of canal, Kor irrigation, kor depth of water, kor period, paleo irrigation, capacity factor, outlet factor, time factor, cumec day, overlap allowance
- Methods of application of irrigation water, their merits and demerits, suitability
- Silting of reservoir, Rate of silting, factors affecting silting and control measures.
- Control levels and storage in reservoir - definition of different related technical terms explained with a neat sketch, Area capacity curve

Unit- III Dams and Spillways

- Dams and its classification: Earthen dams and Gravity dams (masonry and concrete)
- Earthen Dams – Components with function, typical cross section, 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, inspection gallery, drainage gallery, joints in gravity dam, concept of high dam and low dam.
- Spillways - Definition, function, location, types, spillway gates - types and function, Energy dissipaters and types.

Unit- IV Minor and Micro Irrigation

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

Unit- V Diversion Head Works & Canals

Brief discourses on

- Weirs – components, parts, types only
- 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.
10. Relevant BIS codes

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

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

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Estimating, Costing and Valuation	Course Code	CEPC502
Subject offered in Semester	Fifth	Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL	Course Category	PC
Question distribution	As per standing norms of WBSCT&VE&SD	Mark distribution	As per standing norms of WBSCT&VE&SD

Objective:- Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To acquire knowledge on simple terms and concepts related to valuation

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Contents:

Unit – I Fundamentals of Estimating and Costing

- Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction
- Types of estimates – Approximate and Detailed estimate.
- Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate.

- 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.
- Rules for deduction in different category of work as per IS:1200.
- Description / specification of items of building work as per PWD
- Approximate estimate for roads, culvert

Unit- II Approximate Estimates

- Approximate estimate- Definition, Purpose.
- Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Approximate quantity method (with simple numerical)

Unit- III Detailed Estimate

- 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.
- Long wall and Short wall method, Centre line method – for building
- Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements
- Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.
- Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

Unit- IV Estimate for other Civil Engineering Works

- 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.
- Case study – steel structure - industrial shed, chimney, transmission tower and like structure, frame and shutter of door window (wooden, steel)

Unit- V Rate Analysis and Valuation

- 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.
- Definition, purpose and importance of valuation.
- Factors affecting the value of a property. Simple definitions and concepts on scrap value, salvage value, market value, booked value, assessed value, sinking fund, depreciation, obsolescence.
- Different methods of valuation.

Suggested learning resources:

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

Course outcomes:

After completing this course, student will be able to:

- ✓ Select modes of measurements for different items of works.
- ✓ Prepare approximate estimate of a civil engineering works.
- ✓ Prepare detailed estimate of a civil engineering works.
- ✓ Justify rate for given items of work using rate analysis techniques.
- ✓ Acquire general ideas on valuation.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Design of R.C.C and Steel Structure Practices	Course Code	CEPC503S
Subject offered in Semester	Fifth	Number of Credits	1 (L:0, T: 0, P: 2)
Prerequisites	NIL	Course Category	PC
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To learn the concept of limit state design of tension and compression steel members.
- To understand design of steel beams.
- To learn the concept of limit state design of RCC beams.
- To know the limit state design of RCC columns.

List of Practical to be performed [application of CAD is mandatory]:

Sl no 6 to 11 is compulsory, one from 13 &14 is desirable and at least one from the rest

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 a. tension member b. compression members c. flexural members in report form.
3	Draw sketches for a. single lacing b. double lacing and c. battening of a given built up columns.
4	Draw cross section, strain diagram & stress diagram for a. singly reinforced section and b. doubly reinforced section.
5	Draw sketches of different types of column footings.
6	Prepare a plan and draw sectional elevation showing reinforcement detailing in the longer and shorter direction of a single span [four edges discontinuous] for a. one way slab and b. two way slab
7	Prepare a plan and draw sectional elevations showing reinforcement detailing in the longer and shorter direction of two or more span of a two-way slab (having two adjacent edges discontinuous) inclusive of reinforcement for negative moment at support and torsional reinforcement where required.

8	Draw a sectional elevation showing reinforcement detailing of a beam having three span of unequal /equal length with cross section details at midspan and support
9	Prepare a plan and draw a sectional elevation showing reinforcement detailing for a typical isolated square footing having one column
10	Prepare a plan and draw a sectional elevation showing reinforcement detailing of a typical waist slab and landing for single flight of a dog-legged stair
11	Prepare a plan and draw a sectional elevation showing reinforcement detailing of a typical lintel with chajja
12	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements and Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
13	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
14	Prepare a detailed report of site visit for study of different elements of a bridge and roof truss

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 Concrete Structures, 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, 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.

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

- Design of steel tension and compression member.
- Design of steel beams including check for shear.
- Design of singly and doubly reinforced RCC beam.
- Design of shear reinforcement in RC beams.
- Design of RCC column as per IS 456.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Estimating, Costing and Valuation Practices	Course Code	CEPC504S
Subject offered in Semester	Fifth	Number of Credits	1 (L:0, T: 0, P: 2)
Prerequisites	NIL	Course Category	PC
Question distribution		Marks distribution	

Objective:- Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.

List of Practical to be performed:

Application of spreadsheet is advised

SL no 6 to 11, 13 and 17 is compulsory and at least two from the rest

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 & equipment required to construct the given structure as mentioned in at Serial number 1 above.
3	Study of items with specification given in the PWD Schedule of Rates. (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 for buildings, road and culvert.

7	Prepare detailed estimate from the given set of drawings using “standard measurement and abstract format” for (G+1), 2 BHK RCC framed structure Residential Building using description of item from PWD Schedule of Rates along with face sheet and prepare quarry chart, lead statement.
8	Prepare detailed estimate from the given set of drawings of Door(panelled door) and Window(partly glazed) - frame and shutter [wooden]
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 Tube well with Hand pump from the given set of drawing.
14	Assess the valuation of an old building from the given drawing by any one method.
15	Prepare detailed estimate for a two lane bituminous road and culvert (slab type)
16	methods of stack measurement at site for stone chips etc
17	Prepare detailed estimate of steel roof truss

Suggested learning resources:

1. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
2. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
3. PWD Schedule of Rates.
4. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
5. Peurifoy,Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGraw Hill Education, New Delhi.
6. Rangwala,S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.

7. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
8. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Justify rate for given items of work using rate analysis techniques.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Water Resource Engineering Practices	Course Code	CEPC505S
Subject offered in Semester	Fifth	Number of Credits	1 (L:0, T: 0, P: 2)
Prerequisites	NIL	Course Category	PC
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To get acquainted with irrigation projects, canals and other diversion works.

List of Practical to be performed:

Sl no 1 to 6 mandatory, at least one from Sl no 7-11 and at least one from the rest

1.	Calculate average rainfall for the given area using isohyetal, Thiessen polygon method [only simple cases]
2.	Compute the yield of the Catchment area demarcated in the previous problem
3.	Delineation of contributory area for the given outlet from the given topo-sheet
4.	Estimate water requirement of crops in different season from data provided by the subject teacher.
5.	Estimate capacity of the canal for the data provided by the subject teacher.
6.	Calculate reservoir capacity from the data provided by the subject teacher.
7.	Draw a neat sketch showing different control levels and storage for a reservoir.

8.	Draw a labeled sketch of the given different types of earthen dam section
9.	Draw the theoretical and practical profile of the given high type gravity dam section.
10.	Draw a labeled sketch of the given diversion head works and Cross Drainage works.
11.	Draw a labeled sketch of a canal section - a. in partly cutting and partly filling b. fully in cutting c. fully in filling.
12.	Prepare a presentation on the technical details of any one micro or minor irrigation scheme.
13.	Prepare a model of any irrigation structure using suitable material.
14.	Prepare summary of the technical details of any existing water resource project in West Bengal

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

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

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Elective - II: Advanced Design of Structures	Course Code	CEPE506/I
Subject offered in Semester	Fifth	Number of Credits	3(L:3, T: 0, P: 0)
Prerequisites	NIL	Course Category	PE
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To analyze T and L shaped beam sections.
- To understand the concept for design of one way and two way slabs.
- To identify short and long columns and their design provisions.
- To understand the concepts involved in the design of bolted and welded connections.
- To know the provisions of BIS code for design of built up sections.

Module / Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Course Content:

Unit 1: Design of Concrete Slab (LSM)

- Design and detailing of simply supported one-way slabs for flexure, check for deflection control, and shear.
- Design and detailing of one-way cantilever slabs and cantilevers chajjas for flexure, check for deflection control and check for development length and shear.

- Design and detailing of two-way simply supported slabs for flexure with corner free to lift.
- Design and detailing of dog-legged stair.
- Simple numerical problems on design of one-way simply supported slabs, cantilever slab, two-way simply supported slab, waist slab and landing slab of a dog-legged stair.

Unit 2: Design of Axially Loaded Concrete Column and Footing (LSM)

- Assumptions in limit state of collapse – compression
- Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
- Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied.
- Types of footing, Design of isolated square footing of uniform thickness for flexure, and shear.
- Simple numerical problems on the design of axially loaded short columns and isolated square footing.

Unit-3 Design of Steel Tension Members and Compression Members by L.S.M

- Tension Members - introduction and different provision of relevant code, Design Strength of Tension members against yielding of gross section requirements: Deflection limits, Vibration, Durability and Fire resistance against rupture of critical section and due to block shear. Problems on determination of design strength of given members and designing tension members using rolled steel sections for given loads.
- Compression Members - Effective Length and Effective Sectional Area of Compression members, Design Stress and design strength – Buckling Class of cross sections– Imperfection factor– Stress reduction factor– Thickness of elements.
- Analysis and design of axially loaded column.
- Introduction to lacing and battening (No numerical problem on Lacing and Battening).

Unit- 4 Column Bases by L.S.M

- Slab base and Gusseted base – Code Provisions (IS:800-2007) – Minimum thickness and Effective Area of Base plate.
- Design of Slab base for axially loaded columns using bolts /welds.
- Introduction to Gusseted base(no numerical problems on gusseted Base).

Unit- 5 Steel Roof Truss

- Types of steel roof truss & its selection criteria.
- Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987.
- Analysis and Design of steel roof truss. Design of Angle purlin as per I. S. Arrangement of members at supports.

Suggested learning resources:

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

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

- Design of R.C.C one way, two way and waist slab
- Design of R.C.C axially loaded short column and isolated column footing
- Design of steel tension member, compression member and column base by limit state method
- Design of steel roof truss

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Elective – II: Traffic Engineering	Course Code	CEPE506/II
Subject offered in Semester	Fifth	Number of Credits	3(L:3, T: 0, P: 0)
Prerequisites	NIL	Course Category	PE
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Objective:- Following are the objectives of this course:

- To understand the issues involved in traffic flow.
- To know and understand the tools for traffic studies.
- To delineate various traffic control measures.
- To understand measures for preventing accidents.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III and V
Module C /Group C	Unit IV

Contents:

Unit – I: Fundamentals of Traffic Engineering.

- 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 tyre surface.
- Reaction time - factors affecting reaction time. PIEV Theory.

Unit– II: Traffic Studies

- 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.

Unit– III: Road Signs and Traffic Markings

- Traffic control devices –definition, necessity, types.
- Road signs - definition, objects of road signs.
- Classification as per IRC: 67- Mandatory or Regulatory, Cautionary or warning, informative 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.

Unit– IV Traffic Signals and Traffic Islands

- 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.
- Conflict points
- 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, underpass.

Unit– V Road Accident Studies and Arboriculture

- 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:

- Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
- Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi
- Vazirani, V N , Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.
- Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
- Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.
- Dr. Sharma, S. K., Principles, Practices and Design of Highway Engineering , S. Chand & Company Ltd., New Delhi

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

- Analyze road traffic characteristics.
- Undertake various types of road traffic studies.
- Use relevant road traffic signs, signal and markings.
- Identify the intersection depending on the traffic flow.
- Suggest preventive measures to avoid accidents by analyzing the traffic conditions at site.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Elective - III : Building Services and Maintenance	Course Code	CEPE507/I
Subject offered in Semester	Fifth	Number of Credits	3(L:3, T: 0, P: 0)
Prerequisites	NIL	Course Category	PE
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives:

Following are the objectives of this course:

- To know the procedure for classifying various types of buildingservices.
- To know the fire safety requirements for multi-storeyedbuilding.
- To devise suitable plumbing system for given type ofbuilding.
- To understand the procedure for rain water harvesting and solar waterheater.
- Toknowthesystemfordesigninglighting,ventilationandacousticsforanybuilding.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III and V
Module C /Group C	Unit IV

Course Content:

Unit – I Overview of Building Services

- Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of buildingservice- si.e.HVAC(Heat,VentilationandAirConditioning),Escalatorsandlifts,firesafety, protectionandcon- trol,plumbingservices,rainwaterharvesting,solarwaterheatingsystem, lighting, lightening proof arrangement in building, acoustics, sound insulation and electric installationetc.
- Role and responsibility of Building Service Engineers and Plumbers, licensing of a plumber, Introduction to BMS (Building Management Services), Role of BMS, concept of smart building.

Unit– II Modes of vertical communication

- 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, EmergencyCall Push, machine roometc., Design provisions for basic size calculation of space enclosure to accommodate lift services, number of re- quired lifts in multi-storeyed apartment, 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,safety measures.

Unit– III Fire Safety

- Fire protection requirements for multi-storeyed building, causes of fire in build- ing, Fire detecting and various extinguishing systems, Working principles of vari- ous fire protection systems.
- Safety against fire in residential and public buildings (cinema hall, theatrehall,

mall and other multi-storeyed buildings), 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 for evacuation.

Unit– IV Plumbing Services

- Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminology 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 reclaimed water, maintenance of building drainage.
- Different types of pipes, common joints and valves, materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.

Unit– V Lighting, Ventilation and Acoustics

- 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 and maintenance.
- 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-indirect and direct-indirect), types of light control (manual switch, one way and two way switch, remote switch, timer switch and photo-electric cell switch), types of lamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes.
- Concept of ventilation, necessity and Types of ventilation.
- Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavity resonator), factors to be considered in acoustic design

of cinema halls and auditoriums.

Suggested learning resources:

1. Patil, S. M., Building Services, Seema Publication, Mumbai.
2. Mantri and San-deep., The A to Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi.
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publications, New Delhi.
4. Deolalikar, S. G., Plumbing Design and Practice, McGraw-Hill,
5. Akhil Kumar-Das., Principles of Fire Safety Engineering: Understanding Fire and Fire Protection, PHI Learning Pvt. Ltd, New Delhi.
6. Shraman N L, Solar panel installation guide & user manual, The Memory Guru of India.
7. Gupta M K, Practical handbook on building maintenance - Civil works, Nabhi-Publications.
8. BIS., National Building Code Part 1, 4, 8, 9., Bureau of Indian Standard, New Delhi
9. BIS., IS 12183 (Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, New Delhi
10. BIS., 2008 Uniform Plumbing Code – India (UPC- I)., Bureau of Indian Standard

Course outcomes:

After completing this course, student will be able to:

- Classify various types of building services as per functional requirements.
- Propose the fire safety requirements for multi-storeyed building.
- Devise suitable water supply and sanitation system for given type of building.
- Evaluate the potential of rain water harvesting and solar water heater system for the given type of building.
- Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type of building.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Elective - III : Repair and Maintenance of Structures	Course Code	(CEPE507/II)
Subject offered in Semester	Fifth	Number of Credits	3 (L:3, T: 0, P:0)
Prerequisites	NIL	Course Category	PE
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To learn about types of maintenance techniques
- To understand causes of various types of damages.
- To know about relevant materials for repair.
- To learn methods of retrofitting for different structures.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III and V
Module C /Group C	Unit IV

Course Content:

Unit – I Basics of maintenance

- Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration.
- Necessity, objectives and importance of maintenance.
- Approach of effective management for maintenance.
- Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

Unit- II Causes and detection of damages

- Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement.
- Various aspects of visual observations for detection of damages.
- Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge.
- Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

Unit- III Materials for maintenance and repairs

- Types of repair material, material selection.
- Essential parameters for maintenance and repair materials such - bond with substrate, durability.
- Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.
- Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.
- Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.

Unit- IV Maintenance and repair methods for masonry Construction

- Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation.
- Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.
- Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.
- Remedial measures for dampness & efflorescence in wall.

Unit- V Maintenance and repair methods for RCC Construction

- Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation

- Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.
- Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting, guniting, shotcreting
- Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.

Suggested learning resources:

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi
2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies
3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
4. Relevant BIS codes
5. CPWD Maintenance Manual 2012

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

- Decide which type of maintenance is needed for a given damaged structure
- Assess causes of damages various types of structures. • Select the relevant material for repair of the given structure.
- Apply relevant method of retrofitting for re-strengthening of structures.
- Suggest relevant technique to restore the damages of the given structural elements

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Internship-II after fourth Semester	Course Code	CEI508
Subject offered in Semester	Fifth	Number of Credits	1 (L:0, T: 0, P: 0)
Prerequisites	NIL	Course Category	I
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- To participate in industrial environment and Civil Engineering activities.
- To study on supervision of field level works.
- To work part of working drawings.
- To be involved with online courses.

NOTE: Activity(s) from the following has to be performed and prepare a report on the activity together with presentation before the subject teacher.

Activities may be arranged by the West Bengal State Council of Technical and Vocational Education & Skill Development.

Board of Practical Studies, MSME or Department of Small Scale Industries or other engineering department of State Government may be involved. Initiative from the Department of Technical Education, Training and Skill Development is highly solicited.

Activities centering Private organization in the arena of civil engineering construction/ planning and design/ supervision/marketing etc may also be considered.

It may be arranged in-campus or off-campus; online or offline mode or blended mode.

Activities may be conducted continuously for stipulated period of time or may be arranged in a staggered fashion – in the later case Saturday and Sunday may be utilized for the Internship Program and accordingly class schedule will have to be arranged.

Activities may be performed by a group of students or may be done by individually under the guidance of subject teacher(s)

At least one activity has to be performed:

1	To participate and study site layout, excavation of sites, masonry works, concreting or any other field level construction activities at site.
2	To study and observe on Soil Testing and prepare Report required for multi-storey building construction or any other Civil Engineering Construction Project.
3	To visit Civil Engineering consultancy-cum-design office, study and get brief idea about Staad-Pro or any other design or civil engineering software.
4	To visit company related to workshop oriented or fabrication jobs and get brief ideas on these.
5	To be accustomed with Massive open online courses (Moocs) under Swayam Platform; register and study on course selected by Civil Engineering Faculty of the Institute for duration as fixed by WBSCTVESD. NO certificate to be produced during internal or external sessional examination. Only knowledge student can gather will be judged and evaluated accordingly.
6	To undertake any other suitable training or Internship programme selected by Civil Engineering Faculty of the Institute for duration as fixed by WBSCTVESD

After completion of each internship, the student should prepare a comprehensive report to indicate what he/she has observed and learnt in the training period. The student may contact Industrial supervisor/Faculty member/TPO for assigning topics and problems and should prepare the final report on assigned topics. The training report should be signed by the Industrial supervisor/Internship Faculty member, TPO and HOD.

The internship report will be evaluated on the basis of following criteria (as applicable):

Sl no	Criteria for evaluation of Internship Report
1	Originality
2	Adequacy and purposeful writeup
3	Organization, format, drawing, sketches style language
4	Practical applications and relationship with basic

	theory
5	Concepts taught in the course outcomes
6	Attendance record, daily diary, quality of the internship report

Seminars must be arranged for the students based on his/her training report, before an internal committee constituted by the concerned department of the institute. The evaluation will be based on the following criteria:

Sl no	Criteria for evaluation of Internship Report
1	Quality of content presented
2	Proper planning for presentation
3	Effectiveness of presentation
4	Depth of knowledge and skills
5	Viva voce

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

- Understand the brief knowledge of industrial activities.
- Perform online courses under Moocs or other courses.
- Project the industrial activities with his/her different courses of Diploma in Civil Engineering.

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Major Project I	Course Code	CEPR509S
Subject offered in Semester	Fifth	Number of Credits	2 (L:0, T: 0, P: 4)
Prerequisites	NIL	Course Category	PR
Question distribution		Marks distribution	As per standing norms of WBSCT&VE&SD

Objective: - Following are the objectives of this course:

- To collect the information for a given project.
- To apply principles, theorems and bye-laws in the project planning and design.
- To interpret and analyze the data.
- To develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
- To develop presentation skill.
- To enhance creative thinking.

The project report shall be in the following format:

(The project shall be undertaken by a group of 4 to 6 students)

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

NOTE: Same Planning, Drawings and detailing of the problem given in the semester 4 will have be used in Major Project I and Major Project II in semester 5 and 6. All draw-

ing will be done using CAD.

Contents:-

- Title of the Project:-Planning and designing of (G+2) Residential Complex for Middle Income Group.
- The details of the Project are given below:-

(Same topic from the 4th semester shall be considered)

- Each building (RCC framed structure) shall comprise of two symmetrical flat per floor each containing two rooms, bath, WC, kitchen, front verandah with a provision of common staircase and mumty for utilization of roof space and overhead water tank (around 210 sq m. covered area for each building unit and total 100 Nos of flat in the Complex of around 10000 sq m. of total land area) Ground floor to be used for parking spaces.
- The following provisions are to be considered during the project planning:- a) Security room(Single room with WC, Load bearing wall structure), b) Central Park, c) Play Ground, d) Hume Pipe Culvert in between the complex and the 12m wide main road, e) Boundary Wall with main gate, f) Submersible Pump, g) Pump House (Load bearing wall structure), h) Surface Drainage System, i) Bituminous road over WBM inside the complex etc.

The project report shall include:-

1) Load calculation & design of all structural components, structural details – reinforcement of: floor slab (as a whole), critical beam, central column and corner column including footing (Drawing of trench plan), tie beam(tie beam layout plan, and reinforcement detailing), stair with landing etc.

2) Details structural drawing of

a. RCC footing, Column, Beam, Lintel and chajja, staircase – landing slab and waist slab, stringer beam etc., floor slab and roof slab

b. drawing of various types of doors and windows etc. used in construction

3) Prepare bar bending schedule and determine cutting length of all structural items of workshop

4) Prepare a design mix for the project

5) Specification of different items of works

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

- **Design various structural members of the building.**
- **Prepare the drawing and detailing of project by using various drafting softwares.**
- Prepare bar bending schedule of an items of works
- Write specifications for different items of works.
- **Solve the problem by working in a group.**

Name of the Course	Diploma in Civil Engineering	Course duration	6 semester
Course Title	Safety Engineering & Management in the Construction Sector	Course Code	CEPC510
Subject offered in Semester	Fifth	Number of Credits	2 (L:2, T: 0, P: 0)
Prerequisites	NIL	Course Category	PC
Question distribution	As per standing norms of WBSCT&VE&SD	Marks distribution	As per standing norms of WBSCT&VE&SD

Course Objectives: Following are the objectives of this course:

- to be able to comprehend the various safety guidelines applicable for different construction industries
- to be able to understand various hazard and contaminant discharges related to various construction industries
- to be able to plan and implement effective control measures to prevent health hazards, accident and unwanted contaminant discharge from different construction industries.

Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester]	Distribution of unit
Module A/Group A	Unit I and II
Module B/Group B	Unit III
Module C /Group C	Unit IV and V

Course Content:

Unit 1: Safety Philosophy:

Physical, Physiological and Psychological Factors of Safety. Safety Education and Training. Employees Participation in Safety. Economics of Safety. Behavioral Safety culture and motivation. Safety Laws: Provisions of Factories Act and Rules, Employees State Insurance Act.

Unit 2: Safety Management system & Guidelines:

Key elements of Safety Management system & Guidelines (ISO 14001, ISO 45001:2018/OHSAS 18001 etc.), ILO Legislation – Convention and Recommendation concerning Safety, Health and Environment – Safety, Health and Environment as Human Right Issue, Awareness programme, types of occupational health hazards in industries, physical, chemical, biological, mechanical and psychological hazards, common work related or occupational diseases, occupations involving risk of contracting these diseases, mode of causation of the diseases and its effect, diagnostic methods, methods of prevention, notifiable occupational diseases, compensation for occupational diseases, evaluation of injuries, medical services in an industrial establishment and its functions, occupational health audit and survey, occupational diseases relating to construction work, emergency medical treatment of injuries and rehabilitation at construction site. Personal protective equipment Introduction and requirements and assessment of PPE, type of PPE. Non respiratory personal protective devices: head protection, ear protection, face and eye protection, hand protection, feet protection, body protection. Supply, use, care and maintenance of personal protective equipment. Requirements under Factories Acts and Rules. Respiratory personal protective devices, Classification of hazards, classification of respiratory personal protective devices, selection of respirators, instructions and hints in the use of breathing apparatus, supply, use, care and maintenance of breathing apparatus, training in the use of breathing apparatus.

Unit 3: Safety in Construction and Demolition Operation:

a. Safety in Conventional Construction Operations: Underground works, above ground works, underwater portions, movements of construction machinery, special works, safety in use of explosives. Safety in stacking, storage and transport of construction materials: reinforcements, cement, sand, aggregates, chemicals, organic binders, gas cylinders. Safety in use of construction machinery and equipment: batching plant, mixers, earth moving equipment, cranes, pile driving equipment, excavators, drilling equipment, welding equipment, gas cutting equipment, grinding equipment, derricks, compressors, crushers, layers.

b. Safety in Special Construction Operations: Transmission towers, railways, power plants, transformer installations. Working at heights and prevention of falls of persons: high incidence of serious accidents in working at heights, types of operations, planning operations, safety features associated with construction, design and use of gangways, floors, ladders of different types, scaffolds of different types, other safety requirements while working at height, prevention of falls at floor level.

Potential tripping, slipping hazards. Precautions from falling of materials. Laws and Regulations – Relevant Provisions of Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act and Rules – National Building Codes.

Unit 4: Hygiene Concept, definition and importance of hygiene in construction industry:

Difference between domestic hygiene and industrial hygiene. Physical hazards – heat stress and its control, ventilation, noise, vibration, illumination, thermal radiation, X rays, ultra violet radiation, ionizing and non-ionizing radiations, sensitization to different air, water and waste water, soil contaminant related to construction industries, permissible exposure limits, effects of exposure, preventive and control measures.

Unit 5: Strategic management and planning for prevention and control of contaminant discharge from process operation in construction industries:

sensitization to different process operation in different construction industries, identification of sources of contamination and hazards, planning for control and prevention, implementation through proper measures, planning for control and prevention, safety audits, non compliance reports, turn around time for post audit compliance and implementation through proper measures.

Reference books:

- ISO 14001
- ISO 45001:2018/OHSAS 18001
- ILO Legislation
- Jha, N. Kumar, Patel, Dilip A, Singh Amarjit, Construction Safety Management, Pearson India Education Services Pvt. Ltd, Noida, UP.
- Haldar, S.K., Occupational Health & Hygiene in Industry, CBS Publishers
- Das, Akhil Kumar, Principles of Industrial Safety Management by, PHI

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

- understand the basic tenets of safety engineering
- interpret the existing safety engineering guidelines and recommendations
- identify various safety requirements in conventional and special construction and associated demolition sectors.
- Understand hygiene and safety associated with construction industries
- analyze the problems related to safety hazard and contaminant discharge from construction industries and to suggest remedial measures.

Name of the Course: **Diploma in Civil Engineering** Subject: **Design of Steel Structure**
 Course code: **CE** Course Duration :6 semester Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –4 lecture per week	Class Test(CT) - 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks - 100

Aim:-

1. Study of design and implementation steel structure used in building construction.

Objective:-Students will be able to:

1. Analyze the steel structure and its members for determining the forces acting in the member
2. Select proper material and sections from steel table
3. Calculate design values for members
4. Use IS 875 Part 1, 2 & 3 provisions for dead load, live load and wind load.
5. Design the tension member, compression member, beam, purlins and column bases and their connection.
6. **Use of IS 800 – 2007 for designing the member.**
7. Read and interpret the structural drawings
8. Prepare the detailed working drawing of steel roof truss, showing sections and connections.

Pre-Requisite:-

1. Student should understand the load bearing capacity of components of building.
2. Student should be perfect in building drawing and its reading process.

Unit No	Topic	Contact periods	Marks
1	Introduction	6	5
2	Plastic Analysis	12	10
3	Limit State Design	4	5
4	Design Of Tension Members by L.S.M	6	10
5	Design Of Compression Members by L.S.M	10	10
6	Column Bases by L.S.M	6	8
7	Design Of Connections And Detailing	12	12
8	Steel Roof Truss	8	10

Content: Theory (DESIGN OF STEEL STRUCTURES) 4 hours per week

Unit -1 Introduction

Advantages and disadvantages of steel as construction material. Types of sections ,Grades of steel(IS 2062) and strength characteristics; Use of steel table(SP6-Part1); Types of loads on steel structure and its I. S. code specification. Geometrical properties of gross and effective cross sections– Classification of Cross Sections as per IS:800-2007– Internal, external(outstands) and tapered elements of sections– Maximum Effective Slenderness Ratio of members – Necessity of Bracings and Expansion joints in Steel Structures .

Unit-2 Plastic Analysis

Plastic Analysis: Analysis of Steel Structures– Methods– Elastic, Plastic and Advanced method of analysis based on IS: 800-2007– Idealized Stress vs Strain curve– Problems. For Structural Steel– Requirements and Assumptions of Plastic method of analysis– Formation of Plastic hinges in Flexural

members– Plastic Moment of Resistance and Plastic Modulus of Sections– Shape Factors of rectangular / circular/ I / T-Sections– Collapse load.

Unit-3 Limit State Design

Basis for design– Classification of Limit States– Characteristic and Design Actions– Ultimate and Design Strengths– Partial Safety Factors for Loads and Materials– Factors Governing the Ultimate Strength: Stability, Fatigue and Plastic collapse– Serviceability

Unit-4 Design of Tension Members by L.S.M

Tension Members-effective length and Effective Sectional Area of tension members - Design Strength of Tension members against yielding of gross section requirements: Deflection limits, Vibration, Durability and Fire resistance, against rupture of critical section and due to block shear. Problems on determination of design strength of given members and designing tension members using rolled steel sections for given loads– Design of bolted and welded connections for tension members –Problems.

Unit-5 Design of Compression Members by L.S.M

Compression Members- Effective Length and Effective Sectional Area of Compression members – Design Stress and design strength– Buckling Class of cross sections– Imperfection factor– Stress reduction factor– Thickness of elements .Analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on Lacing and Battening)

Unit-6 Column Bases by L.S.M

Slab base and Gusseted base – Code Provisions (IS:800-2007) – Minimum thickness and Effective Area of Base plate– Design of Slab base for axially loaded columns using bolts /welds. Introduction to Gusseted base(no numerical problems on gusseted Base).

Unit-7 Design Of Flexural Members For BM and SF by L.S.M

General- Effective span of Beams, Design strength of bending,(Flexure), Limiting deflection of beams –Design of laterally supported Simple beams for Bending moment and Shear force using single / double rolled steel sections (symmetrical cross sections only) – Problems.

Unit-8 Design Of Connections And Detailing

General- Types of connections– Bolted, Riveted and Welded connections– Rigid and Flexible connections– Components of connections– Basic requirements of connections- Clearance for holes– Minimum and Maximum spacing of fasteners– Minimum edge/ end distances– Requirements of Tacking fasteners. Bolted Connection– Types of bolts– Bearing type Bolts– Nominal and Design shear strengths of bolts– Reduction factors for Long joints, Large grip lengths, Thick packing plates– Nominal and Design bearing strengths of bolts– Reduction factors for over sized and slotted holes– Nominal and Design tensile strengths (tension capacity) of bolts-Simple problems. Welded Connection- Types of welds– Fillet welds– Minimum and maximum sizes– Effective length of weld- Fillet welds on inclined faces–Design strengths of shop/site welds– Butt welds– Effective throat thickness and effective length of butt weld- Simple problems.

Unit-9 Steel Roof Truss

Types of steel roof truss & its selection criteria. Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987 Analysis and Design of steel roof truss. Design of Angle purlin as per I. S. Arrangement of members at supports.

Text Book :

1. Dr. N. Subramanian “Steel Structures”, Oxford University Press.
2. K.S.Sai Ram “Design of Steel Structures” Pearson-Porling Kindersley Pvt Ltd
3. M.R.Shiyekar “Limit State Design in Structural Steel”, PHI Learning Pvt Ltd, 2011
4. **BIS code: IS 800: 2007**

MODEL QUESTION PAPER – 1

PART- A

Note: Answer any 20 Questions. – All Questions carry equal marks

1. Define the term “Shape factor”
2. What do you mean by “Collapse load”?
3. State any two advantages of limit state design with respect to steel structures.
4. Why expansion joints are to be provided in steel structures?
5. List the three different design strengths of a tie member.
6. What is the advantage of bolted connection?
7. Why lacings are provided in compression members?
8. How a slender compression member generally fails?
9. Why steel beams are provided with lateral supports?
10. Specify minimum thickness of web for a beam to avoid web buckling, as per IS:800 - 2007?
11. What is the effective length of a beam for torsional buckling under normal loading condition? When its ends are partially restrained against torsion but not restrained against warping?
12. Which member of a steel roof system is subjected to bi-axial bending?
13. When a flexural member is said to be under high shear?
14. Give two examples for members subjected to combined bending and tension.
15. What will be the reduced effective moment of a beam section when it is under tension?
16. List the different types of bolts?
17. What is meant by tacking fasteners?
18. Specify the value of minimum edge distance for a 20 mm dia bolt hole in case of hand flame cut edges.
19. Define “effective length of butt weld”.
20. What is the minimum thickness of steel member against corrosion-(a) accessible for painting & repairing (b) inaccessible for painting & repairing.

PART- B

Note :i) Answer all Questions choosing either division (A) or division (B) of each question.

ii) All divisions carry equal marks.

21. (A) i) What are the assumptions made in the plastic method of analysis?.

ii) Explain briefly the serviceability requirements of structural elements to be considered in the limit state design.

OR

(B) A simply supported steel beam of effective span 6 metres is subjected to a point load at 2 metres from the left support. The plastic moment of resistance of the section is 200kN.m. Find the collapse load by kinematical method.

22. (A) Design the tie member of a roof truss to carry an axial force of 200 kN, due to live and dead loads, using double angles, which are to be connected back to back on either side of 8mm thick gusset plates by 4 numbers 16mm dia bolts at each end.

OR

(B) Design the slab base and concrete pedestal for a steel column [ISMB350@52.4kg/m](#) carrying an axial design load of 1000 kN. The pedestal is of M20 grade concrete and the SBC of soil is 300kN/m². Yield strength of steel is 250 N/mm². Suggest suitable size of weld if $f_u=460$ N/mm².

23. (A) (i) Differentiate the behaviours of laterally supported and laterally un-supported beams.

(ii) When a beam section has to be designed for the combined effects of bending and shear?

OR

(B) Design a simply supported steel beam using suitable I-Section to carry an udl of 50 kN/m on an effective span of 5 m. The beam is not supported laterally. Yield strength of steel used is 300 MPa. Assume both flanges to be fully restrained against torsional rotation and warping at both ends.

24. (A) A steel column of effective length 4.0 metre is subjected to an axial compression of 600kN

. Select suitable rolled steel I section for the column by limit state method, taking f_y of steel as 340 MPa. Check for overall member strength is not necessary.

OR

(B) An ISLB400@569N/m is used as a laterally supported cantilever beam. The support section of the beam is subjected to a design shear force of 360kN. Determine the design bending strength of the section if f_y of steel is 300 MPa.

25. (A) (i) Explain different types of bolts.

(ii) Draw a neat sketch of beam to column seat angle connection using fillet welds.

OR

(B) A single angle tension member ISA 100x100x8 mm carries an axial force of 150kN. Find out the minimum overlapping length required, on a 10mm thick gusset plate, at its end if (i) 5mm size fillet welds of permissible design shear strength 150 N/mm² are used and (ii) 16mm dia bolts of design bolt value 50kN are used.

Name of the Course: **Diploma in CIVIL Engineering** Subject: **Construction & Disaster Management**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks:

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT) - 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Unit no	Topic	Contact period	Marks
Part A. Construction management			
1	Introduction.	2	4
2	Contract Management	2	6
3	Construction organization	3	5
4	Resource Management	4	8
5	Infrastructure Management	2	4
6	Planning and scheduling techniques	8	10
7	Cost Management	6	8
8	Quality Management and Safety	4	5
Part B. Disaster management			
9.1	Introduction	3	4
9.2	Disaster Mitigation measures	6	6
9.3	Disaster Management	8	10

Content: theory (Management) 3 hour per week

Part A. CONSTRUCTION MANAGEMENT

Unit1:Introduction

Definition of Construction Management(CM) and its system; Benefits of CM; Roles, responsibilities and Risks of personnel involved in CM; Definition of Construction Industry and its trend; Various stages of a construction project.

Unit2: Contract Management

Definition of contract; Types of contract system; Components of contract documents; Floating of Tender; Steps involved in award of contract; Execution and Monitoring of contract documents.

Unit3: Construction organization

Organization Structure & types; Concept of hierarchy; Communication within the hierarchy; Payroll & Records.

Unit4: Resource Management

Definition – Need for resource management – Optimum utilization of resources- finance, materials, machinery, human resources – Resource planning – Resource levelling and its objectives

Unit5: Infrastructure Management

Explanation of site-layout; Approach road; Provision of water connection, electricity connection, establishing communication system, drainage system; Provision for site-office, workshop, warehouse, security room.

Unit6: Planning and scheduling techniques

Bar charts and linked Bar charts, Network analysis and Critical Path Method(CPM), PERT(Program Evaluation and Review Technique), Advantages and disadvantages of CPM & PERT.

Unit7: Cost Management

Control estimate. Direct cost, Indirect cost, Contingency, Cost-volume relationship.

Unit8: Quality Management and Safety

Importance of quality – Elements of quality – Quality assurance techniques (inspection, testing, sampling) Importance of safety – Causes of accidents – Role of various parties (designer / employer / worker) in safety management – Benefits – Approaches to improve safety in construction

Part B. DISASTER MANAGEMENT

Unit-9

9.1 Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.

9.2 Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings – Cyclone shelters – Warning systems.

9.3 Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services – Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

Reference Book : (for Construction Management)

Name of Books	Name of the author	Edition	Name of the Publisher
Construction project management –theory and practice	Kumar Neeraj Jha		Pearson
Construction Management	Sanga Reddy. S		Kumaran Publications, Coimbatore
Construction Management and Planning	Sengupta.B, &H.Guha		Tata McGraw Hill Publishing Company Ltd., New Delhi
Construction Engineering & Management	Seetharaman. S,		Umesh Publications
Project Planning and control with PERT and CPM	B C Punmia		Laxmi Publications
Computer Applications in Construction	Boyd.C. & Paulson Jr		Tata McGraw Hill Publishing company Ltd., New delhi.

(for Disaster Management)			
Name of Books	Name of the author	Edition	Name of the Publisher

WBSCTE

Name of the Course: **Diploma in Civil Engineering** Subject: **Environmental Engineering**
 Course code: **CE** Course Duration: 6 semesters Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –4 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks - 100

Aim:-

1. Study of management of waste materials and their effects on environment.

Objective:-The students will be able to –

1. Estimate water demands
2. Analyse the quality of water
3. Suggest the treatment required by knowing the quality of water
4. Know the sewerage system.
5. Analyse the sewage
6. Suggest the waste water treatment
7. Suggest the treatment for industrial waste
8. Know the solid waste management

Pre-Requisite:-

1. Students should know pollutants and their effects on construction and environment.
2. Student should have knowledge of control of pollution.
3. Student should know the norms of pollution led by Govt.

Contents: Theory (**Environmental Engineering**), 4 Hrs per week

Unit	Topic	Contact period	Marks
Unit -1	ENVIRONMENTAL POLLUTION AND CONTROL 1.1 Introduction- Environment, Ecosystem, Environmental Pollution and its Types and sources, Causes of Pollution, Effects of Pollution - control of water pollution - soil pollution - sources of soil pollution - effects of soil pollution - control of soil pollution - noise pollution - sources of noise pollution - effects of noise pollution - control of noise pollution - air pollution - sources of air pollution - effects of air pollution on human beings, plants, animals, materials - air pollution control equipment - control devices for particulate contaminants 1.2 Environmental degradation - ozone layer depletion - green house effect - acid rain. 1.3 Existing laws related to Environmental Pollution.	03	02
Unit -2	PUBLIC WATER SUPPLY 2.1 Quantity of Water Demands of water - Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, Design period for water supply scheme. Estimation of quantity of water supply required for a town or city. 2.2 Sources of Water Surface and Subsurface sources of water, Water conservation, Ground water recharging – Necessity Importance and	25	26

	<p>advantages.</p> <p>2.3 Intake Structures and Conveyance of water- Definition and types, Factors governing the location of an intake structure. Type of pipes used for conveyance of water, laying of pipes and pipe joints.</p> <p>2.4 Quality of Water Need for analysis of water, Characteristics of water- Physical, Chemical and Biological. Meaning and importance of parameters – Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN. Water quality standards as per B.I.S. code.</p> <p>2.5 Purification of Water Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Filtration-theory of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter, Disinfection: Objective, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants,</p> <p>2.5.1 Miscellaneous water Treatments (Water softening, Defluoridation techniques), Low cost water Treatments: Necessity and importance in rural areas, Prevention of pollution of bores and bore wells.</p> <p>2.6 Methods of distribution of water- Gravity, pumping and combined system Service reservoirs – functions and types, Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system - their suitability, advantages and disadvantages.</p>		
Unit – 3	<p>DOMESTIC SEWAGE</p> <p>3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage</p> <p>3.2 Building Sanitation and Plumbing Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing – one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan), inspection and junction chambers, their necessity, location, size and shape. Maintenance of sanitary units.</p> <p>3.3 Systems of Sewerage Types of Sewers, Systems of Sewerage, Design of sewers, self cleansing velocity and non scouring velocity, Laying, Testing and maintenance of sewers.</p> <p>3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets, Flushing Tanks – manual and automatic</p>	22	28

	<p>3.5 <i>Analysis of Sewage</i> Characteristics of sewage – major parameters.</p> <p>3.6 <i>Treatment of Sewage</i> Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage.</p> <p>3.6.1 <i>Miscellaneous treatments</i> - Septic tank (including design as per IS code), Oxidation pond, Oxidation ditch.</p>		
Unit – 4	<p>INDUSTRIAL WASTE</p> <p>4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments (only brief idea)</p>	02	02
Unit – 5	<p>SOLID WASTES FROM THE SOCIETY</p> <p>6.1 <i>Solid Waste Management Definitions</i> – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste.</p> <p>6.2 Hazardous Wastes- Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.</p>	04	05
Unit – 6	<p>ENVIRONMENTAL SANITATION</p> <p>7.1 <i>Rural Sanitation</i> Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working, Composting (Nadep or Vermiculture)</p> <p>7.2 <i>Emerging Trends (only brief idea)</i> Sant Gadge Baba Swachhatha Abhiyan Low cost Latrines Jalswarajya Scheme</p>	05	05
Unit 7	<p>ENVIRONMENTAL IMPACT ASSESSMENT</p> <p>Environmental impact assessment (EIA) - methodology of EIA – organizing the job - performing the assessment - preparation of environmental impact statement (EIS) - review of EIS - environmental risk assessment – limitation of EIA.</p>	03	02
Unit - 8	<p>PLUMBING</p> <p>8.1 Sanitary Plumbing, Layout, Details of water supply arrangement for residential and public building Rainwater and sewage collection systems</p>	01	02
	Total	64	70

Suggested List of Assignments/Tutorial :-

- 1) Design of a combined sewer carrying sewage and run-off water.
- 2) Design of a septic tank with soak pit.
- 3) Layout of building sanitation with plumbing fixtures in a multistoried building.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santosh Garg	Environmental Engineering (Volume I & II)		Khanna Publishers

Kamla A. & Kanth Rao D. L.	Environmental Engineering		Tata McGraw Hill,
Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering		Dhanpat Rai & Sons
Deolalikar S. G	Plumbing – Design and Practice		Tata McGraw Hill
Rao M. N. Rao H. V. N	Air Pollution		Tata McGraw Hill
H. M. Raghunath	Ground Water		New Age International
Rao&Dutta	Industrial Water Treatment		

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Advanced Construction Techniques & Equipments (Elective)**

Course code: **CE** Course Duration: 6 semesters

Subject offered in Semester: **SIXTH** Subject code:

Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory – 3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of advanced techniques and building materials.

Objective:-The students shall be able to:

1. Know the new materials of construction.
2. Understand various advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

Pre-Requisite:-

1. Student should study current techniques and properties of building materials.
2. Student should think over the problems and the alternatives to it.

Unit no	Topic	Contact period	marks
1	Advanced Construction Materials	2	8
2	Advanced Concreting Methods	6	12
3	Advanced Construction Methods	8	14
4	Hoisting and Conveying Equipments	4	8
5	Earth Moving machinery	4	10
6	Concreting Equipments	4	10
7	Miscellaneous Equipments and Equipment management	4	6

Contents: THEORY (ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENTS (ELECTIVE)

3 Hrs/week

Unit -1 Advanced Construction Materials

1.1 FIBERS AND PLASTICS.

Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers.

Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material.

1.2 Artificial Timber

Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.

1.3 Miscellaneous materials

Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.

Unit -2 Advanced Concreting Methods

2.1 Prestressed Concrete

Grades of Concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prestressing. Precautions during prestressing of members.

2.2 Under water Concreting

Underwater concreting for bridge piers and bored pile construction. Tremy method of under water concreting. Procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required.

2.3 Ready Mix concrete

Necessity and use of Ready Mix Concrete. Production and equipments for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.

2.4 Tremi Concreting method

Definition, application of vacuum dewatering concreting. Equipments used in tremi concreting. Procedure of vacuum dewatering concreting (Tremix).

2.5 Special Concretes

Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete. Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect ratio and percentage of steel fibers on strength of concrete.

2.6 Shortcrete and Guniting

Introduction of shortcrete/guniting, techniques behind shortcreting, methods of shortcreting and its practical uses.

2.7 Introduction to the concept of green concrete and mass concrete

Unit – 3 **Advanced Construction Methods.**

Unit-3: Formwork

Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork.

Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms.

3.2 Construction of Multistoried Buildings

Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures.

3.3 Prefabricated Construction

Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members.

3.4 Soil Reinforcing techniques

Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.

Unit – 4 Hoisting and Conveying Equipments

4.1 Hoisting Equipments

Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks.

4.2 Conveying Equipments

Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

Unit – 5 Earth Moving machinery

5.1 Excavation Equipments

Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines.

5.2 Compacting Equipments

Use of rollers, Roller types- Plain rollers, Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.

Unit – 6 Concreting Equipments

6.1 Concrete Mixers

Types of concrete mixers. Weigh batching equipments, Equipments for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators.

Automatic concrete plants – layout, process and working.

6.2 Stone Crushers

Types of stone crushers, capacities and working. Equipments for production of artificial sand.

Unit – 7 Miscellaneous Equipments and Equipment management

7.1 Miscellaneous Equipments

Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine.

7.2 Equipment Management

Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment, Preventive maintenance of equipment, Break down maintenance of equipments.

Practical:

Skills to be developed:

Intellectual Skills:

1. know the new materials of construction.
2. get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

List of Practical:

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
R. Chudly	Construction Technology Vol. I to IV		ELBS- Longman Group
Sarkar and Saraswati	Construction Technology		Oxford University Press
R.L. Peurifoy	Construction Planning equipment and methods		McGraw-Hill Co. Ltd.
S. Seetharaman	Construction Engineering and management		Umesh Publication, New Delhi.
B. Sengupta and Guha	Construction management and Planning		Tata McGraw Hill
M. L. Gambhir	Concrete Technology(Third Edition)		Tata McGraw Hill
R. C. Smith	Materials of construction		McGraw-Hill Co. Ltd
TTTI Madras	Building Technology and valuation		TTTI Madras

R. Satyanarayana and S. C. Saxena	Construction Planning and Equipment		Standard Publication New Delhi TTTI Chandigarh
	Civil Engineering materials		TTTI Chandigarh
S. C. Rangawala	Construction of structures and Management of Works		Charotar Publication

Reference books :-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
	Practical Civil Engineering Handbook		Khanna Publication

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Architectural Practices & Interior Design** (Elective)

Course code: **CE** Course Duration: 6 semesters Subject offered in Semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of architectural practices.

Objective:-

Student will be able to:

1. Use the basic architecture principles for working drawings.
2. Prepare working drawings of buildings.
3. Design landscape for a institutional / commercial campus.
4. Use the basic principles of interior design for drawing interior plans.
5. Prepare innovative sketch plans for presentation to customer as per requirements.
6. Design interior for a commercial buildings or Flats.

Pre-Requisite:-

1. Student should be perfect in engineering drawing.
2. Student should study the requirements in building construction.

Unit no	Topic	Contact period	Marks
Contents : Theory (Section A – Architectural Practice)			
1	Architectural Design:	2	5
2	Building Aesthetics:	2	5
3	Design of Projects	8	20
4	Landscaping	4	10
Contents : Theory (Section B – Interior Design)			
1	Elements and principles of design	3	5
2	Anthropometrics Data	1	5
3	Interior Materials:	2	4
4	Interior of Residential building	7	17
5	Interior of small commercial building	3	4
Total		48	70

Contents : Theory (Section A – Architectural Practice) 3Hrs/week

Unit -1 Architectural Design:

- 1.1 Review of principles of Architecture.
- 1.2 Site selection, climatic conditions, sun control, orientation, of building & site.
- 1.3 Building by laws & its applications.

Unit -2 Building Aesthetics:

- 2.1 Feeling for aesthetics and utility, composition, unity, mass, composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern.
- 2.2 Character of Building.

Unit – 3 Design of Projects:

1. A case study of residential building
2. A case study of public / commercial building.
3. Aspect of working drawing – plan, elevation section

Unit – 4 Landscaping:

- 4.1 Soft and Hard landscaping.
- 4.2 Basic Principle of landscaping.
- 4.3 Assessment of land.
- 4.4 Design procedure.
- 4.5 A case study of land scape for public/ commercial building campus.

Contents : Theory (Section – B: Interior Design) Hrs/week Marks

Unit 1 - Elements and principles of design.

- 1.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern.
- 1.2 Importance of colour as art element. Various colourscheme.

Unit 2- Anthropometrics Data:

- 2.1 Relation of human measurement to furniture and movement and to circulation patterns.

Unit-3- Interior Materials:

- 3.1 Different interior materials, paneling, partitions, finishing, materials, furniture.
- 3.2 False ceiling, flooring, paints.

Unit 4- Interior of Residential building:

- 4.1 Use of space, circulation, standard size of furniture.
- 4.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.

Unit 5- Interior of small commercial building:

- 7.1 Planning of interior for small commercial units such as offices, consulting chambers, shops etc.
- 7.2 Furniture details such as executive table, architectures table etc. used in commercial units.

Term Work: (Any Four)

8. Prepare working drawing – plans, elevation sections, considering thickness of plastering with micro level details and with scale 1:50 of a given submission drawing.
9. Prepare innovative plans, elevations, sections, considering the thickness of plastering with micro details and working drawings for residential building with scale 1:50 special details of components (Minimum 3 components such as kitchen otta details, compound wall gate, grill, front door, windows, staircase etc.) with scale 1:20 / 1:15 with respect to No. 1
10. Design a landscape for any existing public building campus
11. Prepare interior plan for 2 BHK residential bungalow / flat.
12. Prepare interior plan of any one commercial unit such as office, bank, restaurant, shop etc.
13. Prepare a report of market survey for different materials required for interiors

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
M. G. Shah, C.M. Kale / S.Y. Patiki	Building construction		Tata McGraw Hill
Joseph De Chiara, Julins Panch, martin Zelnik	Time saver standard for interior design & space planning		MC Graw Hill
Albert O. Halse	The use of colours in interiors		McGraw Hill
Bousmaha Baiche & Nicholes Walliman Nwtert			Architects Black Well Science

1. IS/International codes – National building codes.**2. Journals / Periodicals:**

1. Inside out side
2. A + D Journal on architecture.
3. Indian Architects and builders.
4. Design & Interiors.

3. Software:

1. Auto CAD
2. 3 D Max.
- 3 D Home

Name of the Course: **Diploma in Civil Engineering** Subject: **Maintenance & Rehabilitation Of Structure (Elective)**

Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of building maintenance.

Objective:-

Student will be able to

1. Distinguish between different types of causes of damage.
2. Decide the appropriate technique according to failure.
3. Identify causes of failure of masonry building & its retrofitting.
4. List causes of failure of R.C.C. building, its retrofitting.
5. Find the strength, age of building & maintenance of life lines.
6. Prepare estimates & tenders for structure damage due to hazards.

Pre-Requisite :-

S.No

1. Student should have entire knowledge of building constructed.
- 2 Student should be perfect in reading the building drawing.

Unit no	Topic	Contact period	Marks
1	Introduction	3	6
2	Causes & detection of damages:	2	8
3	Materials for repairs:	2	6
4	Masonry walls:	3	7
5	Repairs to foundation:	3	7
6	Water proofing:	2	3
7	Concept of repairs & strengthening of RCC structures:	2	3
8	Damage due to fire:	2	3
9	Advanced Damage detection techniques:	3	5
10	Strengthening methods	4	9
11	Evaluation of strength, economic & age of building:	2	5
12	Maintenance of life lines:	2	5
13	Estimates and tendering	2	3

Contents: Theory (MAINTENANCE & REHABILITATION OF STRUCTURE (ELECTIVE)) 3 Hrs/week

Unit -1 Introduction

- 1.1 Necessity, operation, maintenance & repairs of structures
- 1.2 Classification of maintenance,
- 1.3 Rehabilitation (restoration), strengthening, retrofitting.

1.4 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.

Unit -2 Causes & detection of damages:

- 2.1 Causes of damages, damages due to earthquakes, fire hazards, flood hazards, dilapidation,
- 2.2 List of basic equipments for investigation.

Unit – 3 Materials for repairs:

- 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting cement mortar,
- 3.2 Shot-creting
- 3.3 Mechanical anchors.

Unit -4 Masonry walls:

- 4.1 Damp walls, causes effects, remedies, eradication of efflorescence
- 4.2 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.

Unit -5 Repairs to foundation:

- 5.1 Remedies, types & processes of settlement, foundation sinking
- 5.2 Examination of existing foundation, strengthening of foundation.

Unit -6 Water proofing:

- 6.1 Leaking Basements & roofs

Unit -7 Concept of repairs & strengthening of RCC structures:

- 7.1 Concept of repairs of RCC structures
- 7.2 Physical examination of common defects,
- 7.3 Structural repairs & strengthening repairs by new developments.

Unit -8 Damage due to fire:

- 8.1 Fire resistance, effects of temp. of RCC,
- 8.2 Repairs to RCC structures damaged due to fire.

Unit -9 Advanced Damage detection techniques:

- 9.1 Advanced damage detection techniques, non destructivetesting.

Unit -10 Strengthening methods:

- 10.1 Cantilevers, beams, slabs, walls, columns, foundation.

Unit -11Evaluation of strength, economic & age of building:

- 11.1 Determination of approx. age of a building.
- 11.2 Determination of strength of structural member of old building.
- 11.3 Finding cost in use of a existing building.

Unit -12 Maintenance of life lines:

- 12.1 Maintenance of electric supply, water supply leaking pipe, joints and sewerage systems, closed drains, sewers.
- 12.2 Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways

Unit -13 Estimates and tendering:

- 13.1 Estimates of annual repairs, special repairs and maintenance work.
- 13.2 Preparation of tender

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
P.K. Guha	Maintenance and Repairs of Buildings		New Central book

			Agencies
Nayak B. S	Maintenance Engineering For Civil Engineers		Khanna Publication
Hutchin SonBD	Maintenance and Repairs of Buildings		Newnes Butterworth –
Ransom W. H.	Building Failures – Diagnosis and Avoidance		E and F. N. Span.
	Building repairing handbook (?)		CPWD
	SP-25 building cracks and repairs		BIS

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial:-

- Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
- Finding the approximate strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
- Prepare estimate of retrofitting of plumbing of a building.
- Determine approximate age and economics of an old house.
- Determine load carrying capacity of a slab, beam, column by using rebound hammer

Name of the Course: **Diploma in Civil Engineering** Subject: **Micro Irrigation(Elective)**
 Course code: **CE** Course Duration :6Semester Subject offered in the semester: **SIXTH**
 Subject code: Question code: Maximum Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lectures per week	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of water conservation and micro irrigation.

Objective:-

1. The student will be able to:
2. Find out consumptive use of water.
3. Suggest suitable micro irrigation system for a farm.
4. Give Layout of micro irrigation system.
5. Design micro irrigation system.
6. Supervise functioning of micro irrigation system.
7. Maintain micro irrigation system

Pre-Requisite:-

1. Student should be perfect on hydrological pressures.
2. Students should know the morphological study of land used.

Unit no	Topic	Contact period	Marks
1	Introduction:	2	4
2	Soil- Plant-Water-Relation	6	14
3	Methods of Micro Irrigation	4	6
4	Design of Sprinkler Irrigation System:	8	18
5	Design of Drip Irrigation System	8	18
6	Fertigation And Filtrations	4	10

Contents: Theory (MICRO IRRIGATION) 3 Hrs/week

Unit -1Introduction:

- 1.1 Definition of micro irrigation
- 1.2 Necessity of micro irrigation,
- 1.3 Advantages of micro irrigation system,
- 1.4 Difficulties in micro irrigation.
- 1.5 Comparison between micro irrigation and other methods of irrigation.

Unit -2 Soil- Plant-Water-Relation:

- 2.1 Soil moisture relation, Hygroscopic water, Field capacity, water, Gravitational water, Field capacity, Permanent wilting point, Available moisture, Readily available, moisture, Soil moisture deficiency, Equivalent moisture.
- 2.2 Definition of irrigation frequency. Estimating depth and frequency of irrigation on the basis of soil moisture regime, concept, Simple problems.
- 2.3 Optimum utilization of irrigation water, Definition of irrigation efficiencies.

- 2.4 Evapotranspiration and/or Consumptive use of water, Methods of finding evapotranspiration by Pan Evaporimeter and Modified Penman method. (No Problems)
- 2.5 Water audit, Concept of water audit, Necessity of water audit, Benefits of water audit,

Unit – 3 Methods of Micro Irrigation:

- 3.1 Sprinkler and Drip irrigation.
- 3.2 Benefits and limitations of sprinkler and drip irrigation systems.
- 3.3 Comparison between sprinkler irrigation and drip irrigation system.
- 3.4 Layout of sprinkler irrigation system and drip irrigation system.

Unit – 4 Design of Sprinkler Irrigation System:

- 4.1 Design of main, sub-main, lateral and sprinkler.
- 4.2 Types of sprinklers and selection
- 4.3 Design and selection of micro sprinkler Irrigation systems.

Unit- 5 Design of Drip Irrigation System:

- 5.1 Design of main, Submain, Lateral and Drippers
- 5.2 Types of drippers and selection
- 5.3 Design and selection of micro jet
- 5.4 Selection of Pumps
- 5.5 Installation and maintenance of drip irrigation system

Unit – 6 Fertigation and Filtrations:

- 6.1 Advantage and limitations of Fertigation
- 6.2 Methods for Fertilizer injection
- 6.3 Filtration – Particle size, Selection of filter, Filtration methods, Methods of cleaning filters.
- 6.4 Filters and their types.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A.M.Michael	Irrigation Theory and Practice		Vikas Publisher House, New Delhi.
	Sprinkler Irrigation		WALMI Aurangabad
	Drip Irrigation		WALMI Aurangabad
Dr.M.S.Mane, B.L.Ayare Dr.S.S.Magar	Principle of Drip Irrigation		Jain Brothers New Delhi
R.K.Sivanappan	Sprinkler Irrigation		Oxford & I B Publishing New Delhi.

Video Cassettes and CDs:

1. Estimation of reference crop.
2. Evapotranspiration by Modified Penman Method including analysis of weather data - WALMI Aurangabad.

Reference books :- Nil

Suggested List of Laboratory Experiments:- Nil

Suggested List of Assignments/Tutorial:-

Assignments:

1. Report writing on visit to farm with sprinkler irrigation system and preparing layout plan and neat-labeled sketches.
2. Report writing on visit to farm with drip irrigation system and preparing layout plan and neat-labeled sketches.
3. Design of sprinkler irrigation system for given farm with cost estimation.
4. Design of drip irrigation system for a given fruit garden farm with cost estimation.

Name of the Course: **Diploma in Civil Engineering** Subject: **Watershed Management(Elective)**
 Course code: **CE** Course Duration:6 semesters Subject offered in the semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:

1. Study of watershed management.

Objective: - The students will be able to:

1. Apply integrated approach to watershed.
2. Apply techniques of soil and water conservation in watershed management.
3. Use rainwater-harvesting techniques.
4. Identify water harvesting structure
5. Use peoples participation in local watershed management and development.

Pre-Requisite:-

1. Student should study the sources of water and its limitations.
2. Students should study the traditional methods of water management.

Unit no	Topic	Contact period	Marks
1	Introduction:	6	8
2	Soil and Water Conservation	8	20
3	Water Harvesting:	8	18
4	Water Harvesting Structures:	5	14
5	Socio Economic Aspects:	5	10

Contents: Theory (WATERSHED MANAGEMENT (ELECTIVE)) -3 Hrs/week Marks

Unit -1Introduction:

- 1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management, Sustainable Development, Natural resource Management
- 1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development
- 1.3 Causes and effects of degradation of watershed
- 1.4 Integrated multi-disciplinary approach for watershed management, steps in watershed management.
- 1.5 Ill effects of urbanisation on watershed management

Unit -2 Soil and Water Conservation:

- 2.1 Soil erosion- definition of erosion, problems of erosion, types of soil erosion.
- 2.2 Land classification for watershed management
- 2.3 Soil conservation, need of soil conservation, soil conservation technology.
- 2.4 Engineering measures for erosion control such as contour cultivation, contour bunding, graded bunding, bench terracing, trenching, construction of grade stabilisation structure, retention or detention reservoirs, agronomical measures (names only)
- 2.5 Contour bunds, design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund.

- 2.6 Graded bunding, design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding.
- 2.7 Bench terracing, types, design.
- 2.8 Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains.
- 2.9 Control of gullies and their reclamation for various land Use

Unit – 3 Water Harvesting:

- 3.1 Definition, need of rainwater harvesting, advantages of rainwater harvesting,. Techniques of rainwater harvesting- roof water harvesting and surface water harvesting (definition)
- 3.2 Traditional methods of rainwater harvesting in deccan plateau-cheruva, kohli tank, phad, kere, the ramtek model and bhandaras (short description with neat sketch).
- 3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, recharge structures, Recharge structures – pit, trench, dug well, hand pump, recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters
- 3.4 Reuse of domestic water

Unit – 4 Water Harvesting Structures:

- 4.1 Types of watershed structures- such as small weir, banchara, K.T. weir, percolation tank, jalbandh, farm pond and check dam.
- 4.2 Details of watershed structure with neat sketch.

Unit – 5 Socio Economic Aspects:

- 5.1 People's awareness, participation and response.
- 5.2 State and integrated approach.
- 5.3 Sustainable society for economical upliftment.
- 5.4 Economics.

Assignment/Term work should contain Mini project on any one of the following:

1. Rain Water Harvesting of a building.
2. Integrated water resource management of small area (e.g. college campus, small village etc.)
3. Preparation of complete water shed management plan for small area identified from toposheet
4. Case study of watershed management plan.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
V. V.Dhruvanarayana G. Sastry, U. S. Patnaik	Watershed management		Indian Council for Agricultural Research, KrishiAnusandhan Bhawan, Pusa, New Delhi
J. V. S. Murty	Watershed management in India		Wiley Estern Ltd
Raj Vir Singh	Watershed planning and management		Yash publishing House
Field manual on watershed management			Central Research Institute For Dry Land Agriculture, Hydrabad
E. M. Tideman	Watershed management		Omega Scientific Publications, New Delhi
N. D. Mani	Watershed management		Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
Robert J. Reimold	Watershed management: practice, policies and coordination		BOSS International US ISBN0070522995

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **WATER RESOURCES MANAGEMENT (Elective)**

Course code: **CE** Course Duration: 6 semesters Subject offered in the semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

OBJECTIVES:

- On completion of the course, the student will be familiar with:
- To understand water resource potential in India and need for water resource management .
- To understand the components of hydrological cycle and hydrograph.
- To understand the occurrence of ground water and ground water exploration methods.
- To understand the ground water basin management concept.
- To study the classification of rivers and river training works.
- To know the different types of storage works and dam structures.
- To understand the distribution system of canals and management of canal irrigation.
- To understand the concept of water shed management including GIS approach.
- To study the types of detention basins and reclamation of water logged lands.

Unit no	Topic	Contact period	Marks
1	Introduction & Hydrology	6	10
2	Ground water and its management	10	15
3	River training works and storage works	10	15
4	Distribution works and management of canal irrigation	12	18
5	Watershed management, water harvesting and recycling	10	12

Contents: Theory (WATER RESOURCES MANAGEMENT (Elective)) -3 Hrs/week Marks

Unit 1

1.1 INTRODUCTION

Water resources – world water inventory - Importance of water resources - Necessity for conservation and development of water resources – water resources of India - water resources management -purpose - factors involved in water resources management.

1.2 HYDROLOGY

Introduction – Definition -Application of Hydrology in engineering -Hydrological cycle - Precipitation – forms of Precipitation -measurements of rain fall - Rain gauge - types of rain gauges – raingauge network – mean rainfall over a drainage basin – methods -Radar and Satellite Measurements of rainfall - runoff - Estimation of runoff - losses – Hydrograph – Unit Hydrograph - uses

Unit 2

2.1 GROUND WATER

Ground water resources- zones of Ground water-Aquifer - types- terms used –porosity, permeability, yield, specific yield, specific retention, coefficient of storage, specific capacity – Darcy's law-measurement of yield of well -pumping test- recuperation test-ground water exploration –geo physical methods -Electrical resistivity method – seismic resistivity method- logs.

2.2 MANAGEMENT OF GROUND WATER

Concept of basin management - Ground water basin investigations -data collection and field work - mining yield - perennial yield - salt balance- basin management by conjunctive use - artificial recharge of Groundwater - recharge methods.

Unit 3

3.1 RIVERS AND RIVER TRAINING WORKS

Classification of river - Major rivers in India and Tamil Nadu – Interlinking of rivers in India and its importance – flood - flood forecasting -flood control in India. River training - objectives of river training -classification of river training - methods of river training – levees -guide banks – spurs – types - artificial cut-offs – launching apron -pitching of banks - pitched islands - miscellaneous methods.

3.2 STORAGE WORKS

Surface storage - purpose of surface storage – tanks – types – tankweirs – tank outlet – reservoirs – types - storage capacity of reservoir -methods of determination of storage capacity of reservoir – reservoirlosses – dams - classification of dams - selection of dam site – Earthdams – types - methods of construction- causes of failure of earth dam -remedial measures – spillway - types - spillway crest gates-types -sluiceway - types.

Unit 4

4.1 DISTRIBUTION WORKS

Irrigation Canal - Typical cross section of canal - components of canalsection - classification of canal - alignment of canal - canal head works –types - components of diversion head works - cross drainage works –types - canal losses - lining of canal – necessity - types of lining.

4.2 MANAGEMENT OF CANAL IRRIGATION

Canal irrigation system - Need for canal irrigation management -objectives of canal irrigation management - methods of improving canalirrigation management - cropping pattern - need for crop rotation – cropwater requirement - water delivery system - irrigation scheduling -frequency of irrigation - optimum use of irrigation water – irrigationefficiencies - conservation of water on the field - farmer's participation -irrigation manager.

Unit 5

5.1 WATER SHED MANAGEMENT

Water shed - classification of water sheds - integrated approach forwater shed management - role of remote sensing and GIS in water shedmanagement - soil and water conservation – Necessity - soil erosion –causes - effects – remedial measures against erosion - contour bunding- strip cropping - bench terracing – check dams - vegetated water way –afforestation - crop residue - land drainage - surface drains - sub surface drains.

5.2 WATER HARVESTING AND RECYCLING

water harvesting - runoff collection - onsite detention basin - ponds -types - Seepage control – methods -evaporation control - Recycling ofharvested water - waste water recharge for reuse – methods – waterlogging - remedial measures - soil reclamation

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santhosh Kumar Garg	Hydrology and water resources engineering		Khannapublishers,Delhi.
G.L.Asawa	Irrigation and Water Resources Engineering		New age international(p) ltd.publishers, New Delhi.
David Keith Todd	Ground water Hydrology		John wiley &sons,Singapore
Dilip Kumar Majumdar	Irrigation water management - Principles and Practice		PHI Pvt.Ltd.NewDelhi-1.
Madan Mohan Das&Mimi Das Saikia	Irrigation and water power Engineering		PHI learning pvt. Ltd., NewDelhi-1

Name of the Course: **Diploma in Civil Engineering** Subject: **EARTHQUAKE ENGINEERING (Elective)**

Course code: **CE** Course Duration: 6 semesters Subject offered in the semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

OBJECTIVES:

On completion of the course, the student will be able:

- To know the causes and consequences of earthquakes;
- To understand the magnitude and effects of earthquakes on structures;
- To understand the behaviour of various types of buildings during earthquakes;
- To know about the design concepts of earthquake resisting buildings;
- To know the methods of evaluation and retrofitting of damaged structures.

Unit no	Topic	Contact period	Marks
1	INTRODUCTION TO EARTH QUAKE	7	10
2	SEISMIC EFFECTS ON STRUCTURES	10	16
3	BEHAVIOUR OF STRUCTURES DURING EARTHQUAKES	14	20
4	CONCEPTS OF DESIGN OF EARTHQUAKE RESISTING BUILDINGS	9	12
5	RETROFITTING OF BUILDINGS	8	12

Contents: Theory (EARTHQUAKE ENGINEERING (Elective)) -3 Hrs/week Marks

Unit 1 INTRODUCTION TO EARTH QUAKE

Objective of earthquake engineering - Engineering Seismology – Structure of the earth - Temperatures and Pressures with respect to depth -Plate Tectonics - Evolution of Indian Sub-Continent- Seismotectonics of India - Severe earthquakes in Indian sub-continent - Causes of earthquake- Definition of terms : Fault line, Active Fault, Focus or Hypo centre, Epicentre, Epicentre distance, Focal depth, Peak ground acceleration, Foreshocks, Aftershocks, Aseismic, Ioseismal, Seismic gap- Ground shaking - Seismic waves -Body waves - P-waves and S-waves - Surface waves - Reyleigh and Love waves – Earthquake Intensity - Earthquake size - Magnitude - Wave magnitude, Duration magnitude, Moment magnitude - Energy released - Classification of Earthquake based on magnitude- Consequences of earthquake – Ground motion, Ground rupture, Liquefaction, Landslides, Fire, Tsunamis, etc-Seismic Zoning Map of India (2002) - Earthquake frequency - Prediction of Earthquake risk -Measurement of Earthquake - Instruments used – Various scales - Richter's Magnitude Scale .

Unit 2 SEISMIC EFFECTS ON STRUCTURES

Nature of ground motion - Effects of source, path and site – Ground shaking effect on structures - Effects of Amplitude, Duration and Distance of Earth quake - Damage potential of earthquakes -Effects of Inertiaforces, Seismic load, Deformations in structures, Horizontal and Vertical shaking of structures, Transfer of inertia forces from top to bottom- Effects of Soil - Influence of ground condition on earthquake motion -Causes for Seismic damages in buildings: Soft storey failure, Floating columns, Plan irregularity, Vertical irregularity, Lack of confinement of concrete, Long cantilevers with heavy dead loads, Insufficient shear reinforcements in columns, Poor quality construction, Poor quality materials, Corrosion of reinforcement, Pounding of adjacent buildings – Short column effect - Effects of size and shape of buildings – Horizontal and vertical layout of buildings - Effect of shifting of filler wall locations from floor to floor, non uniform rigidity distribution - Ductility and flexibility of buildings.

Unit 3 BEHAVIOUR OF STRUCTURES DURING EARTHQUAKES

Characteristics of buildings affecting their behavior - Symmetry, regularity, stiffness, flexibility, strength, time period, damping, ductility, materials and method of construction - Ductile, Brittle and Fatigue fractures - Behavior of structures on sloped ground - Behaviour of Structures with load bearing walls – Brick / Stone /Mud masonry - Large inertia forces due to heavyweight, Very low tensile / shear strengths and brittleness of walls, Stress concentration at corners of openings, Unsymmetrical openings, Poor mortars, Free standing masonry walls, Wall enclosures without roof –Cracks in load bearing walls due to flexure and shear caused by earthquake – Improvements in the behavior of reinforced masonry structures - Behaviour of RCC Structures – Framed / Shear wall / Dual structures - Shear failure of columns - Types of damages in beams - Functions of stirrups in seismic beams - Outward bulging of concrete and buckling of compression reinforcement of beams - Effect of joints on the ductile behaviour of RCC / Steel members -Behaviour of Steel structures - Types of joints, Joint collapse, Joint ductility -Behaviour of Non-Structural elements in buildings during earthquakes - Behaviour of brittle elements - Behaviour of structural members under cyclic loading - Soil characteristics and its impact on various types of structures during earth quake – Twisting of buildings

Unit 4 CONCEPTS OF DESIGN OF EARTHQUAKE RESISTING BUILDINGS

Earthquake proof building - Earthquake resisting building – Acceptable damages to building elements under minor and frequent earth quakes, moderate and occasional earthquakes, and strong but rare earthquakes - General requirements of structures for earthquake resistance and structural safety - Concepts of ductility, deformability and damageability - Concept of base isolation - Ductile performance of structures - Reinforcement detailing for ductility of RC structures -Flexible building elements - Special requirements for RC columns and beams to resist earthquake - Confining steel in columns – Special confining reinforcement for Short columns - Maximum spacing of ties and minimum lapping length of main bars in columns – Ductile detailing of RC buildings - Joints of framed structures –Reinforcements in Beam Column Joints - Providing Shear walls –Arrangement of shear walls - Boundary elements of shear walls –Reinforcements for shear walls - Advantages of shear walls in stilt floors of RC buildings - Earthquake resistant features for masonry buildings - Protection of openings in masonry walls - Masonry bond -Horizontal bands or Ring beams at plinth / lintel / roof

levels in masonry- Horizontal / Vertical reinforcements in masonry walls - Framing of thin load bearing walls – Reinforcement for hollow block masonry – Reduction of earthquake effects - Base isolation technique - Types - Seismic dampers- Types of Dampers: Viscous, Friction, Yielding dampers – Seismic-vibration control.

Unit 5 RETROFITTING OF BUILDINGS

Evaluation, Repair, Restoration and Seismic Strengthening of Buildings: Assessment of structural and nonstructural damages caused by earthquakes, major and minor damages, Feasibility study for retrofitting –Structural level retrofitting method and Member level retrofitting method- Repair materials: Shotcrete, Epoxy resins, Epoxy mortar, Gypsum Cement mortar, Quick setting mortars, Mechanical Anchors -Techniques to restore original strength: Repair of minor and medium cracks, repair of major cracks , crushed concrete and fractured /excessively yielded / buckled reinforcement - Seismic strengthening techniques: Modification of roofs or floors, Insertion of new slab, Stiffening existing slab, Anchoring the slab to supporting walls / beams -Inserting new walls - Strengthening existing walls: Grouting, Use of wire mesh, Connecting the walls, Pre stressing, Providing buttress - Strengthening of RC members: Reinforced concrete rings around existing columns, Jacketing the existing weak beams, Welding new steel to the old steel and replacing the cover, Pre stressing of old beams - Introduction of additional load bearing elements in the structure - Strengthening of Foundations : Improving drainage, Providing apron, Adding RC strips with keys – Strengthening of soft or weak stories of Existing buildings - Bracing of roof truss frames, Anchoring of roof trusses to supporting walls .

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Pankaj Agarwal and Manish Shrikhande	Earthquake Resistant Design of Structures	2010	PHI Learning Pvt Ltd
The Associated Cement Companies Ltd	Guidelines for Earthquake Resistant Non Engineered Construction		
IS: 1893 (Part 1) - 2002	Criteria for Earthquake Resistant Design of Structures - General Provisions and Buildings		
IS:13920-1993.	Code of practice for ductile detailing of RC structures subjected to Seismic forces		
C.V.R.Murty	Earthquake Tips		IIT, Kanpur, Sponsored by BMTPC, New Delhi.
by Robert W.Day	Geotechnical Earthquake Engineering Hand Book		McGRAW – HILL
Shunzo Okamoto	Introduction to Earthquake Engineering		University of TokyoPress
IS:13935 - 2002	Repair and Seismic strengthening of buildingsGuidelines		

Dr Kamalesh Kumar	Basic Geotechnical Earthquake Engineering		New Age International Publications, New Delhi, 2009
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EARTHQUAKE ENGINEERING (ELECTIVE THEORY II)

MODEL QUESTION PAPER - 1

Time : 3 Hrs Max Marks : 75

PART- A

Marks 15 x 1 = 15

Note : Answer any 15 Questions. – All Questions carry equal marks

- 1 Define the term “Epi centre”
- 2 Name any one of the severe earth quake of India
- 3 When Tsunami is generated due to earth quake ?
- 4 Name the different types of seismic waves
- 5 Define “inertia force” on structures due to earth quake
- 6 What is meant by “soft storey” ?
- 7 Whether the building as a whole is to be ductile or brittle for good seismic performance ?
- 8 List any two effects on a masonry wall due to a minor earth quake
- 9 What do you mean by stress concentration ?
- 10 What is the reason for twisting of buildings ?
- 11 Why buildings on slopes are more vulnerable to earth quakes ?
- 12 When a masonry wall is called reinforced masonry ?
- 13 What type of damages are expected during moderate and occasional earthquakes ?
- 14 Specify the requirement of a shear wall
- 15 Define “base isolation”
- 16 What are the different types of Dampers ?
- 17 What do you mean by retrofitting of buildings ?
- 18 What are the materials used for filling the cracks in masonry walls ?
- 19 How a damaged RC column could be repaired ?
- 20 Mention any two methods recommended for strengthening the old masonry structures

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PART- B

Marks 5 x 12 = 60

Note : i) Answer all Questions choosing either division (A) or division (B) of each question.

ii) All divisions carry equal marks.

21 (A) i) Explain briefly the structure of the earth, with a neat sketch

ii) Explain in detail how the earthquakes are being measured

(OR)

(B) i) Write short notes on Plate Tectonics

ii) How earth quakes are classified based on their magnitude ?

22 (A) Explain in detail with necessary sketches the effect of ground shaking on different types of structures

(OR)

(B) How Architectural features affect buildings during earthquakes ? Explain with neat sketches

23 (A) List out the various characteristics of buildings which affect their behavior during earthquakes and explain how they affect

. (OR)

(B) Write short notes on:

(i) “joint collapse” in steel structures, (ii) “flexural cracks in load bearing walls” and

(iii) “effect of cyclic loading”

24 (A) Explain in detail the special requirements for RC columns and beams to resist the effect of earthquakes

(OR)

(B) (i) How shear walls are to be arranged in a building with stilt floor ?

(ii) How the vibration of building elements due to earthquake can be controlled ?

25 (A) (i) Write a note on “stiffening of slabs”

(ii) Explain any one method of strengthening of foundation

. (OR)

(B) (i) Explain how a soft storey of an existing multi-storey building can be strengthened

(ii) What is the necessity of bracing of roof truss frames ?

Name of the Course: **Diploma In Civil Engineering** Subject: **CIVIL ENGINEERING PROJECT II**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW)50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

Aim:-

1. Exposition of professional approach of students towards knowledge gain.

Objective:-Students will be able to:

1. Collect the information for a given project.
2. Apply principles, theorems and bye-laws in the project planning and design.
3. Interpret and analyze the data.
4. Develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
5. Develop presentation skill.
6. Enhance creative thinking.

Pre-Requisite:-

1. Students should have entire knowledge of civil engineering.

Contents:- CIVIL ENGINEERING PROJECT II 3 Hrs/week

Project:

Skills to be developed:

Intellectual skills:

- 1) Decide and collect data for projects.
- 2) Read and interpret the drawing, data.
- 3) Design the components.
- 4) Apply the principles rules regulations and byelaws.

Motor skills:

- 1) Plan for different phases of a task.
- 2) Prepare drawings for project.
- 3) Use of computer for drawing, networking.
- 4) Work in a group for a given task.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

CIVIL ENGINEERING PROJECT:

Arrange 4 building units (already developed in the "CIVIL ENGINEERING PROJECT I") in a 2200 sq. m of vacant land adjacent to the 12 m wide road including placing of essential service unit like deep tube-well, pump house, underground reservoir, four 1BHK security quarter, internal bituminous road over WBM, surface drain network and boundary wall with main gate

Name of the Course: **Diploma in Civil Engineering** Subject: **Civil Engineering Lab-IV**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

List of Practical:

Water Supply Engineering:

- 1) To determine fluoride concentration in given water sample
- 2) To determine the turbidity of the given sample of water.
- 3) To determine residual chlorine in a given sample of water.
- 4) To determine suspended solids, dissolved solids, and total solids of water sample
- 5) To determine the dissolved oxygen in a sample of water.
- 6) To determine the optimum dose of coagulant in the given sample by jar test.
- 7) To determine arsenic concentration (semi-quantitative) in given water sample.
- 8) To determine hardness of water.

Sanitary Engineering:

- 1) To determine the dissolved Oxygen in a sample of waste water.
- 2) To determine B.O.D. of given sample of waste water.
- 3) To determine C.O.D. of given sample of waste water.
- 4) To determine suspended solids, dissolved solids and total solids of waste water sample.
- 5) To determine various pollutant levels in the atmosphere using Digital Air Volume Sampler.
- 6) Energy generation plants from Gobar Gas.

Name of the Course: **Diploma in Civil Engineering** Subject: **Field Surveying Practice II**
 Course Code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

Practical:

Skills to be developed:

Intellectual skill:

- 1) Identify the components of plane table, theodolite, and advanced survey instruments.
- 2) Know the working principles of these survey instruments.
- 3) Finding the horizontal and vertical distances.
- 4) Identifying errors in setting out curve and tabulating elements of a curve.

Motor Skills:

- 1) Taking and recording the observation in the field book.
- 2) Preparing drawings, maps etc. with the observed data.
- 3) Setting out curve for the given alignment.
- 4) Use Micro optic theodolite, EDM for finding different parameters.

Instructions:-

- 1) Group size for survey practical work should be maximum 15 students. (May be compromised depending on instrument condition and other local condition of the polytechnic)
- 2) Each student from a group should handle the instrument independently to understand the Function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical. A student from a group should know the basic philosophy of raw data collection, data handling, calculation required for plotting and drawing.
- 4) 3-4 full day per project is required for carrying out project work.

List Of Projects:

- 1) Theodolite traverse Survey for a closed traverse of 5-6 sides for a small area. Computation by Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet.
- 2) Setting out simple circular curve by Rankine's method of Deflection angles (both one theodolite and two theodolite methods) for a given problem supplied by the concerned teachers and plotting the details of curve on A-1 size imperial drawing sheet
- 3) Layout of the building (building plan used in drawing or estimation subject may also be used)
- 4) Determination of the height of institution building with the help of theodolite

Name of the Course : **Diploma In Civil Engineering** Subject: **Professional Practices-IV**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester : **SIXTH**
 Subject code: Question code: Marks :50

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 25
Tutorial: Nil	Practical(PR) 25
Practical : 3	Total 50
Credit :- 2	

Aim :-

1. Development of professional awareness in before and after sales and services construction sector.

Objective :-

Student will be able to:

Acquire information from different sources.

Prepare notes for given topic.

Present given topic in a seminar.

Interact with peers to share thoughts.

Prepare a report on industrial visit, expert lecture.

Pre-Requisite :-

1. Students should have complete knowledge of design of construction.
2. Students should know all the govt norms related to construction industry.

Contents : PROFESSIONAL PRACTICES-IV 3Hrs/week

Unit -1 Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (**minimum 3 visits**). Following are the suggested type of Industries/ Fields -

- i) Visit to RCC framed structure building for details of reinforcement.
- ii) Visit to water /sewage treatment plant.
- iii) Visit to works carried out under watershed development/micro irrigation scheme.
- iv) Visit to any structure undergoing rehabilitation/retrofitting.

Unit -2The Guest Lecture/s from field/industry experts, professionals to be arranged (2Hrs duration), minimum 2 nos. from the following or alike topics. The briefreport to be submitted on the guest lecture by each student as a part of Term work.

- a) HRD and civil engineering projects.
- b) Project planning and execution of civil engineering projects.
- c) PWD system of accounts
- d) Contract Management
- e) RCC design and detailing

Unit – 3Information Search ,data collection and writing a report on the topic

- a) Collection of data for valuation of old building

- b) Collection of details of BOT project under execution.
- c) Collection of Data and case study of failure of RCC structure.
- d) Collection of information on any topic from journal available in library.

Unit – 4 The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -

Role of civil engineer in disaster management.

Scope of out sourcing of civil engineering services.

Pollution control.

Unit – 5 Seminar Presentation

The students should select a topic for **Seminar** based on recent developments in civil engineering field, emerging technology etc.

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma In Civil Engineering** Subject: **Rural Engineering**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester : **SIXTH**
 Subject code: Question code: Marks :50

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 25
Tutorial: Nil	Practical(PR) 25
Practical : 3	Total 50
Credit :- 2	

Aim:-

1. Study of socio-economical effects of rural area on construction industry.

Objective:-

1. The students will be able to:
2. Use knowledge for solving the problems of rural population.
3. Render their services for the various development schemes of state / central Govt.
4. Prepare modified plan for existing farmer's house with due suggestions.
5. Provide support services as a Civil Engineer for rural population..
6. Provide guidance to start cottage industries related to Civil Engineering.
7. Inspire the villagers for using non conventional energy appliances.
8. Provide services for developing and propagating the programmes of water shade management.

Pre-Requisite:-

1. Student should study socio economical culture of proposed rural area.
2. Students should know all the norms of construction led by Govt.

Contents:- RURAL ENGINEERING 3Hrs/week

Practical:

Term work shall consist of reports on any six of the following assignments:

- 1.1 Socio Economic survey of village, to identify, the needs of village people
- 1.2 Visit to the Structures built under water shade management program (**at least two structure**)

1. Gabian structure
2. Underground Bandhara
3. Kolhapur type weir
4. Cement Plug, Contour Bunding
5. Rain Water Harvesting

Prepare neat labeled sketches and report on the above visits.

2. Visit to a farmer's house
 - 2.1 Profile of a farmer for case study
 - 2.2 Measured drawing of existing farmers house
 - 2.3 Preparation of modified plan with due suggestions with respect to water supply, sanitations, cattle shade, fodder shade, court yard, composting yard, bio/Gobar Gas plant.
3. Report writing on the following with neat labeled sketches (**Minimum one**)
 - 3.1 Sprinkler Irrigation System, with capacity calculation, head and discharge calculation, power calculation for pump, pressure calculation for pipe.
 - 3.2. Drip Irrigation System with capacity calculation, head and discharge calculation, Power calculation for pump, pressure calculation for pipe
 - 3.3 Layout of Lift Irrigation, with capacity calculation, head and discharge calculation, power calculation for pump, pressure and dia. Calculation for pipe.
4. Report writing on **any one** of the cottage industries related to civil engineering regarding demand, utility, advantages, effect on rural economy etc.
 - Brick Manufacturing

- Cement Block manufacturing
- Cement concrete pole for fencing
- Roof tiles / decorative Terracotta tiles manufacturing.
- Stone Crusher.

5. Collecting information regarding schemes declared by State / Central Govt. in which **Civil Engineer has effective participation (at least one)**

- (i) Indira AwasYojna
- (ii) WalmikiAwasYojna
- (iii) SwajalDharaYojna
- (iv) Jawahar Well Yojna
- (vi) Village / Farm Tank.

6. Collecting information regarding use of non-conventional energy source like- Solar energy, Bio/Gobar Gas plant, wind mill,

7. A Study report on **any one**

- Basic Study of electrical installation for house wiring, its components, different types of wires and its uses, need of fuse and its material used, need of earthing and its use.
- Identification of electrical motor pump set, its electrical connection, fault finding and its remedies.

8. A Study report on

Concept of Community Polytechnic in India regarding their role in upliftment of rural population, their area of working, such as manpower development, transfer of technology, technical support services, information dissemination, community services. A visit to nearest Community Polytechnic shall be arranged. A visit report shall be prepared covering all aspect.

Text Books: - Nil

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil