Department: Civil Engineering
Class: Final Year B. Tech

Rev: Course Structure /01/NEP/2024-25
Semester: VII

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE4701	PCC	Estimation and Costing	03	-	-	03	10	10	30	50	100	03
23CE4702	PCC	Design of Concrete Structure -II	03	-	-	03	10	10	30	50	100	03
23CE4703	PEC	Program Elective Courses-IV	03	-	-	03	10	10	30	50	100	03
23CE4704	PEC	Program Elective Courses-V	03	-	-	03	10	10	30	50	100	03
23CEMDXX	MDM	Multidisciplinary Minor-V	03	-	-	03	10	10	30	50	100	03
23CE4705	PCC	Estimation and Costing Laboratory	-	-	02	02	15	15	-	20	50	01
23CE4706	VSEC	Structural Design And Drawing –II Laboratory	-	-	02	02	15	15	-	20	50	01
23CE4707	ELC	Research Methodology	04	-	-	04	10	10	30	50	100	04
23CE4708	VEC	Value and Ethics	02	-	-	02	25	25	-	-	50	Audit
23CE4709	ELC	Project-II	-	-	04	04	25	25	-	50	100	02
TOTAL			**21**	**-**	**08**	**29**	**140**	**140**	**180**	**390**	**850**	**23**

Program Elective Courses – IV

(Subject 1)	(Subject 2)	(Subject 3)
Advance Prestressed Concrete(23CE4703A)	Town Planning (23CE4703B)	Legal Aspect in Civil Engineering(23CE4703C)

Program Elective Courses - V

(Subject 1)	(Subject 2)	(Subject 3)
Analysis of Indeterminate Structure(23CE4704A)	Water and Land Management(23CE4704B)	Traffic Engineering (23CE4704C)

Multidisciplinary Minor –V

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Contract Accounts and Tenders(23CEMDA5)	Professional Practice and Ethics(23CEMDB5)	Bridge Engineering(23CEMDC5)

Estimating and Costing

23CE4701	PCC	Estimating and Costing	3-0-0	3 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Construction material, Building Drawing, Engineering Management

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret the purpose, types, and units of measurements for estimating civil works.
CO2	Develop approximate and detailed estimates using standard methods.
CO3	Analyze rates for various construction items using standard schedule of rates (SSR).
CO4	Explain specifications, their importance, and drafting of general/detailed specifications.
CO5	Construct tender documents; understand contract types, and knowledge of B.O.T projects.
CO6	Identify valuation principles, methods, depreciation, and rent fixation of buildings.

Course Content:

Unit 1: : Introduction to Estimation and Quantity Importance and objectives of estimating, Types of estimates: preliminary, detailed, revised, supplementary, etc. Units of measurement as per IS 1200, Items of work in different types of civil engineering projects, Taking out quantities – center line and long wall-short wall methods.	**[06]**
Unit 2:Detailed and Approximate Estimates Methods of approximate estimation (plinth area, cubic rate, bay method etc.) ,Detailed estimate for buildings: earthwork, concrete, brickwork, plastering, etc. ,Preparation of Abstract of Cost ,Technical sanction and administrative approval ,Contingencies, work-charged establishment, tools and plants	**[06]**
Unit 3: Analysis of Rates Purpose and factors affecting rate analysis, Task or out-turn of labour, lead, lift, and transportation, Analysis of rates for: Earthwork, PCC, RCC, Brickwork, Plastering, Flooring, etc. Introduction to Standard Schedule of Rates (SSR) and DSR	**[06]**
Unit 4:Specifications Definition, purpose, and importance of specifications, General specifications for civil works, Detailed specifications for common building items (brickwork, concrete, plaster, etc.).	**[06]**
Unit 5: Tenders, Contracts, and B.O.T Projects Definition and types of contracts: item rate, lump sum, cost-plus, labour contracts, etc. Tender process: Notice Inviting Tender (NIT), Earnest Money Deposit (EMD), tender form	**[06]**

,Comparative statement, acceptance, and agreement ,Contractor classifications, prequalification of contractors ,Introduction to B.O.T (Build-Operate-Transfer) and PPP models.	
Unit6:: Valuation and Depreciation Introduction to valuation and valuer's duties ,Purpose and principles of valuation Different methods of valuation: Rental, Profit, Direct Comparison, etc. ,Depreciation and methods: Straight line, Sinking Fund, etc., Fixation of rent, capitalized value, scrap value, salvage value .Numerical problems on valuation and depreciation .	**[07]**

Text Books:

1. B.N. Dutta – Estimating and Costing in Civil Engineering, UBSPublishers
2. M. Chakraborti – Estimating, Costing, Specification and Valuation in Civil Engineering, Laxmi Publications
3. G.S. Birdie– A Textbook of Estimating and Costing, DhanpatRai Publishing
4. S.C. Rangwala – Estimating, Costing and Valuation, Charotar Publishing House

Reference Books:

1. National Building Code of India (NBC) – Bureau of Indian Standards
2. Standard Schedule of Rates (SSR) – CPWD/PWD Publications
3. IS:1200 series – Indian Standard Methods of Measurement of Building Works
4. P.W.D. Handbook – Respective State PWD Guidelines

Design of Concrete Structure -II

23CE4702	PCC	Design of Concrete Structure -II	3-0-0	3 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Design of Concrete Structure -II

Course Outcomes: At the end of the course, students will be able to:

CO1	Design of water tank by using working stress method.
CO2	Design of continuous beam (Two spans and three spans).
CO3	Design the combined footing& raft foundation.
CO4	Explain the concept of pre stressing.
CO5	Analyze the losses of pre stress in pre and post tensioned system.
CO6	Design of pre stress concrete section-Limit state of collapse in flexure

Course Content:

Unit : 1- Design of water tank Design of water tank - Introduction to working stress method for water tank design, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks (ii) rectangular water tanks.	**[07]**
Unit : 2 -Design of continuous beams Limit state Design of two span continuous beams and three span continuous beams using IS coefficient, concept of moment redistribution	**[07]**
Unit : 3 Design of combined footing Foundation - Design of combined footing (Slab type, slab beam type) and design concept of raft foundation.	**[06]**
Unit : 4 - Introduction to prestress Basic concept of pre stressing. Historical development. Types and systems of pre stressing. Analysis of rectangular and symmetrical I sections. Different cable profiles.	**[07]**
Unit : 5 - Losses of pre stress Losses of pre stress in Pre & Post tensioned members. Flexural strength of pre stress concrete section	**[06]**
Unit : 6 Design of pre stress concrete Design of pre stress concrete - rectangular and Symmetrical I sections for following criteria: (i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.	**[07]**

Text books:

1. Limit state theory and Design –Karve and Shah , Structures publications , Pune.
2. Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi.
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee.

Reference books:

1. IS 456-2000, Plain And Reinforced Concrete - Code Of Practice
2.IS 1343 (1980): Code of Practice for Prestressed Concrete
3. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi.
4. Reinforced Concrete Design-M. L. Gambhir - Mcmillan India Ltd. New Delhi.

Program Elective Courses- IV

23CE4703A	**PEC**	**A) Advance Pre-stress Concrete structures**	**3-0-0**	**3 Credits**

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Strength of materials, Structural analysis-I

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basic principles of pre-stressing.
CO2	Design rectangular and I sections pre-stressed beam.
CO3	Analyze and design end block in post tensional members.
CO4	Analyze and design pre-stress concrete pipes and sleepers.
CO5	Analyze and design single bay portal fame for single story.
CO6	Design pre-stress concrete one way and two way slab.

Course Content:

Unit 1: Introduction to Pre-Stress Concrete Introduction to pre-stressed concrete ,Materials, Basic principles of Pre-stressing, Load balancing concept, stress concept, center of thrust, Various losses encountered in pre-tensioning and post-tensioning methods	**[06]**
Unit 2: Design of Beams Design of beams : Rectangular and I sections for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes	**[06]**
Unit 3: Design of End blocks Analysis and design of end blocks in post tensional members, primary and secondary distribution zones, Bursting and spalling tensions	**[06]**
Unit 4: Design of Pipes and Sleepers Analysis and design of pre-stressed concrete structures such as concrete pipes and Sleepers.	**[06]**
Unit 5 Design of Portal Frames Analysis and design of portal frames, single storey and limited to one bay.(Fixed and Hinged).	**[06]**
Unit 6 Design of Pre-Stress Slab Design of pre-stressed concrete Floor slab, one way and two way slab.	**[06]**

Text Books:

1. N. Krishna Raju, Prestressed Concrete Design, McGraw Hill Publications, 6th edition,2018.
2. P. Dayaratnam, Prestressed Concrete Design, Medtech publishers, 7th edition, 2017.
3. N. Rajgopalan, Prestressed Concrete Design, Narosa Publishers 2nd edition, 2010.
4. E.G. Nawy, Prestressed Concrete Design, Pearson publication, 2nd edition, 1995.
5. T.Y. Lin ―Prestressed Concrete‖, John Wiley & sons Inc. New York, 3rd Edition, 1981.

Reference Books:

1. "Design of Prestressed Concrete Structures" by T Y Lin and N H Burns
2. "Prestressed Concrete Analysis and Design: Fundamentals" by A E Naaman
3. "Prestressed Concrete Bridges" by N Krishnaraju
4. "Limit State Design of Prestressed Concrete" by Y Guyan
5. "Prestressed Concrete Design" by Nagarajan

Program Elective Courses-IV

23CE4703B	PEC	B) Town Planning	3-0-0	3 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Transportation Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the principles of town planning and its different stages
CO2	Explain the building classifications and housing policies
CO3	Identify the requirements and methods of re-planning of existing towns.
CO4	Interpret the planning standards and features of master plans
CO5	Identify the road patterns in a Town
CO6	Identify the features of traffic congestion and management in an existing town

Course Content:

Unit 1: Introduction Necessity, Principles of town planning, Stages of town development, Distribution of land uses, Forms of planning, Planning of Modern and military town , Cost of town planning, Recent planned cities in India	**[06]**
Unit 2: Town Planning surveys and other features Types of surveys, Principles and advantages of zoning, Transition, Classification & design of Residential buildings, Rural and low cost housing, National housing policy, Prevention of slum formation, Requirements of industries, Industrial township, Classification & design of public buildings.	**[06]**
Unit 3: Re-Planning of Existing Towns Objectives, Urban Renewal projects, Decentralization and Recentralization, Three magnet theory, Garden city concept, Satellite towns, Defects in existing towns, Requirement & shapes of surface drain, Refuse of town. Case studies: Kashi and Ajodhya Redevelopment	**[06]**
Unit 4: Building by-laws and development/master plans Bye-laws for buildings, Bye-laws for cinemas/theaters etc. Fire protection, Planning standards, Features for master plans, necessity, Master plans for military town and hill stations, Stages and methods for preparation and execution of master plans. Case studies: Chandigarh and Gandhi agar	**[06]**
Unit 5: Urban roads Classification of Urban roads, Types of street system, Through and by pass roads, outer and inner ring roads, Freeways, Road aesthetics, Cul-de-sac streets, Rapid transit system	**[06]**

Unit 6: Traffic management Traffic congestion, Road Junction and Intersection: angle of crossing, Channelizing, Gradient, Rotaries, Grade separators, Accidents and signals, Roads signs and Markings, Street lighting in a town, Traffic problem in existing towns, Peculiarities of traffic in a town.	**[06]**

Text Books:

1. Town Planning- Charotar Publication – S.C. Rangwala
2. Building & town planning- Dr. R.P. Rathaliya

Reference Books:

1. Fundamentals of town planning- DhanpatRai& Sons. – G.K.Hiraskar
2. Planning and Designing of Buildings- Engg. Book Publishers- Sane Y.S.
3. Town Planning and Road Traffic by Sir Alker Tripp. Edward Arnold & Co., London
4. Housing Problems in India by Dr.K.V.Varghese. Eureka Publication , New Delhi

Program Elective Courses-IV

23CE4703C	PEC	C) Legal Aspects In Civil Engineering	3-0-0	3 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate the standard building contracts and provisions of the Indian Contract Act.
CO2	Interpret legal principles of bailment, indemnity, guarantee, and injunction.
CO3	Explain the key provisions and applications of Indian labour and industrial acts.
CO4	Apply knowledge of arbitration laws and procedures for resolving construction disputes.
CO5	Demonstrate understanding of safety engineering principles and accident prevention methods.
CO6	Explain employer liabilities and regulatory requirements related to workplace safety.

Course Content:

Unit 1: Professional Practice and Administration Contracts Professional Practice and Administration Contracts: The standard form of building contracts, Indian contract Act, The right of building owner, Right of Contractor, Types of Civil Engineering contracts	**[06]**
Unit 2: Bailment Bailment: Nature of Transactions, Delivery of Bailee, care to be taken, Bailee's Responsibility, Termination, Bailment of pledges. Injunction: Types Temporary, Perpetual, Mandatory when referred, Indemnity and Guarantee: Difference between the two, The Contract of Guarantee and Indemnity,	**[06]**
Unit 3: Industrial Acts and Labour Laws Industrial Acts and Labour Laws: Indian factories Act, Industrial Dispute Act, Payment of Wages Act, Work Compensation Act, Trade Union Act, The Building and Other Constructions Workers' (Regulation of Employment and Conditions of Service) Act, 1996	**[06]**
Unit 4: Arbitration and Award Arbitration and Award: Indian Arbitration Act, Arbitration Agreement, Conduct of Arbitration, Power and Duties of Arbitration, Rules of Evidence, E- Tendering, Preparation and publication of ward, Methods of Enforcement impending and Awards.	**[06]**
Unit 5: Safety Engineering Safety Engineering: Sources, Classification, Cost of Accident and Injury Workmen's Compensation Act, Safety Programme, Safety Organization.	**[06]**
Unit 6: Acts	**[06]**

Employers Liability Act, Employers Insurance Act, Safety and Health Standards Occupations Hazards, personal Protective equipment, preventive measures Factory Act, Fatal accidents	

Text Books:

1. Indian arbitration Act by B. S. Patil.
2. Indian Contract Act.
3. Safety Engineering, Govt. of India Publication.
4. Professional Practice, RoshanNamavati.
5. Legal Aspects of building and Engineering Contracts by B. S. Patil.

Reference Books:

1. Indian Contract Act Avatar Singh.
2. Indian contract Act Jhamb.

Program Elective Courses-V

23CE4704A	**PEC**	**A)Analysis of Indeterminate Structure**	**3-0-0**	**3 Credits**

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Strength of materials, Structural analysis-I

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the indeterminacy for structure.
CO2	Analyze indeterminate beams and frames using the slope deflection method
CO3	Analyze indeterminate beams and frames (with and without sway) using the moment distribution method.
CO4	Construct bending moment diagrams for beams and frames using Kani's method
CO5	Apply the flexibility method for analyzing beams and frames
CO6	Analyze indeterminate beams and frames by applying the stiffness approach.

Course Content:

Unit 1:Introduction to Indeterminacy: Concept of Indeterminacy and degree of freedom, Advantages and Disadvantages of Indeterminate Structure, common methods of analysis.	**[06]**
Unit 2:Slope Deflection Method Introduction ,sign convention, derivation of slope deflection equations, Analysis of continuous beams including effects of support settlements , Analysis of orthogonal rigid frame including sway frames with kinematic indeterminacy ≤ 3	**[06]**
Unit 3:Moment Distribution Method Fundamentals and development of the method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames, including sway frames with kinematic indeterminacy ≤ 3	**[06]**
Unit 4:Kani's Method Concept and relationships between bending moments and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway	**[06]**
Unit 5:Matrix Method of Analysis – Flexibility Method Introduction to axes, coordinates, and flexibility matrix, System approach for analyzing continuous beams and plane trusses, Analysis of simple orthogonal rigid frames with static	**[06]**

indeterminacy ≤ 3	
Unit 6:Matrix Method of Analysis – Stiffness Method Introduction to stiffness matrix formulation, System approach for analyzing continuous beams and plane trusses, Analysis of simple orthogonal rigid frames with kinematic indeterminacy ≤ 3	**[06]**

Text Books:
1. Punmia B.C., "Structural Analysis", Laxmi Publications
2. Khurmi R.S., "Theory of Structures", S Chand, Delhi
3. Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill,3rd edition 2010
4. Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
5. Wang C.K., "Statically Indeterminate Structures", McGraw Hill

Reference Books
1. Ramamrutham S. and Narayanan R., "Theory of Structures" DhanpatRai Publishers, Delhi
2. Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
3. Timoshenko and Young, "Theory of structures", McGraw Hill
4. Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH

Program Elective Courses-V

23CE4704B	PEC	B) Water and Land Management	3-0-0	3 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Basics of Environmental & Water Resources

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the various sources of pollution and its effects.
CO2	Identify treatment, disposal and recycling options for solid wastes.
CO3	Illustrate the necessity Losses, Distribution, and reclamation in irrigation.
CO4	Apply the governing equation of groundwater flow for different cases.
CO5	Apply dewatering systems, filtration, drainage and seepage for ground Improvement.
CO6	Identify different hydraulic structures

Course Content:

Unit 1: Water Pollution Definition of Water Pollution, Cause and Sources, Ground water pollution Cause and Sources, R Industrial Waste Effects, Natural methods of wastewater Disposal.	**[06]**
Unit 2: Solid Waste Engineering And Management Solid Waste- Types, Sources and Engineering Classification, Collection Systems, Collection Equipment, Recycle, Reduce and Reuse, Composting, Incineration, Pyrolysis, Disposal Methods	**[06]**
Unit 3: Irrigation Technology And Water Management Soil-Moisture Irrigation Relationship, Losses in water canals, Distribution of water into the fields through water courses, Lined canals, Saline and alkaline lands reclamation and management of Salt affected lands	**[06]**
Unit 4: Ground Water Hydrology Distribution of Subsurface Water, Different Types of Aquifers, Structure and Types of Wells. Well Hydraulics: Analysis of Steady Radial Flow Towards a Well in a confined Aquifer, Artificial Recharge	**[06]**
Unit 5: Ground Improvement Technique Objectives, methods of densification, compactions of coarse and fine grained soils, dewatering systems, stabilization using admixture	**[05]**

Unit 6: Gravity Dam Factors governing selection of type of dam, Modes of failure, Earthen Dam, causes of failure, control of seepage, Spillway, Diversion Structures, cross/head regulator, Canal System and Design	**[07]**

Text Books:

1. Modi, P.N. ―Irrigation, Water Resources and Water Power Engineering‖ Standard Book House, New Delhi, 2nd ed, 1990.
2. Purushotham Raj, Ground Improvement Techniques, Laxmi publications, New Delhi.
3. A. K. Rastogi., Numerical Groundwater Hydrology, Penram International Publishing (India) Pvt.Ltd.2007.

Reference Books

1. Mutreja, K. N. ―Applied hydrology‖, Tata McGraw Hill Pub. Co., New Delhi, India- 1986.
2. Metcalf and Eddy, A Text Book of Waste Water Engineering

Program Elective Courses-V

23CE4704C	PEC	C)Traffic Engineering	3-0-0	3 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Transportation Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the characteristics of traffic stream, vehicular and driver behaviors.
CO2	Explain the various methods of traffic surveys and the interpretation of traffic data
CO3	Examine several statistical and photographic methods of Traffic Studies
CO4	Identify various traffic signs and road marking
CO5	Design the traffic signals as per IRC and Webster's method
CO6	Identify the parameters of road accident in terms of traffic safety and traffic management

Course Content:

Unit 1: Introduction Introduction, objectives, scope; Driver behaviour and Mixed traffic characteristics of India; PIEV Theory; Macro and microscopic parameters; Relationships among traffic parameters; Traffic flow theory; Characteristics of uninterrupted and interrupted traffic flow facilities; Traffic flow modeling; Capacity and Level-of-service.	**[04]**
Unit 2: Traffic studies Traffic volume, speed, travel time and delay studies; Parking study; Origin & Destination Survey, Accident studies, Manual & Mechanical methods, Photographic techniques in Traffic surveys.	**[06]**
Unit 3: Analysis and Interpretation of Traffic Studies Statistical method: mean, standard deviation and variance, poission, binomial distribution, Normal distribution of traffic datas, Histogram and cumulative frequency curves of speed studies, time mean speed and space mean speed.	**[08]**
Unit 4: Traffic sign and road markings Importance of signs and markings, Types of traffic signs: Prohibitory sign, warning sign, Mandatory sign, overhead sign, Location, height and maintenance of traffic sign, Types of road markings, Parking space limits, object markings	**[06]**
Unit 5: Traffic signals Types of intersection; Unsignalized, Signalized and rotary intersection; Conflicts at intersection; Signal time and phase diagram; Signal design as per Webster's and IRC method;	**[06]**

Introduction to Intelligent Transportation System for traffic management, enforcement and education. Components of ITS.	
Unit 6: Traffic safety and management Accident situation in India, Collection of accident data, Collision and condition diagram, pedestrian safety, Traffic management measures and their influence in accident prevention, Scope of traffic management measures, Restrictions of turning movements,	**[06]**

Text Books:

1. S K Khanna and CEG Justo and AVeeraragavan, Highway Engineering, Nem Chand and Bros.
2. C JotinKhisty and B Kent Lall, Transportation Engineering: An Introduction, Prentice Hall of India Pvt. Ltd, New Delhi-110001, 2002
3. P. Chakroborty and A. Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2003.
4. Pignataro L. J., Traffic Engineering – Theory and Practice, Prentice Hall, 1973.
5. L. R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2000.

Reference Books

1. Roger P. Roess, William R. McShane& Elena S. Prassas, Traffic Engineering, Prentice-Hall, 1990.
2. Highway Capacity Manual (HCM), Transportation Research Board, USA, 2000.
3. Wohl M. and Martin B. V., Traffic System Analysis, McGraw-Hill Book Company, 1967.
4. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan PressLtd. 1996.

Multidisciplinary Minor-V

23CEMDA5	MDM	A) Contract Accounts and Tenders	3-0-0	3 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the method of PWD for initiating work.
CO2	Develop the specification for various items in construction.
CO3	Identify the contract for civil engineering works.
CO4	Explain the contract system for civil engineering work
CO5	Construct the tender for civil engineering works.
CO6	Apply arbitration act for civil engineering work.

Course Content:

Unit 1: Public work Account Introduction, organizational structure of PWD, functions of PWD, administrative approval, methods used in PWD for carrying out work	**[04]**
Unit 2: Specification **Specification, necessity and importance of specification, Points to be observed in** framing specification, types of specification, , Preparing detailed specification of items in civil engineering works such as Building Construction, Irrigation Engineering, Public Health Engineering.	**[06]**
Unit 3: Contracts Contract, Objects of contract, requirements of valid contract, Overview of Indian contract Act 1872, types of engineering contract, dispute in contract, international contract	**[05]**
Unit 4: Contract System Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor in PWD, condition of contract, rights of contractor	**[04]**
Unit 5: Tender and tender Document Tender, types of tender, tender form, tender document, tender notice, time limits for tender notice, acceptance and rejection of tender, engineering tender documents, concept of e-tendering	**[05]**
Unit 6: Arbitration Arbitration, need for arbitration, arbitrator, qualification of arbitrator, different kind of arbitration according to arbitration act, procedure of settlement of dispute in contract, action	**[06]**

taken by departmental officer in charge, arbitration award	

Text Books:

1. Gupta, R.P. (2015) "Contracts, Accounts and Tenders in Construction Industry," Nem Chand & Bros, Roorkee
2. Raghunath, S. (2013) "Construction Contracts and Accounts: An Indian Perspective," Charotar Publishing House Pvt. Ltd., Anand
3. Bandyopadhyay, K.K. (2017) "Contracts, Accounts and Tenders in Construction Management," New Central Book Agency, Kolkata
4. Mukhopadhyay, A.K. (2019) "Construction Contracts and Tenders: Theory and Practice," Oxford University Press, New Delhi
5. Ghosh, S.K. (2014) "Contracts, Accounts and Tenders in Civil Engineering," PHI Learning Pvt. Ltd., New Delhi

Reference Books

1. P N datta; Estimating and costing in civil engineering, USB Publication, New Delhi
2. Chakraborti M; Estimating costing specification and valuation; ISBN, Kolkata.
3. Raina V K ; Construction management and contact practices , Shroff publisher, New Delhi
4. Patil B S; civil engineering contracts and estimates; Orientlongman, Mumbai.

Multidisciplinary Minor-V

23CEMDB5	MDM	B) Professional Practice and Ethics	3-0-0	3 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the roles and responsibilities of different stakeholders in civil engineering practice.
CO2	Apply ethical principles and understand professional behavior in engineering.
CO3	Apply principles of contract and commercial laws.
CO4	Interpret arbitration procedures and other legal dispute resolution systems.
CO5	Apply the labour laws and construction-related regulations to civil
CO6	Illustrate intellectual property rights and their importance in engineering innovation. .

Course Content:

Unit 1: Professional Practice & Stakeholders Government Bodies: Regulatory authorities, safety norms (e.g., CPWD, MORTH),Standardization Bodies: BIS, IRC – setting technical standards, Professional Bodies: IEI, IRC, IIA, COA, ECI – certification, training, professional interaction, Clients/Owners: Role based on contracts, Developers: Governed by real estate regulations (e.g., RERA),Consultants: Functioning under guidelines from CEAI and similar bodies, Contractors: Governed by legal contracts and construction laws	**[06]**
Unit 2: Professional Ethics Definition and types: Ethics, Engineering Ethics, Business Ethics, Personal Ethics ,Code of Ethics (Institution of Engineers, India) Concepts: Profession and Professionalism, Professional Responsibility and Accountability ,Conflict of Interest, Environmental Negligence, Distinction: Gift vs Bribe, Real-life ethical dilemmas and case studies	**[06]**
Unit 3: Contracts and Legal Framework-Law of Contract (Indian Contract Act, 1872):Essential elements: Offer, Acceptance, Consideration, Capacity, Consent, Legality, Unlawful/Illegal Agreements, Contingent contracts, Contract discharge and Remedies, Contracts of Guarantee & Indemnity, Agency Contracts, Sale of Goods Act, 1930: Conditions and Warranties, Performance of Contract of Sale	**[06]**
Unit 4: Arbitration and Dispute Resolution Arbitration: Meaning, scope, types-Key features: Arbitration Act (1940 vs 1996)Judicial intervention, international arbitration, Arbitration Agreements: Validity, types, Tribunal Powers: Appointment, challenge, procedure , Other Dispute Resolution Mechanisms: Mediation, negotiation, Dispute Boards, Legal terms: Confidentiality, interim orders, judicial support	**[07]**

Unit 5: Labour Laws & Construction Regulations Role and hiring methods of labour in construction Major Acts: Industrial Disputes Act, 1947Standing Orders Act, 1946Workmen's Compensation Act, 1923, RERA Act, 2017, NBC (National Building Code) – Safety, zoning, fire regulations	**[05]**
Unit 6: Intellectual Property Rights (IPR) Meaning and types of IP: Patents, Trademarks, Copyright, Industrial Design, Trade Secrets Copyright Act, 1957-Coverage, computer software, ownership, Infringement, piracy, and remedies ,Patent Act, 1970 ,Application process, PCT (Patent Cooperation Treaty),Rights, duties, duration of patents, Infringement and legal remedies	**[06]**

Text Books:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset.
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash

Reference Books

1. Avtarsingh (2002), Law of Contract, Eastern Book Co.
2. Dutt (1994), Indian Contract Act, Eastern Law House
3. Anson W.R. (1979), Law of Contract, Oxford University Press
4. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration

Multidisciplinary Minor-V

23CEMDC5	MDM	C) Bridge Engineering	3-0-0	3 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Design of Concrete structure

Course Outcomes: At the end of the course, students will be able to:

CO1	Classify bridges and understand their components, functions, and design requirements as per
CO2	Analyze and design RCC slab and T-beam bridges using IRC codes.
CO3	Design steel bridges including plate girders and trusses with consideration for fatigue and joint detailing.
CO4	Apply principles of prestressed concrete to the design of bridge superstructures.
CO5	Design bridge substructure components such as piers, abutments, and foundations considering geotechnical and hydraulic factors.
CO6	Recommend suitable construction methods, maintenance strategies, and rehabilitation techniques for various bridge types.

Course Content:

Unit 1: Introduction Importance and classification of bridges, Components of a bridge, Site selection and geological investigation, Loads on bridges (dead, live, impact, wind, seismic, temperature), AASHTO, IRC, and relevant codes	**[04]**
Unit 2: Bridge Design Principles Design philosophies: Working Stress, Ultimate Load, Limit State, Load Distribution in bridges, Design of slab bridges (simply supported and continuous), Design of T-beam bridges, Courbon's theory and Guyon - Massonet method	**[06]**
Unit 3: Steel Bridges Types of steel bridges (truss, plate girder, suspension), Design of plate girder bridges, Design of connections: bolted and welded, Design of bearings and expansion joints, Fatigue considerations in steel bridges	**[07]**
Unit 4: Prestressed Concrete Bridges Principles of prestressing, Types of prestressing: pre-tensioning and post-tensioning, Design of prestressed concrete slab and girder bridges, Losses in prestress, Cable profiles and tendon layouts	**[07]**
Unit 5: Substructure and Foundation Design Types of bridge piers and abutments, Design of piers and abutments, Design of open, pile, and well foundations, Scour and hydraulic considerations, Earth pressure theories and wing walls	**[07]**

Unit 6:Construction and Maintenance of Bridges Methods of bridge construction (cast-in-situ, precast, segmental), Launching techniques for superstructure, Inspection, maintenance, and rehabilitation of bridges, Health monitoring systems for bridges, Case studies of bridge failures	**[05]**

Text Books:

1. Bridge Engineering by S.P. Bindra
2. Design of Bridges by Krishna Raju
3. Essentials of Bridge Engineering by D. Johnson Victor
4. "Bridge Engineering" – Ponnuswamy S.

Reference Books

1. IRC codes, AASHTO LRFD Bridge Design Specifications
2. "Concrete Bridge Practice: Construction, Maintenance and Rehabilitation" – V.K. Raina
3. "Design of Steel Structures" – Subramanian N.
4. "Prestressed Concrete" – Krishna Raju / N. Rajagopalan
5. AASHTO LRFD Bridge Design Specifications
6. IS:456 – Code of Practice for Plain and Reinforced Concrete

Estimation and Costing Laboratory

23CE4705	**VSEC**	**Estimation and Costing Laboratory**	**0-0-2**	**1 Credits**

Teaching Scheme:	**Evaluation Scheme:**
Practical: 2 hr/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret architectural and structural plans of a residential building and compute the required quantities for various construction items
CO2	Apply different approximate estimation techniques
CO3	Develop a comprehensive detailed estimate and abstract of cost for a small-scale building project by calculating item-wise quantities and applying current rates.
CO4	Determine rate analysis for selected construction items by breaking down labor, material, equipment, and overhead costs to determine unit rates.
CO5	Develop general and detailed technical specifications for major construction works, ensuring compliance with IS codes and standard practices.
CO6	Develop standard tender documents for construction works and carry out building valuation using any method and depreciation calculations using standard methods.

Course Content:

1. Calculate quantities for earthwork, brickwork, concrete, and plastering from a simple G+0 residential plan.
2. Estimate the cost of a residential building using
   - Plinth area method
   - Cubic rate method
   - Bay method
3. Prepare a **detailed estimate** and **abstract of cost** for a small building project including:
   - Earthwork
   - Brickwork
   - RCC
   - Plastering
4. Conduct rate analysis for any **two items** out of:
   - Earthwork
   - PCC
   - RCC
   - Brickwork
   - Plastering

- Flooring

5. **Part A.** General specifications for earthwork, concrete, and brickwork
   Part B. Detailed specifications for any two items like brick masonry and plastering.
6. **Part A.** Draft a sample Tender Document (NIT, Tender Form, and Comparative Statement)
   Part B. Carry out a valuation using the any method and calculate depreciation by Straight Line and Sinking Fund Method for a simple building.

Text Books:

1. B.N. Dutta – Estimating and Costing in Civil Engineering, UBSPublishers
2. M. Chakraborti – Estimating, Costing, Specification and Valuation in Civil Engineering, Laxmi Publications
3. G.S. Birdie– A Textbook of Estimating and Costing, DhanpatRai Publishing
4. S.C. Rangwala – Estimating, Costing and Valuation, Charotar Publishing House

Reference Books:

1. National Building Code of India (NBC) – Bureau of Indian Standards
2. Standard Schedule of Rates (SSR) – CPWD/PWD Publications
3. IS:1200 series – Indian Standard Methods of Measurement of Building Works
4. P.W.D. Handbook – Respective State PWD Guidelines

Structural Design and Drawing – II Laboratory

23CE4706	**VSEC**	**Structural Design and Drawing – II Laboratory**	**0-0-2**	**1 Credits**

Teaching Scheme:	**Evaluation Scheme:**
Practical: 2 hr/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Analysis and design of RCC building.
CO2	Analysis and design water tank/ retaing wall/Foundation.
CO3	To develop the detailed drawing for different RCC structures

Course Content:

The lab work shall consist of detailed design &drawing of the following R. C. structures by Limit State method unless specified.

1. Residential G+2 storey building

2. Any ONE from following

a) Circular water tank resting on ground with rigid base. (by working stress method)
b) Retaining wall (cantilever or counter fort type)
c) Combined footing/ raft foundation/ pile foundation.

Note:

- Computer analysis of any one frame for project No.1 shall be performed for Dead Load, Live Load & Earthquake Loads using relevant application software.
- Drawings prepared shall indicate ductility details as per the provision in IS: 13920.

Text books:

1. Limit state theory and Design –Karve and Shah , Structures publications , Pune.
2. Limit State Design of reinforced concrete P.C. Varghese, Prentice Hall, New Delhi.
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee.

Reference books:

1. IS 456-2000, Plain And Reinforced Concrete - Code Of Practice
2.IS 1343 (1980): Code of Practice for Prestressed Concrete
3. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi.
4.Reinforced Concrete Design-M. L. Gambhir- Mcmillan India Ltd. New Delhi.

Research Methodology

23CE4707	ELC	Research Methodology	4-0-0	4 Credits

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 4hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the concept, scope, and types of research.
CO2	Identify appropriate research designs based on specific research problems.
CO3	Outline a thorough literature review using credible sources.
CO4	Identify suitable data collection and analysis methods.
CO5	Interpret ethical guidelines in conducting and reporting research.
CO6	Develop a structured and impactful research report.

Course Content:

Unit 1: Introduction to Research Definition and significance of research, Types of research and research process, Identification of research problem, Emerging trends in research, Applications of research in academia and industry.	**[08]**
Unit 2: Research Design Defining and formulating the research problem; Types of research design approaches and their pros and cons; Selecting the research problem and understanding the necessity of its clear definition; Importance of literature review in problem formulation; identifying research gaps from existing literature and databases; development of a working hypothesis.	**[09]**
Unit 3: Literature Review Importance and objectives of a literature review, Types of literature review, Sources of literature, Techniques for reviewing, Tools for organizing literature	**[07]**
Unit 4: Data Collection and Analysis **Primary data collection methods:** Surveys, interviews, field observations, Numerical and experimental. **Secondary data collection methods:** Existing literature, reports, case studies, and databases. **Data processing:** Handling missing data, filtering unwanted data, and preparing datasets for analysis. **Data Analysis strategies**: Data Analysis with Statistical analysis	**[08]**
Unit 5: Research Reporting and Presentation Structure of a research report: Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References, Referencing styles, Visual representation of data (tables, charts, graphs), Tips for effective research presentations, Oral presentation – Planning – Preparation.	**[08]**

Unit 6: Research and publication Ethics **Scientific Conduct:** Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication, and Plagiarism, Redundant publications: duplicate and overlapping publications. **Publication Ethics:** Publication ethics: introduction and importance, Conflicts of interest, Publication misconduct: concept, problems, Violation of publication ethics, authorship and contributor ship	**[08]**

Text books:

1. C.R. Kothari – Research Methodology: Methods and Techniques.
2. Ranjit Kumar – Research Methodology: A Step-by-Step Guide for Beginners

Reference books:

1. Hamdy A. Taha- Principles of operations research: An Introduction.
2. Ravindran, Phillips, Solberg-Operations Research: Principles and Practice

Value and Ethics

23CE4708	VEC	Values and Ethics	2-0-0	Audit

Teaching Scheme:	**Evaluation Scheme:**
Lecture: 2hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret the principles of ethics and human values by examining their influence on personal behavior, public conduct, and value formation through family, society, and education.
CO2	Demonstrate improved attitude, morals, aptitude, and integrity in contributing positively to society
CO3	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO4	Explain the significance of value inputs in a classroom and start applying them in their life and profession.
CO5	Analyze publication ethics and misconduct to ensure adherence to ethical standards, authorship guidelines, and responsible research dissemination.
CO6	Evaluate the role of ethics, professional values, and gender sensitization in promoting responsible and equitable conduct in engineering and public life.

Course Content:

Unit 1 Ethics and Human Interface Ethics and Human Interface, Essence, determinants and consequences of Ethics in human actions; Dimensions of ethics; ethics in private and public relationships Human Values – lessons from the lives and teachings of great leaders, reformers and administrators, Role of family, society in inculcating values, role of educational institutions in inculcating values.	**[04]**
Unit 2: Attitude, Morals, Aptitude, Integrity towards Society Attitude: content, structure, function, Attitude and its influence and relation with thought and behavior, Aptitude and foundational values towards society , integrity, impartiality and non-partisanship, objectivity, dedication towards society, empathy, tolerance and compassion intelligence-concepts, and their utilities and application.	**[04]**
Unit 3:Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya, Understanding harmony in the Family.	**[04]**

Unit 4: Value Education: Need, Guidelines, content and process for Value Education, Self-Exploration–; Natural Acceptance and Experiential Validation, Continuous Happiness and Prosperity, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	**[04]**
Unit 5: Publication Ethics Publication Ethics: Introduction, Scope & importance, Best practices/standards initiatives & Guidelines: COPE, WAME, etc., Conflict of Interest, Publication Misconduct: definition, concept, problems that lead to unethical behavior & Vice versa, Violation of Publication Ethics, Authorship & Contributor ship, Identification of Publication misconduct, complaints & appeals, Predatory publishers & Journals.	**[04]**
Unit 6: Ethics and Gender Sensitization Ethics - Meaning, Importance, & Types of Ethics, Values and Attitudes of Professional Engineers, Seven Principles of Public Life. Gender Sensitization: Introduction, Sex vs. Gender, Social construction of Gender, Gender Roles, Gender Stereotypes, Ending violence against girls/ women: Advancing safety and rights, Gender Equality.	**[05]**

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
3. Neeraj Kumar, "Lexicon for Ethics, Integrity & Aptitude", Chronicle Publication, 2016.
4. SantoshAjmera, NandKishor Reddi, "Ethics - Integrity and Aptitude", Tata McGraw Hill Publication, 2014.
5. M. Karthikeyan"Ethics, Integrity and Aptitude", Tata McGraw Hill Publication, 2015.
6. Dr. Vara Lakshmi G, Dr. R V Anuradha, "Gender Sensitization", Neelkamal Publications.

Reference Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
2. A N Tripathy, 2003, Human Values, New Age International Publishers.
3. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers , Oxford University Press.
4. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
5. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

Mega Project Phase -II

23CE4709	ELC	Mega Project Phase -II	0-0-4	4 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 8hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks End Semester Exam : 50 Marks

Course Content

Since Mega Project Phase-II is in continuation to Mega Project Phase-I, the students are expected to complete the total project by the end of semester VII. After completion of project work, they are expected to submit the project report including the work done in Phase-I and Phase-II.

The report shall be comprehensive and presented typed on A4 size sheets and **hard bound.** The number of copies to be submitted is number of students plus two. The assessment would be carried out by the panel of examiners (Guide and Project Evaluation Members) for both, term work and oral examinations.

The project work should be published in any one of the national/international quality conference or reputed journal.

Report shall summarize the literature survey; spell out the scope of work, methodology and results. Viva-voce Examination shall be based on work carried out by the student