Branch: Civil Engineering. **Year: Fourth.** **Semester: Eighth**

SL. NO.	COURSE NO.	SUBJECT	PERIOD			EVALUATION SCHEME					
Theory			L	T	P	Sessional Examination			ESE	Subject Total	Credit
						TA	CT	Total			
1.	CE 811	Design of Structures-IV.	3	1		50	25	75	100	175	4
2.	CE 812	Flood Management & River Engineering.	3	1		50	25	75	100	175	4
3.	CE 813	Construction Management.	3	1		50	25	75	100	175	4
4.	CE 814	Elective-III.	3	1		50	25	75	100	175	4
5.	CE 815	Elective-IV.	3	1		50	25	75	100	175	4
6.	CE 817	General Viva-Voce.							75	75	2
7.	CE 816	Project-II.								*	8
Total			15	9							

Total marks: 1100 Total Periods: 24 Total Credits: 30

TA: Teachers assessment. *CT: Class Test.* *ESE: End Semester Examination.*

Electives: -

Civil Engineering: Elective-III: Prestressed Concrete Design/ Water Resources Engineering/ Design of Substructures.
Elective-IV: Water Power Engineering/Hydraulic Machines/ Disaster Management/Environmental Impact assessment.

* Project-II : TA : 60 Marks.
Report : 40 Marks.
Presentation : Mid Semester- 25 Marks.
End Semester- 25 Marks.

EIGHTH SEMESTER
DESIGN OF STRUCTURES- IV
SUB CODE: CE 811

Theory – 100.
Sessional – 75.

Time – 4 hrs.

FIRST HALF (40%)

1. **Elements of seismology (**prerequisite; refer CE 404**).**
2. **Concept of Earthquake Resistant Design:**

   Ductility and design force, significance of ductility, Design for ductility.
3. **Use of Indian standard codes: IS: 1893, IS: 4326, IS: 13920.**

SECOND HALF (60%)

4. **General consideration of bridges:**

   Types of bridges, economic spans, selection of suitable types of bridges.
5. **Loads and their distribution:**

   IRC loads, Railway loads, military loading classes, analysis of deck slab for wheel loads, load distribution among various longitudinal beams of a bridge.
6. **Design of super-structure:**

   R.C.C. Tee beam bridge, balanced cantilever bridge, Pratt truss steel bridge.
7. **Design of sub-structure:**

   Various types of bearing and design, different types of foundation design.

EIGHTH SEMESTER

FLOOD MANAGEMENT AND RIVER ENGINEERING

SUB CODE: CE: 812

Theory – 100.
Sessional – 75.
Time – 3 hrs.

FIRST HALF: FLOOD CONTROL

Introduction: Definition, causes and effects of flood; incidence and extent of floods with special reference to North East region, flood damages, Dambreak or Embankment breaching Flood in North East.
Flood estimation: Rational, empirical and unit hydrograph methods; design flood, flood frequency analysis – annual series and partial duration series, probability and return period of flood, Gumbel and Log pearson distributions, design flood selection criteria, design storm, probable maximum flood.
Flood management: Flood damage mitigation, reduction of peak flood – reservoirs and detention basin; confinement of flow embankment, flood walls, ring bunds; reduction of peak stage – channel improvement, cut – off Diversion of flood water – emergency flood ways, river diversion, inter basin transfer; flood abatement – watershed management measures, weather modification; flood plain management land use regulations, flood plain zoning, flood proofing, flood insurance; emergency measures.

Dams and embankments: Elements of gravity, arch and earth dams, selection of sites, stability analysis, embankments – materials of construction, typical sections, effectiveness and side effects.

SECOND HALF: RIVER ENGINEERING

Introduction: River course – upper, middle and delta reaches; Himalayan and Peninsular rivers, principal river systems of India
Types of rivers: Perennial, flushy and virgin rivers; incised, boulder, flood plain, delta and tidal rivers; aggrading, degrading, meandering and braided rivers.
Sediment transport: Sediments – bed load, suspended load and wash load; riverbank erosion, incipient motion, mode of sediment transport – rolling, sliding, saltation and suspension; introduction to theories of sediment transport including Shield's Theory.
Regimes of flow: Definition, description of regimes of flow: plane bed, ripples, dunes, transition and anti dunes; prediction of regimes of flow.
River behaviour: Behaviour of rivers in straight reaches and bends, meandering – causes and general features, factors effecting meanderings, cut – off – development and effects, causes of braiding and delta formation.
River training: Definition, objectives, classification – high water, low water and mean water river training; river training works – marginal embankment, spurs, guide bank, porkupines, bank pitching and revetment, cut off, pitched island, sills and bottom paneling, bandalling and river training works in Assam.

EIGHTH SEMESTER
CONSTRUCTION MANAGEMENT
SUB CODE: CE 813

Theory – 100.
Sessional – 75.

Time – 3 hrs.

Introduction: Civil Engineering and management as business management, construction management and sustainability.

Stages of Construction: Tendering-purpose and methods, notice inviting tender, prequalification, pretender conference, tender documents, fast-track projects, acceptance and selection criteria, elements of contract as per India contract Act 1872, types of contracting systems, sub-contract, construction team and conflicting interests, managerial interventions, responsibility of team members, Indian Arbitration Act 1940.

Bar charts and networks: limitation of bar charts, CPM and PERT in construction industry for time and material management, probabilistic assessment of project completion time, introduction to risk management in construction.

Special features of in-situ construction: Construction hazards and application of top down construction technique, micro piles, diaphragm wall.

Time 3 hrs.

Role of equipments and modern construction industries: Equipment-intensive constructions, selection of construction equipments-factor affecting, typical and special equipments for civil engineering structures such as-roads, bridge, multistoreyed buildings and towers, some national and international specialist construction industries, industrialized building, suitability of in Indian context, advantage and disadvantage of industrialized buildings, role of modular co-ordination and standardization.

References:

i. Dhir, B. M. and Gahlot: Construction Planning and Management:, P. S. New Age International Publisher.
ii. Benjamin, J. and Cornell, C. A.: Probabilit, Statistics and Decision for Civil Engineers, McGraw- Hill, New York.
iii. Indian Contract Act 1872.
iv. Pro of the International Conf. On case histories in Geotechnical Engineering, St. Louis, 1988.
v. Bora, A, and Ranjan, G. (1997). "Strengthening of Existing Foundations Using Micro Piles". Proc. of International Conf. on Civil Engineering for Sustainable Development, University of Roorkee, Vol.-1 pp 359-388.
vi. Bora, A. (1997a). "Sustainability Parameters and Role of Civil Engineers". Proc. of International Conf. on Civil Engineering for Sustainable Development, University of Roorkee, Vol.-2 pp 807-818.
vii. Relevant Indian Standard codes of practices.

EIGHTH SEMESTER

(A) PRESTRESSED CONCRETE DESIGN

SUB CODE: CE 814 (ELECTIVE – III)

Theory- 100.

Sessional – 75.

1. **<u>Deflection of prestressed concrete Beams</u>:**

   Factors influencing deflection, Deflection of uncracked and cracked members, Long time deflection, codal practices.

2. **Design of prestressed concrete sections:**

   Design for flexure, shear, axial force, bond and bearing. Design 6 pre-tensioned members.

3. **Transfer of prestress:**

   Transfer by bond, transmission length, code provision for bond and Transmission length.

4. **Design of Anchorage Zone:**

   Stress distribution in End block, comparative analysis, Anchorage zone reinforcement.

5. Design of partially prestressed members, simple problems of propped cantilever, Fixed and continuous beams.

6. **Limit state design criteria of prestressed concrete members:**

   Criteria for limit states, strength and serviceability limit states, crack widths in prestressed members, durability limit state, Design procedure.

EIGHTH SEMESTER

(B) WATER RESOURCES ENGINEERING
SUB CODE: CE 814 (ELECTIVE – III)

Theory – 100.
Sessional 75.
Time 3 hrs.

1. Introduction: -

Fields of water resources engineering; problems of water resources engineering, economics in water resources engineering, Social aspects of water resources engineering, planning of water resources projects, the future of water resources engineering. Water

SUB CODE: CE 814 (ELECTIVE – III)

resource in North East and its use.

2. Probability concepts in planning: -

Frequency series, recurrence interval, statistical methods for estimating the frequency of rare events, Gumbel's method, Log Pearson type III distribution, confidence limits, partial duration series, flood frequency at points without stream flow records, probable maximum flood.

3. Engineering Economy in Water Resources Planning: -

Social importance, steps in an Engineering economy study, discount rate, sunk cost, intangible values, economic life, physical life and period of analysis of a project, cash flow diagram, discounting factors – single payment factors and uniform annual series factors, discounting methods, present worth method, rate of return method, annual cost method, benefit cost ratio method.

4. Cost Allocation: -

Definition, separable cost, joint cost, common cost, method of cost allocation–remaining benefits method and alternative justifiable expenditure method.

5. Planning for Water Resources Development: -

Levels of planning, phases of planning objectives, data required for planning, projections for planning, project formulation, project evaluation, environmental considerations in planning multipurpose project planning, requirement of uses in multipurpose projects, drawbacks in project planning.

6. Reservoir: -

Purpose, physical characteristics of reservoir, storage capacity determination from the site, reservoir site selection, life storage capacity by mass curve method, reservoir sedimentation, trap efficiency, distribution of sediment in a reservoir, useful life of reservoir, reservoir operation, reservoir sedimentation control, reservoir yield, economic height of a dam, reservoir working table.

EIGHTH SEMESTER
(C) DESIGN OF SUB – STRUCTURES

Theory 100.
Sessional 75.

Time 3 hrs.

Geotechnical and Structural design of shallow foundations: Loads for design, determination of safe bearing capacity & allowable bearing pressure of footings in clay & sand, dimensioning of single isolated footing, considerations for dimensioning of groups of footings for equal settlements – the standard current practices.
Structural design of isolated footings, strip footings, combined footings.

Raft in clay & sand: Types and their suitability, determination of safe bearing capacity & allowable bearing pressure.
Structural design of raft by conventional (rigid) method as per IS: code of practice.

Pile Foundation: Determination of allowable load on single & pile group in clay & sand, fixation of length, diameter, number and spacing of piles, introduction to micro piles.
Analysis of Laterally loaded piles by Reese & Metlock approach.
Structural design of pile, pile group and pile cap.

Elements of Bridge Sub Structure: Forces on bridge sub – structure (IRC & IRS specification), well foundation with components only.
Structural design of bridge piers, abutment.

Earthquake Engineering in Foundation Design: Interpretation of IS: Code provisions for design of foundations for buildings, retaining walls, water towers, etc under earthquake loading.

EIGHTH SEMESTER
(A) WATER POWER ENGINEERING
SUB CODE: CE 815 (ELECTIVE – IV)

Theory - 100.
Sessional - 75.
Time 3 hrs.

Introduction:
Energy, work and power; water energy, hydropower and other powers, their relative merits, comparison of hydro, thermal and nuclear power; hydropower potential and its estimate in North East.

Estimation of available power: Flow and power duration curves, firm power, secondary power, dump power, load distribution – base load, peak load factor, capacity factor, pondage, storage, mass curve – determination of reservoir yield and capacity.

Types of hydropower plants: High, medium and low head plants; runoff river plants, storage plants, diversion canal plants, pumped storage plants, tidal power plants; base load and peak load plants; concentrated fall and divided fall developments, components of hydropower schemes, general layout of hydropower plan with all its components, Notable Hydropower projects in North East.

Water Conveyance: Intakes – types, trash rack, control gates; canals, fore bay, tunnels, pipes.

Penstock: Design criteria, economic diameter, anchor, blocks, water hammer analysis – Alleviels equation, resonance.

Surge Tanks: Functions, types, design criteria, stability analysis with physical verifications by laboratory model (existing).

Turbines: Types, functions, characteristics; working principles, pelton wheel, Francis turbine, Kaplan turbine, turbine characteristics – specific speed, characteristic curves, selection of type and numbers of turbines; scroll case, draft tubes, governing of turbines.

Power House: Components, general layout – surface and underground power houses.

EIGHTH SEMESTER
(B) HYDRAULIC MACHINES
SUB CODE: CE 815 (ELECTIVE – IV)

Theory - 100.
Sessional - 75.
Time -3 hrs.

Introduction: Energy, work and power; basic principles of fluid flow – continuity equation, energy equation and momentum equation; angular momentum.

Impact of jets: Application of momentum principles – forces of jets on flat plates and curved vanes, water wheel, velocity triangle, radially rotating vanes, jet propulsion.

Water turbines: Classification, component parts, working principles, work done, efficiency, impulse turbine – Pelton wheel; reaction turbine – Francis turbine, Kaplan turbine, propeller turbine; scroll case, draft tube, governing of turbines.

Performance of Turbines: Turbine characteristics, principles of similarity, performance curves, selection of turbines – type and number of units.

Centrifugal pumps: Classification, component parts, layout, working principles, work done, manometric head, efficiencies, pressure increase, minimum starting speed, multi stage pumps. Vertical turbine pump.

Reciprocating pump: Component parts, types, layout, discharge, slip, indicator diagram – effects of acceleration and friction, work done, air vessels – its effects, maximum speed of rotating crank.

Other machines: Hydraulic press, hydraulic jack, accumulations, intensifier, hydraulic ram, jet pump, air lift pump, aerial flow pump.

EIGHTH SEMESTER
(C) DISASTER MANAGEMENT
SUB CODE: CE 815 (ELECTIVE-IV)

Theory-100.
Sessional-75.
Time-3 hrs.

Meaning of hazard, vulnerability, risk, disaster; types of disasters and their social and economic significance, international concern.

Need of comprehensive approach for management of disasters, Introduction to sustainable development and disaster management.

Disasters in regional context: Earthquakes, landslides and floods; basic ideas related to causes of earthquakes, earthquake magnitude and intensity scales, seismic waves, earthquake disaster scenario, comprehensive earthquake disaster management plan. Factors affecting landslide and flood disaster, comprehensive landslide and flood disaster management plan.

Books:

Dr. Indu Prakash, 1994, ***Disaster Management***, Rastriya Prahari Prakashan, Sahibabad, Ghaziabad.
V. K. Sharma (Editor), 1995, ***Disaster Management***, Indian Institute of Public Administration, New Delhi.
U.R. Rao, ***Space Technology For Sustainable Development***, Tata McGraw Hill.

EIGHTH SEMESTER
(D) ENVIRONMENTAL IMPACT ASSESSMENT
SUB CODE: CE 815 (ELECTIVE – IV)

Theory - 100.
Sessional - 75.
Time -3 hrs.

1. Environmental Impact Assessment: An Overview

Introduction to EIA; Basic methodology: Screening, scoping Baseline data, Stake holder's involvement, Prediction of effects, Mitigation, EIA in decision making , Documentation, Project Implementation

2. Environmental Laws:

Introduction, Constitutional Provisions, Union list, sate list, concurrent list, Environmental Protection Acts, Functions of central and state boards, penalties, water act.

3. Screening and Scoping:

Aims and objectives, Checklists and matrix, choosing tools.

4. Environmental Indices and Indicators for Describing the Affected Environment:

Background Information, Environmental-Media Index- Air Quality, Environmental-Media Index- Water Quality, Environmental-Media Index- Noise, Environmental-Media Index- Ecological Sensitivity and Diversity, Environmental-Media Index- Archaeological Resources, Environmental-Media Index- Visual Quality, Environmental-Media Index- Quality of life, Development of indices

5. Prediction and Assessment of Impacts on the Air, Surface water, Soil, Ground Water, Noise Environment, Biological Environment, Cultural Environment and socio-economic environment:

Key regulations, Addressing Environment impacts: identification of the types, qualities/quantities of pollutants and effects, Base line data, Relevant quality standards and regulations, Impact Prediction, Assessment of impact significance, identification and incorporation of mitigation measures

6. Public Participation in EIA.
7. Rapid Environmental Impact assessment.
8. Environmental Risk assessment.
9. Preparation of written document.
10. Environmental Monitoring.
11. Some case studies and project work.

Text Book:

1. Environmental Impact Assessment, Larry W Canter, McGraw-Hill.
2. Renewable Energy Resources and Their Environmental Impact, S A Abbasi and Naseema Abbasi, Prentice Hall India.

EIGHTH SEMESTER
PROJECT-II
SUB CODE: CE 816

Marks - 150.

Under this course, students of the class will be divided into groups of 2/3/4 students. Each group will be assigned a topic related to design of Multi Storeyed building/ bridge/ other Civil Engineering structures. Each group will work under one or more supervisor(s) from the

department. After completion of the work, the students will submit a report on the project alongwith working drawings and also appear in a viva-voce examination.

EIGHTH SEMESTER
VIVA-VOCE
SUB CODE: CE 817

Marks – 75.

A final semester viva-voce examination will be held at the end of 8^{th} semester. The viva-voce will be to assess the student on his/her overall knowledge of the subjects related to Civil Engineering in addition to the project works he/she had undertaken in 7^{th} and 8^{th} semester.