ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

SEVENTH SEMESTER

Sr. No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks				Minimum Passing Marks	No of Hours for ESE
				L	T	P		Mid-Sem Examination	Continual Assessment	End Sem Examination	Total		
1.	PCC	23CV701T	Estimation and Costing	3	-	-	3	15	15	70	100	45	3
2.	PCC	23CV701P	Estimation and Costing lab	-	-	2	1	-	25	25	50	25	-
3.	PCC	23CV702T	Construction Management and Law	3	-	-	3	15	15	70	100	45	3
4.	PEC	23CV703T	Program Elective – III (Refer PE Basket)	3	-	-	3	15	15	70	100	45	3
5.	PEC	23CV704T	Program Elective – IV (Refer PE Basket)	3	-	-	3	15	15	70	100	45	3
6.	PEC	23CV705T	Program Elective – V (Refer PE Basket)	3	-	-	3	15	15	70	100	45	3
7.	ELC	23CV706P	Project - II	-	-	8	4	-	50	50	100	50	-
8.	ELC	23CV707P	Summer / Winter Internship*	-	-	-	2	-	50	--	50	25	-
9.	MDM	23CV731M	Multidisciplinary Minor – V (Refer PE Basket)	3	-	-	3	15	15	70	100	45	3
Total				18	-	10	25	90	215	495	800	-	-

Program Elective - III	
23CV703T(i)	Advanced Steel Design
23CV703T(ii)	Metro Rail Transportation Design & Construction
23CV703T(iii)	Geotechnical Exploration & Ground Improvement Techniques

Program Elective – IV	
23CV704T(i)	Earthquake Resistant Design of Concrete Structures
23CV704T(ii)	Urban Transportation Planning
23CV704T(iii)	Irrigation Engineering

Program Elective - V	
23CV705T(i)	Repairs & Rehabilitation of Structures
23CV705T(ii)	Pavement Design
23CV705T(iii)	Solid Waste Management

Multidisciplinary Minor - V	
23CV731M	Public Transport Systems

		July 2026	NEP 1.0	Applicable for 2026-27
Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV701T	Estimation and Costing	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. To understand various types of estimates 2. To interpret drawings and estimate the quantities of various items in civil engineering projects 3. To prepare detailed schedules for reinforcing steel bars in concrete structures 4. To prepare specification for construction projects 5. To analyze rates for different items of work 6. To apply valuation methods for buildings and other properties	At the end of the course, students will be able to: 1. Explain the importance and purpose of estimation in civil engineering, including understanding of units of measurement, items of work, and their descriptions 2. Apply various methods of preliminary and detailed estimation and compute material quantities with accuracy 3. Explain the necessity and types of specifications and describe the need to prepare tender documents and types of contract 4. Perform rate analysis for major civil engineering items using current market rates of materials and labour 5. Explain the purpose and principles of valuation and identify factors affecting property value

Unit I	**[9 Hrs]**
Introduction: Importance and Purpose of Estimation in Civil Engineering, Units of measurement, Items of work and their description, Administrative Approval and Technical Sanction. **Bar Bending Schedule:** Calculation of reinforcing steel for various components of building.	
Unit II	**[9 Hrs]**
Preliminary Estimation: Objectives and its methods, Earthwork estimates in roads, hill roads and canals. **Detailed Estimation:** Methods, Estimation of Load bearing and framed structures	
Unit III	**[9 Hrs]**
Specifications: Necessity, Importance and Types, Writing detailed specifications of important Items of work. **Tenders:** Necessity, Tender documents, Notice Inviting Tender, Methods for Carrying out tender Work. **Contract:** Essentials, Types, Contract documents, General & Special Conditions of Contract.	
Unit IV	**[9 Hrs]**
Rate Analysis: Necessity, Introduction, Procedure, Factors deciding Rate Analysis, Labour Guidelines from National Building Code, Market rates of Material and Labour, Rate Analysis of major items of work.	
Unit V	**[9 Hrs]**
Valuation: Introduction, Purpose, Factors affecting value of property, Types of Value, Calculation of Depreciation and its methods, Capitalised value, Year's Purchase, Sinking Fund, Net & Gross income, Rent fixation.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Estimating and Costing in Civil Engineering (Theory and Practice)	B.N. Dutta	28th	CBS Publishers
2	Estimating, Costing, Specification & Valuation In Civil Engineering	M. Chakraborti	15th	Chakraborti
3	A Textbook of Estimating and Costing (Civil)	D.D. Kohli, Ar. R.C. Kohli	13th	S Chand
4	Civil Estimating & Costing	A.K. Upadhyay	5th	Katson Books
5	Estimating, Costing And Valuation	Rangwala	4th	Charotar Publishing

Reference Books

S.N	Title	Authors	Edition	Publisher
1	National Building Code of India 2016	BIS	Volume 1 & 2	Bureau of Indian Standards
2	CPWD Schedule of Rates	CPWD	Edition 12	Government of India
3	IS 1200 Series	BIS	Volume 1 & 2	Bureau of Indian Standards

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
23CV701P	Estimation and Costing Lab	-	-	2	1	CA	ESE	Total
						25	25	50

Course Objectives	Course Outcomes
1. Understand the fundamentals of estimating and costing 2. Apply knowledge to prepare Bar Bending Schedules by calculating reinforcement quantities 3. Develop skills to apply various methods of preliminary and detailed estimation for civil engineering works 4. Analyze and perform rate analysis by considering labor, material, equipment costs, and relevant guidelines from the National Building Code 5. Explain the principles and methods of valuation of properties	At the end of the course, students will be able to: 1. Prepare and interpret Bar Bending Schedules for different structural components such as footings, columns, beams, and slabs, and calculate the quantity of reinforcement steel 2. Apply standard methods to prepare estimates of quantities and costs for various civil engineering works 3. Perform rate analysis for major items of civil engineering work by applying standard procedures 4. Develop detailed specifications for important items of civil engineering works following standard codes and practices 5. Apply standard methods to calculate standard rent of residential and commercial properties based on net and gross income, market trends, and legal guidelines

Expt. No.	Title of the experiment
1	Estimation of quantity of reinforcing steel using bar bending schedule.
2	Calculation of preliminary estimate using plinth area method.
3	Calculation of detailed estimate of earthwork of roads/canals.
4	Detailed estimation by centre line method.
5	Detailed estimation by long wall – short wall method.
6	Draft detailed specification for various items of civil engineering work.
7	Analyse the unit rate of major items of civil engineering work.
8	Fixation of standard rent of property.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Estimating and Costing in Civil Engg	B.N. Dutta	28th	CBS Publishers
2	Civil Estimating & Costing	A.K. Upadhyay	5th	Katson Books
3	Estimating, Costing And Valuation	Rangwala	4th	Charotar Publishing

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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV702T	Construction Management and Law	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1.Gain a comprehensive understanding of the various phases of construction projects, including planning, design, procurement, construction, and project completion. 2.Learn project management methodologies and techniques tailored to the construction industry, including scheduling, budgeting, resource allocation, risk management, and quality control. 3.Explore the legal framework governing construction projects, including contract, property act, and regulations specific to the construction industry.	At the end of the course, students will be able to: 1.Describe project characteristics and various stages of a project. 2.Create a construction project plan, project schedules, and application of information system in management of construction projects. 3.Classify various types of equipment's to be used in the construction and its operational cost estimates, understand manpower requirement, planning, resources utilization and management. 4.Identify the quality control aspects in planning & management, safety provisions and safety equipments. 5.Describe the legal aspects in construction projects through the understanding of various acts pertaining to civil engineering and architectural planning & sanctioning, provisions of arbitration and litigations.

Unit I	**[9Hrs]**
BASIC STUDIES IN CONSTRUCTION PROJECT Type of Project & its Financing, Detailed Project Report Analysis and Feasibility, Time of Completion, Provisions of Escalation in Time and Cost, Choice of Technology and Construction Methodologies &Techniques, Site Planning (Case Studies).	
Unit II	**[10 Hrs]**
CONSTRUCTION SCHEDULING Network Analysis:- The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT),Bar Chart, Resource Oriented Scheduling, Allocation, Leveling, Crashing and Time/Cost Tradeoffs, Line of Balance. MIS in Construction Project, Project Management System-MS Project, BIM.	
Unit III	**[9 Hrs]**
MANPOWER – Requirement and methods of calculating Productivity, Staffing, planning, directing & controlling. Organizational Charts, Duties and Responsibility of Personal Manager **MATERIAL** – Requirement, Procuring, Storing & Delivery. Quality Checks, Inventory Control techniques, construction Waste generation and Management. **MACHINERY** – Different type of construction equipment and their applications- Excavators, Dozer, Rollers, Hoisting and Hauling equipments, Cost & Working Hour analysis, Depreciation analysis.	
Unit IV	**[8 Hrs]**
QUALITY AND SAFETY MANAGEMENT Concept of Total Quality Management, Safety Provisions as per National Building Code of India, Safety equipment. Advanced Techniques of Monitoring & Assessment.	
Unit V	**[9 Hrs]**
LEGAL ASPECTS IN CONSTRUCTION PROJECTS AND VARIOUS RELATED ACTS Town Planning Requirements, Acts and codes related to planning, Regional Town Planning, Housing Development Act, Highway Act, Irrigation Act, Local Acts (Gunthewari), Environmental (Protection) Act, Forest Conservation - Water Pollution and air pollution, Transfer of property Act– Sale, purchase, lease. Land Acquisition and Rehabilitation Act, Indian Contract Act.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Construction Planning and Management	Peurifoy	-	McGraw-Hill Education
2	Construction Planning and Management	Dr U K Shrivastava, Galgotia Publ.	-	Galgotia Publications Pvt Ltd
3	Laws related to buildings and engineering contracts in India	Gajaria G T, LexisNexis	-	Butterworths India Publisher, 2000

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Project Planning & Management	B C Punmia	-	Laxmi Publications Pvt Ltd

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Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV703T(i)	Advanced Steel Design	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. To understand basic principles of reliability-based design on steel structures. 2. To understand the behavior of various members of structures. 3. To understand the design philosophy of various structural member.	At the end of this course, student will be able to, 1.To recognize the design philosophy of steel structures and understand the concept of limit state design and design connections. 2. To study the behavior of members, and industrial buildings. 3.Apply the principles, procedures and current codal requirements to the analysis and design of truss and bridges, etc. 4. Design of gantry girders as a structural member. 5.Understand and design of advanced steel structures like chimney. .

Unit I Conections	**[9 Hrs]**
Introduction: Introduction to Structural Steel, failure of connections, design of various connections.	
Unit IV Girder	**[9 Hrs]**
Analysis and Design of Industrial Building (Design of purlins for roofs, design of built-up purlins)	
Unit III Truss Bridge	**[9 Hrs]**
Introduction to truss. Design of truss bridges.	
Unit IV Girder	**[9 Hrs]**
Introduction to girder, Introduction to web girder. Design of gantry girder and plate girder	
Unit V Chimney	**[9 Hrs]**
Introduction to PEB, Components of PEB, Materials Used in PEB, Design Philosophy of PEB, Applications of PEB.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Design of Steel Structures	Arya A.S and Ajmani J.L.	6th edition	Nemchand & bross
2	Design of Steel Structures	Duggal S.K.	3rd Edition	McGraw Hill Pub., (1998).

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Design of Steel Structures	Gaylord,E.H. & Gaylord,C.N	2nd edition	McGraw Hill Pub., (1998).
2	Steel Structures- Design and Behavior	Salmon and Johnson	3rd edition	Harper and Collins Publishers.
3	Design of Steel Structures	N. Subramanian	2nd edition	Oxford University press

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV703T(ii)	PE – III Metro Rail Transportation Planning and Construction	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. To understand the planning, feasibility studies, and routing considerations for metro rail transit systems in urban environments. 2. To analyze the planning principles and structural requirements of elevated and underground metro stations and viaducts. 3. To understand the MEP systems (Mechanical, Electrical, Plumbing) including ventilation, fire safety, and emergency systems in metro stations. 4. To apply codes of practice and quality management principles in metro planning and construction.	1. Plan and evaluate feasibility of metro systems with appropriate routing studies and ridership analysis. 2. Design elevated and underground metro stations as per laid down codes and regulations. 3. Analyze and design elevated viaducts, box girders, and bridge structures for metro transit. 4. Interpret MEP systems including ventilation, fire safety, emergency egress, and utility management in metro infrastructure. 5. Apply construction management, quality control, and safety practices in metro projects using international standards.

Unit I	**[9 Hrs]**
Introduction to Metro Rail Systems; Need and objectives of Metro systems in urban context; Transit-Oriented Development (TOD); Demand estimation and ridership forecasting; Route planning and alignment optimization considering urban constraints. Financial feasibility studies; Comparison of metro with other mass transit systems; Case studies of major metro systems in India (Delhi, Mumbai, Bangalore) and abroad (Singapore, Hong Kong).	
Unit II	**[9 Hrs]**
Architectural layout of elevated metro stations; codes and regulations, implementations	
Unit III	**[9 Hrs]**
Structural types: Simply supported, continuous, cable-stayed, and composite deck systems, Seismic design considerations for elevated structures	
Unit IV	**[9 Hrs]**
Architectural and functional layout of underground stations; Ventilation system design including platform screen doors and piston effect; Emergency egress and evacuation procedures; Fire and life safety systems integration Mechanical, Electrical, and Plumbing systems: HVAC design, electrical distribution, water supply and sewage management; Lighting and signaling systems; Communication and IT infrastructure.	
Unit V	**[9 Hrs]**
Construction sequencing and project planning for metro works; Site investigation and ground surveys; ; Construction quality control and assurance procedures; Environmental management and pollution control during construction, Traffic management during construction. Case studies of challenges and solutions in Indian metro construction.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Manual on Rapid Mass Transit Systems	Ministry of Railways, India	Latest Edition	CMRL/DMRC/BMRCL
2	Metro Station Design and Development	Indian Railways / Metro Project Manuals	2020-2025	Government Publications
3	Safe Design and Operation of Underground Railway Stations	Institution of Civil Engineers (ICE)	2nd Edition, 2012	Thomas Telford

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Codes of Practice: IS:456, IS:1893, IRC:6 (for bridge design)	Bureau of Indian Standards	Latest Versions	IS / IRC Publications

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Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV703T(iii)	Geotechnical Exploration and Ground Improvement Techniques	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. Explain the necessity and importance of geotechnical exploration and select appropriate methods of subsurface investigation for different civil engineering projects. 2. Describe and plan field and laboratory sampling and in-situ penetration tests and interpret results for evaluating soil properties and safe bearing capacity. 3. Identify different types of geosynthetics and their functions, and select suitable products for separation, filtration, drainage, reinforcement and erosion control. 4. Understand the principles, components and construction procedures of reinforced earth structures and soil nailing systems, diaphragm walls and deep soil mixing techniques for ground improvement	On successful completion of this course, students will be able to: 1: Describe the objectives, planning and execution of soil exploration programmes, including spacing, depth and extent of boreholes for various civil engineering structures. 2. Select suitable sampling tools and in-situ penetration tests, prepare boring logs, and interpret test data for assessment of subsoil conditions and safe bearing capacity. 3.Classify geosynthetics (geotextiles, geomembranes, geogrids, geocomposites, geofoam, etc.) and recommend their use in pavements, retaining structures and ground improvement works. 4. Design basic layouts and explain construction procedures of reinforced earth walls and soil nailing systems for retaining structures and slope stabilization. 5. Explain the design considerations, construction sequence, advantages and limitations of diaphragm walls and deep soil mixing as ground improvement techniques.

Unit I	**[9 Hrs]**
Geotechnical Exploration: Necessity and Importance of soil exploration, Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes, Spacing and depth of various Civil engineering structures, SPT, Corrections in SPT, Electrical Resistivity Method, Seismic Refraction Method.	
Unit II	**[9 Hrs]**
Sampling and Penetration Test: Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils. Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log. Static Cone Penetration Test, Dynamic Cone Penetration Test, Interpretation of results to determine SBC for the soil	
Unit III	**[9 Hrs]**
Geosynthetics: Various types of geosynthetics, their suitability and uses, Geofoam, Geogrid and their applications	
Unit IV	**[9 Hrs]**
Reinforced Earth Walls and Soil Nailing: Principle and construction of RE walls, Applications Soil nailing, construction procedure, application, advantage and suitability	
Unit V	**[9 Hrs]**
Diaphragm wall and Deep Soil Mixing: Diaphragm wall, construction procedure, application, advantage and suitability Secant piles, construction procedure, application, advantage and suitability	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Ground Improvement Techniques	B. M. Das	6th Edition	Prentice Hall India
2	Ground Improvement Techniques	Purushottama raj	8th Edition	Tata McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Ground Improvement Engineering	John C Evans	8th Edition	CRC Press Ltd.
2	Geotechnical Investigations and Improvement of Ground Conditions	Anagnostopoulos	1st Edition	CRC Press Ltd.

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV704T(ii)	Earthquake Resistant Design of Concrete Structures	4	-	-	4	20	20	60	100

Course Objectives	Course Outcomes
1. To understand the fundamentals of earthquake engineering and the importance of seismic-resistant design in structures. 2. To familiarize students with current Indian standards (such as IS 1893 and IS 13920) for seismic analysis and ductile detailing. 3. To develop skills in calculating seismic loads acting on structures using codal provisions. 4. To analyze building structures under earthquake forces using appropriate structural analysis methods. 5. To apply principles of ductile detailing in reinforced concrete members to ensure safety and energy dissipation.	At the of the course, students will be able to: 1. Understand the fundamentals of engineering seismology, including faults, folds, and earthquake wave propagation, and earthquake parameters using seismic data and instruments. 2. Analyze the causes and effects of earthquake damage, evaluate ground failure mechanisms, and interpret response spectra and ground motion characteristics for assessing seismic risk. 3. Apply concepts of strength, ductility, and energy absorption in reinforced concrete members. 4. Evaluate seismic-resistant design guidelines for multi-storey buildings, considering torsion, soft storey effects, P-delta effects, soil-structure interaction, and drift limitations. 5. Design earthquake-resistant buildings as per present Indian standards.

Unit I	**[9 Hrs]**
Engineering Seismology, faults and folds, Propogation of earthquake waves, quantification of earthquake, magnitude, energy intensity of earthquake, accelerograph, accelogram, recording and analysis of earthquake records, seismicity of the world, Analysis and interpretation of earthquake data, determination of magnitude, epicenter, epicenter distances focal depth, focal mechanism, seismic zoning	
Unit II	**[9 Hrs]**
Causes or sources of earthquake damage, damage due to ground failure, History of a past earthquakes, response spectrum from available earthquake records, Evolution of seismic risk, Concept of response spectra, site-specific spectrum, characteristics of earthquake ground motion.	
Unit III	**[9 Hrs]**
Strength, ductility and energy absorption, ductility of reinforced members subjected to flexure. Axial loads & shear detailing of RCC members beam column, Beam-column joints for ductile behaviors, IS code previsions.	
Unit IV	**[9 Hrs]**
Guideline for achieving efficient seismic resistant design, Special aspects in Multi-storey buildings, effect of torsion, flexible first story, P-delta effect, soil-structure, interaction on building response. Drift limitation. Study of IS: 1893:2025, IS: 13920:2025 for analysis and ductile design of RCC structures and other related codes.	
Unit V	**[9 Hrs]**
Design of Building as per present Indian standards	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Design of Earthquake Resistant Structures	Agrawal & Shrikhande	3rd	Prentice Hall of India Pvt. Ltd
2	Seismic design of R C & Masonry Buildings	Paulay, T. & Prestiley M.J.N	2nd	John Willey & Sons
3	Basic Elements of Earthquake Engineering	Asadour H. Hadjian	-----	Willey
4	Earthquake Resistant Design of Structures	S.K.Duggal	2nd	Oxford

Indian Standard Codes of Practice

S.N	Title	Publisher
1	**IS 1893 (Part 1): 2016** - Criteria for Earthquake Resistant Design of Structures - General Provisions and Buildings	Bureau of Indian Standards, New Delhi
2	**IS 13935: 2019** - Repair and Seismic Strengthening of Buildings	Bureau of Indian Standards, New Delhi
3	**IS 1726: 2019** - Code of Practice for Foundations	Bureau of Indian Standards, New Delhi
4	**IS 4326: 1993** - Earthquake Resistant Design and Construction of Buildings – Code of Practice	Bureau of Indian Standards, New Delhi
5	**IS 1893 (Part 1): 2016** - Criteria for Earthquake Resistant Design of Structures - General Provisions and Buildings	Bureau of Indian Standards, New Delhi

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV704T(ii)	PE – IV Urban Transportation Planning	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. To introduce students to the fundamentals of urban transportation systems and planning concepts. 2. To understand travel demand characteristics and urban land-use–transport interaction. 3. To familiarize students with traffic surveys, data collection, and analysis techniques. 4. To develop knowledge of public transportation systems and sustainable transport strategies. 5. To expose students to modern urban transport planning tools, policies, and practices.	On successful completion of the course, students will be able to: 1.Explain the role and importance of transportation planning in urban development. 2.Analyze urban travel demand and traffic characteristics using standard techniques. 3.Apply transportation planning models for forecasting travel demand. 4.Evaluate public transport systems and traffic management measures. 5.Propose sustainable and integrated urban transport solutions.

Unit I	**[9 Hrs]**
Urbanization and transportation issues, Transportation systems: components and classification, Objectives and scope of urban transportation planning, Transportation planning process, Land use–transport interaction, Road Safety, Transport Policies and Urban Mobility Plans,	
Unit II	**[9 Hrs]**
Travel demand characteristics, First mile and last mile connectivity surveys, Household interview surveys, Roadside and cordon line surveys, Traffic volume, speed, and parking surveys	
Unit III	**[9 Hrs]**
Overview of travel demand modeling, Trip generation: concepts and methods, Trip distribution models, Modal split: factors and models, Traffic assignment techniques	
Unit IV	**[9 Hrs]**
Types of public transport systems, Bus transit systems and operations, Rail-based urban transport: Metro, Monorail, LRT, Performance evaluation of public transport, Introduction to Intelligent Transportation Systems (ITS)	
Unit V	**[9 Hrs]**
Traffic management techniques, Parking management and policies, Non-motorized transport planning, Sustainable urban transport concepts, Road safety audit	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Traffic and Transportation Planning	Khanna and Justo		Nem Chand & Bros
2	Urban Transport Planning	Kadiyali L. R.		Khanna Publisher
3	Transportation Engineering and Planning	Papacostas & Prevedouros		Prentice Hall

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Urban Transportation Systems	Vukan R. Vuchic		McGraw Hill
2	Traffic and Highway Engineering	Nicolas J Garber		WadsworthPublishing Co.

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV704T(iii)	PE – IV Irrigation Engineering	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. Understand basic concepts of irrigation and construction of various hydraulic structures. 2. Introduce basic concepts of water, plants, their interactions, as well as irrigation and drainage systems. 3. Understand the structures involved the elementary hydraulic design of different structures.	At the end of the course, students will be able to: 1. Understand the importance and scope of irrigation engineering. 2. Understand the methods and efficiency of irrigation, crop water requirement. 3. Understand the basic profile of dams and use the knowledge in checking stability of Gravity dams and Earth dams. 4. Understand the component parts of diversion headwork. 5. Understand water logging and provide the solution to such problem.

Unit I	**[8 Hrs]**
General: Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; types of Irrigation systems.	
Unit II	**[8 Hrs]**
Water Requirement of Crops: Suitability of soils for Irrigation, Standards of Irrigation water; Depth and frequency of Irrigation; Basic Terminologies, Relation between duty and delta.	
Unit III	**[7 Hrs]**
Dams: General Classification of dams as per use, hydraulic design and materials; Factors governing selection of dams. Instrumentation in dam.**Gravity Dam:** Forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.**Earthen Dams:** Types of earthen dam; Description of component parts of earthen dams-foundation.	
Unit IV	**[7 Hrs]**
Spillways: Types of spillway, types of Spillway gates. **Diversion Head Works:** Regulators**,**Component parts of diversion headworks, causes of failure of weirs on permeable foundation; Bligh's Creep theory; Dr. Khosla's theory for design of weirs on permeable foundations.	
Unit V	**[6 Hrs]**
Canals and Cross Drainage Works: Types of canal, Alignments of canal, Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals, Purpose aqueducts, siphon aqueducts, super passage, canal siphon, inlets and level crossings, Causes, effects, preventive measures of water logging, types of drains.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Irrigation Engineering and Hydraulic Structures	Santosh Kumar Garg	-	Khanna Publishers
2	Irrigation Engineering and Hydraulic Structures	S.R. Sahastrabudhe	-	S.K. Kataria & Sons ; Publication
3	Irrigation Engineering and Water Power Engineering	B.C. Punmia	7th	Laxmi Publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Irrigation Engineering	N.N. Basak	-	McGraw-Hill Education (India) Pvt Limited,
2	Irrigation Engineering and Hydraulic Structures	R.K.Sharma	2nd	S Chand Publishing. Publication

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV705T(i)	PE – V Repairs and Rehabilitation of Structures	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. Familiarize Students with deterioration of concrete in structures. 2. Equip student with concepts of NDT and evaluation. 3. Understand failures and causes for failures in structures 4. Familiarize different materials and techniques for repairs 5. Understand procedure to carryout Physical evaluation of buildings and prepare report	At the end of the course, students will be able to: 1. Explain deterioration of concrete in structures. 2. Carryout analysis using NDT and evaluate structures. 3. Assess failures and causes of failures in structures. 4. Carryout Physical evaluation and submit report on condition of the structure. 5. Carryout analysis of structures and take preventive action as per conditions & Requirement.

Unit I **[10 Hrs]**

Deterioration of concrete in structures: Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures, Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

Unit II **[8 Hrs]**

Non Destructive Testing: Nondestructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

Unit III **[9 Hrs]**

Failure of buildings: Definition of building failure-types of failures- Causes of Failures Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices, Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipments - repair of cracks in concrete.

Unit IV **[9 Hrs]**

Materials for repair and rehabilitation: Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects , Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

Unit V **[9 Hrs]**

Repair & Retrofitting: Techniques Distress, observation and preliminary test methods.
Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures. Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Maintenance & Repair of Civil Structures	B.L. Gupta & Amit Gupta		
2	Rehabilitation of Concrete Structures	Charles J. Kibert	5th edition	Standard Publishers
3	Repair and protection of concrete structures	Noel, P. Mailvaganam	1991	CRC Press
4	Concrete repair and maintenance Illustrated	Peter.H.Emmons	2001.	Galgotia publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Handbook on repair and rehabilitation of RCC buildings	CPWD, Government of India.		
2	Handbook on seismic retrofit of buildings	A Chakrabarti et.al	2010	Narosa PublishingHouse

		July 2026	NEP 1.0	Applicable for 2026-27
Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV705T (ii)	PE - V Pavement Design	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. To understand the basic concepts, types, and components of pavement systems. 2. To evaluate traffic loading and material properties required for pavement design. 3. To design flexible pavements using standard methods and principles. 4. To understand and design rigid pavements based on stress analysis. 5. To study evaluation methods and maintenance strategies for pavements.	At the of the course, students will be able to: 1. Explain types of pavements and identify their components and influencing factors. 2. Determine design traffic and assess subgrade and material properties. 3. Design flexible pavements using IRC guidelines and analyze their behavior. 4. Analyze stresses and design rigid pavements as per IRC standards. 5. Evaluate pavement conditions and recommend maintenance and rehabilitation measures.

Unit I	**[9 Hrs]**
Introduction to Pavement Engineering: Definition, functions, and importance of pavements, Types of pavements: Flexible and Rigid, Pavement components and their functions, Wheel load and contact pressure, Factors affecting pavement design, IRC guidelines overview	
Unit II	**[9 Hrs]**
Traffic and Material Characterization: Traffic analysis: Axle load, ESWL, VDF, Equivalent Single Axle Load (ESAL), Traffic forecasting, Subgrade properties (CBR, resilient modulus), **Pavement materials:** Bitumen and aggregates, Laboratory and field tests	
Unit III	**[9 Hrs]**
Design of Flexible Pavements: Flexible pavement design principles, CBR method (IRC:37), Layered system concept, Stress-strain analysis, Pavement thickness design	
Unit IV	**[9 Hrs]**
Design of Rigid Pavements: Components of rigid pavements, Westergaard's theory, Stresses in concrete pavements, IRC:58 design procedure, Joints and their types, Load transfer mechanisms (dowel and tie bars)	
Unit V	**[9 Hrs]**
Pavement Evaluation, Maintenance and Rehabilitation: Types of pavement distress, Pavement evaluation methods (PCI, roughness), Non-destructive testing (FWD, Benkelman Beam), Maintenance strategies, Overlay design, Recycling techniques	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Principles & Practice of Highway Engineering	Kadiyali L. R. and Lal, N. B	-	Khanna Publishers, Delhi.
2	Principles, Practice and Design of Highway Engineering	S.K. Sharma	-	S. Chand and Co.
3	Highway Engineering	Martin Rogers, Bernard Enrigh	-	Willey Blackwell

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Pavement Analysis and Design	Huang Y. H	-	Englewood Cliffs, New Jersey, USA
2	Principles of Pavement Design	Yoder E. J. and Witczak M. W	-	John Wiley and Sons

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV705T (iii)	Solid Waste Management	3	-	-	3	15	30	70	100

Course Objectives	Course Outcomes
1. Get broader understandings on various aspects of solid waste management starting from its generation to processing with options for reuse and recycle, transport and disposal. 2. Cover many other aspects including recovery of biological conversion products from solid waste to compost and biogas, incineration and energy recovery. 3. Understand various aspects of hazardous waste management and treatment, and integrated waste management.	At the end of the course, students will be able to: 1. Identify various types, sources and characteristics of solid wastes. 2. Understand process of handling/managing the solid waste. 3. Understand the techniques and methods used in recovery of materials and energy from solid wastes. 4. Identify process and methods of disposal of solid waste. 5. Categorize and manage the hazardous waste.

Unit I		**[5 Hrs]**
	Solid Waste: Definitions, Characteristics, and Perspectives: Types of solid wastes, sources of solid wastes, properties of solid wastes, Solid Waste Management Rules (2016).	
Unit II		**[7 Hrs]**
	Segregation, Collection and Transportation of Solid Waste: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; transfer and transport; processing techniques; Integrated SW Management concepts.	
Unit III		**[8 Hrs]**
	Resource and Energy Recovery: Processing techniques; RRR approach, materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products; materials and energy recovery systems.	
Unit IV		**[8 Hrs]**
	Disposal of Solid Waste: Dumping of solid waste; sanitary landfills – site selection, operation of sanitary landfills – Leachate collection & treatment. Identify methods of solid waste disposal during a site visit and follow safety precautions.	
Unit V		**[8 Hrs]**
	Hazardous Waste Management: Introduction; Concern about Hazardous Waste Management; Hazardous Waste Management Rules (2016), Characteristics of Hazardous Waste; Transportation and Disposal of Hazardous Waste; Industrial/biomedical waste, E- waste management.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Solid waste management in developing countries	Bhide A.D. and Sundaresan B.B	-	INSDOC, New Delhi
2	Introduction to Environmental Engineering & Science	Gilbert M. Masters, Wendell P. Ela	-	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Handbook of Solid Waste Management	Tchobanoglous G and Kreith F	**2002, 2nd Edition**	McGraw-Hill Education

		July 2026	NEP 1.0	Applicable for 2026-27
Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23CV731M	Public Transport System	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
1. Differentiate different transit systems 2. Identify mass transit corridors 3. Evaluate transit performance and transit terminals	At the end of the course, the students will be able to: 1. Describe transit modes, management activities and demand analysis 2. Do Comparative Analysis and evaluations 3. Illustrate financing and management of Public Transportation 4. Appraise working of various performance attributes 5. Illustrate various aspects of transportation systems

Unit I	**[9 Hrs]**
SYSTEM AND TECHNOLOGIES: Urban passenger transportation modes, transit classifications and definitions, theory of urban passenger transport modes, rail transit, bus transit, Para transit and ride sharing, designing for pedestrians, trends in transit rider ship and use of different modes.	
Unit II	**[9 Hrs]**
COMPARING ALTERNATIVES: Comparing costs, comparative analysis, operational and technological characteristics of different rapid transit modes, evaluating rapid transit	
Unit III	**[9 Hrs]**
PLANNING: Transportation system management, system and service planning, financing public transportation, management of public transportation, public transportation marketing.	
Unit IV	**[9 Hrs]**
TRANSIT SYSTEM EVALUATION: Definition of quantitative performance attributes, transit lane capacity, way capacity, station capacity, theoretical and practical capacities of major transit modes, quantification of performance.	
Unit V	**[9 Hrs]**
CITY TRAFFIC: Classification of transportation systems, conventional transportation systems, unconventional transportation systems, prototypes and tomorrow's solutions, analysis and interpretation of information on transportation systems, perspectives of future transportation.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Public Transport: Its Planning, Management, and Operation	Peter R. White	5th	New York Publishers
2	Urban Transit: Operations, Planning, and Economics	Vukan R. Vuchic	3rd	Wiley
3	Public Transportation	George E. Gray and Lester A. Hoel.	3rd	Prentice

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Bus Transport: Economics, Policy, and Planning	David A. Hensher	1st	Elsevier Publications
2	Public Transport Planning and Management in Developing Countries	Ashish Verma, Ramanayya, T.V.	1st	CRC Press
3	Urban Mass Transportation Planning	Alan Black	2nd	McGraw-Hill