



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in Light of NEP-2020
M.Tech. Construction Technology and Management
(2025-2027)

(2023-2024)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 5301(1)	DSE	Environmental Man-agement	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

On completion of this course, students will understand the principles, tools, regulatory framework, and managerial practices required to prevent pollution, conserve resources, assess environmental impacts, and improve the environmental performance of construction projects and organizations.

Course Outcomes (COs):

1. Explain the fundamental concepts of environmental management, ecosystems, natural resources, and sustainable development.
2. Identify major sources and effects of air, water, soil, and noise pollution and recommend suitable prevention and control measures.
3. Apply environmental impact assessment, risk assessment, life-cycle thinking, and environmental auditing to construction projects.
4. Interpret key environmental laws, regulatory requirements, and institutional responsibilities relevant to projects in India.
5. Develop an environmental management plan using ISO 14001 principles, resource efficiency, waste management, monitoring, and continual improvement.

Syllabus:

UNIT I

08 Hrs.

Introduction to environmental management: scope, objectives and principles; relationship between development and environment; ecosystems, biodiversity and ecological balance; natural resources and their conservation; carrying capacity; sustainable development, Sustainable Development Goals, circular economy, climate change, carbon footprint and the environmental responsibilities of construction managers.


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MTCE 5301(1)	DSE	Environmental Man- agement	60	20	20	0	0	3	0	0	3

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UNIT II

09 Hrs.

Environmental pollution and control: sources, characteristics, effects, monitoring and control of air, water, soil and noise pollution; ambient standards and indicators; pollution prevention, cleaner production and resource efficiency; solid waste, hazardous waste, construction and demolition waste, plastic waste and e-waste - segregation, collection, treatment, recycling, recovery and safe disposal.

UNIT III

08 Hrs.

Environmental assessment and decision tools: screening and scoping; baseline environmental studies; prediction and evaluation of impacts; alternatives analysis; mitigation hierarchy; Environmental Impact Assessment process and report structure; Environmental Management Plan; public consultation; environmental risk assessment, disaster and emergency preparedness; life-cycle assessment, cost-benefit analysis and environmental valuation.

UNIT IV

08 Hrs.

Environmental policy, law and governance in India: constitutional provisions; Environment (Protection) Act, 1986; Water Act, 1974; Air Act, 1981; environmental clearance and consent mechanisms; waste-management rules relevant to projects; roles of MoEFCC, CPCB, SPCBs and local bodies; compliance obligations, permits, documentation, monitoring, reporting, environmental liability and professional ethics.

UNIT V

09 Hrs.

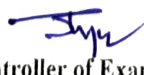
Environmental management systems: environmental policy, planning, implementation, operational control, competence, communication, documentation, performance evaluation and continual improvement; ISO 14001 requirements; environmental aspects and impacts register; objectives, targets and programmes; environmental auditing, compliance audit and management review; sustainability reporting, environmental performance indicators, green procurement and preparation of a project-specific environmental management plan.


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MTCE 5301(1)	DSE	Environmental Management	60	20	20	0	0	3	0	0	3

MTCE - Guided Student Activity: P – Practical; C - Credit;

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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Text Books:

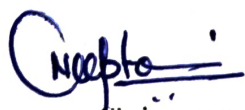
1. Environmental Management, N. K. Uberoi, Excel Books, New Delhi.
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu and Valli Manickam, B. S. Publications.
3. Environmental Management, Suresh K. Dhameja, S. K. Kataria & Sons, New Delhi.

Reference Books:

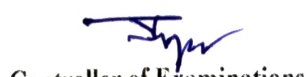
1. ISO 14001: Environmental Management Systems - Requirements with Guidance for Use, International Organization for Standardization.
2. Environmental Impact Assessment: Theory and Practice, Peter Wathern, Routledge.


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MTCE 5301(2)	DSE	Sustainable Construction Engineering	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

On completion of this course, students will be able to integrate environmental, economic and social considerations into the planning, design, procurement, construction and operation of built assets, with emphasis on low-carbon materials, resource efficiency, life-cycle performance and sustainable construction management.

Course Outcomes (COs):

1. Explain the principles, drivers and performance objectives of sustainable construction in the context of construction technology and management.
2. Evaluate construction materials and building alternatives using life-cycle thinking, embodied carbon, durability, circularity and responsible sourcing.
3. Recommend sustainable site, water, energy and building-system strategies appropriate to project requirements and climatic conditions.
4. Plan and control sustainable construction operations using green procurement, lean practices, BIM, waste minimization and environmental management measures.
5. Assess building sustainability using codes, rating systems, life-cycle costing and carbon-performance indicators, and prepare a project sustainability plan.

Syllabus:

UNIT I

08 Hrs.

Fundamentals of sustainable construction: meaning, scope and need; environmental, economic and social dimensions; built-environment impacts; sustainable development goals; resource efficiency, resilience and climate-responsive construction; whole-life and integrated design approaches; project stakeholders, value creation, barriers and opportunities; role and responsibilities of the construction manager in delivering sustainable built assets.



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MTCE 5301(2)	DSE	Sustainable Construc- tion Engineering	60	20	20	0	0	3	0	0	3

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UNIT II

09 Hrs.

Sustainable construction materials and life-cycle performance: material flows, embodied energy and embodied carbon; life-cycle assessment principles and system boundaries; environmental product declarations; selection criteria based on availability, durability, maintainability, recyclability and responsible sourcing; low-carbon cement and concrete, supplementary cementitious materials, recycled aggregates, steel, masonry, timber and emerging bio-based materials; design for adaptability, disassembly, reuse and circular construction.

UNIT III

08 Hrs.

Sustainable site and building strategies: site selection, ecology protection, heat-island reduction and storm-water management; water demand reduction, rainwater harvesting, wastewater treatment and reuse; passive design, orientation, envelope, daylighting and natural ventilation; energy-efficient lighting and services; renewable-energy integration; indoor environmental quality, thermal comfort, acoustics and low-emitting materials; coordination of design and construction decisions for performance.

UNIT IV

08 Hrs.

Sustainable construction planning and operations: sustainability requirements in project briefs, contracts and tendering; green procurement and supply-chain management; construction and demolition waste audits, segregation, recovery and disposal; efficient use of materials, water, energy and equipment; site pollution prevention, dust, noise and erosion control; lean construction, prefabrication, modular construction and BIM-enabled coordination; logistics, workforce welfare, monitoring, documentation and environmental management plans.

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UNIT- V

09 Hrs.

Performance assessment and implementation: applicable provisions of the National Building Code and Energy Conservation Building Code; overview and comparison of GRIHA, IGBC and LEED rating systems; net-zero energy, water, waste and carbon concepts; operational versus embodied carbon; life-cycle costing, value engineering and payback; commissioning, measurement and verification, post-occupancy evaluation and sustainability reporting; case studies and preparation of a project-specific sustainable construction implementation plan.

Text Books:

1. Sustainable Construction: Green Building Design and Delivery, Charles J. Kibert, John Wiley & Sons.
2. Sustainable Construction, Sandy Halliday, Butterworth-Heinemann.
3. Handbook of Green Building Design and Construction, Sam Kubba, Butterworth-Heinemann.

Reference Books:

1. Green Building: Project Planning and Cost Estimating, R. S. Means, John Wiley & Sons.
2. GRIHA Manual and Rating Guidelines, GRIHA Council, New Delhi.



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MTCE 5301(3)	DSE	Building Services	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

On completion of this course, students will understand the planning, design coordination, installation, testing, commissioning, operation and maintenance requirements of essential building services, enabling effective management of safe, comfortable, efficient and code-compliant construction projects.

Course Outcomes (COs):

1. Explain the functions, design criteria and coordination requirements of major building services in construction projects.
2. Plan water-supply, plumbing, sanitation, drainage and rainwater-management systems in accordance with relevant standards.
3. Evaluate HVAC, ventilation and indoor environmental quality requirements and coordinate their installation and commissioning.
4. Interpret electrical, lighting, fire-safety and vertical-transportation service requirements for different building types.
5. Integrate building services using BIM and building-management systems, and develop strategies for testing, commissioning, operation, maintenance and life-cycle performance.

Syllabus:

UNIT I

08 Hrs.

Introduction and coordination of building services: scope, classification and functional requirements; influence of occupancy, building type and climate; service zones, shafts, plant rooms and equipment access; applicable provisions of the National Building Code; coordination among architectural, structural and MEP disciplines; preparation and interpretation of service drawings, specifications, schedules and shop drawings; BIM-based service coordination, clash detection, constructability and roles of the construction manager.



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MTCE 5301(3)	DSE	Building Services	60	20	20	0	0	3	0	0	3

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UNIT II

09 Hrs.

Water supply, plumbing and drainage services: sources, demand estimation, storage and distribution; direct, indirect and hydro-pneumatic systems; pumps, pipes, valves and fixtures; hot-water systems; sanitary plumbing, traps, venting, soil and waste systems; sewage collection, treatment and reuse; storm-water drainage, rainwater harvesting and groundwater recharge; water conservation, metering and leak detection; installation, testing, commissioning and maintenance requirements.

UNIT III

08 Hrs.

Heating, ventilation and air-conditioning services: thermal comfort and indoor air quality; heat-gain and cooling-load concepts; natural and mechanical ventilation; air-conditioning system types, refrigeration cycle, chillers, cooling towers, air-handling and terminal units; duct and piping layouts; controls, insulation, condensate drainage, vibration and noise control; energy efficiency, ventilation standards, installation planning, testing, adjusting, balancing and commissioning.

UNIT IV

08 Hrs.

Electrical, lighting and allied services: electrical load estimation; incoming supply, substations, transformers, switchgear and distribution; wiring systems, cable routing, earthing, lightning protection and power-factor improvement; emergency and standby power, UPS and renewable-energy interfaces; illumination principles, daylight integration and energy-efficient lighting; lifts, escalators and moving walks - selection, capacity, traffic analysis, safety provisions, installation coordination and maintenance.

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UNIT V

09 Hrs.

Fire protection, intelligent systems and service management: fire detection, alarm, suppression, hydrant, sprinkler, smoke-control and evacuation systems; fire-water storage and pumping; communication, security, access-control and public-address systems; building automation, Building Management System and integrated controls; sensors, metering and performance monitoring; MEP procurement, contracts, sequencing and quality assurance; testing and commissioning plans, handover documentation, operation and maintenance, facility management, life-cycle cost, energy audits and retrofitting of building services.

Text Books:

1. Building Services Handbook, Fred Hall and Roger Greeno, Routledge.
2. Building Services Engineering, David V. Chadderton, Routledge.
3. Mechanical and Electrical Equipment for Buildings, Walter T. Grondzik and Alison G. Kwok, John Wiley & Sons.

Reference Books:

1. National Building Code of India 2016, Bureau of Indian Standards, New Delhi.
2. ASHRAE Handbook - Fundamentals, American Society of Heating, Refrigerating and Air-Conditioning Engineers.

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MTCE 5302(1)	DSE	Management Information Systems	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

On completion of this course, students will understand how management information systems support planning, coordination, monitoring, control and decision-making in construction organizations and projects, and will be able to specify, evaluate and manage digital information solutions for CTM practice.

Course Outcomes (COs):

1. Explain the concepts, components and managerial roles of information systems in construction organizations and projects.
2. Organize project data using database, enterprise-system and common-data-environment principles.
3. Apply project management information systems to planning, cost, resources, procurement, contracts, quality and safety management.
4. Develop dashboards and decision-support outputs using construction KPIs, earned-value data, business intelligence and predictive analytics.
5. Evaluate MIS implementation, integration, security, governance and change-management requirements for construction enterprises.

Syllabus:

UNIT I

08 Hrs.

Fundamentals of Management Information Systems: data, information, knowledge and information quality; system concepts and components; information needs at operational, tactical and strategic levels; transaction processing systems, MIS, decision support systems and executive information systems; organizational processes and decision-making; role of MIS in construction enterprises; system development life cycle, requirements analysis, feasibility, process mapping and user participation.

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UNIT II

09 Hrs.

Data and enterprise information management: data structures, files, databases and database management systems; relational concepts, entities, attributes, keys and relationships; data validation, coding, classification and master data; document and records management; enterprise resource planning and functional integration of finance, human resources, procurement, inventory and equipment; cloud databases, data exchange, interoperability and common data environments for construction projects.

08 Hrs.

UNIT III

Construction Project Management Information Systems: system architecture and workflows; project planning and scheduling information; progress measurement, resource and equipment tracking; estimating, budgeting, cost control and cash-flow information; procurement, stores and supply-chain systems; tender, contract, change, claim and payment administration; quality, safety and risk information; field reporting, mobile data capture and integration of PMIS with BIM, GIS and enterprise systems.

08 Hrs.

UNIT IV

Business intelligence and decision support for CTM: construction key performance indicators; data aggregation, dashboards, scorecards and exception reports; earned value management and forecast information; variance, trend, what-if and sensitivity analysis; data visualization and management reporting; data warehouses, online analytical processing and data mining; predictive analytics, artificial intelligence and machine-learning applications in cost, schedule, productivity, safety and risk decisions.

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MTCE 5302(1)	DSE	Management Infor- mation Systems	60	20	20	0	0	3	0	0	3

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UNIT V

09 Hrs.

MIS planning, implementation and governance: information-systems strategy and alignment with organizational objectives; system selection, configuration, customization and integration; make-or-buy and software-as-a-service decisions; implementation planning, testing, migration, training and change management; user adoption and performance evaluation; information security, access control, backup, disaster recovery, privacy, audit trails and cyber risks; digital signatures, legal records, emerging IoT and digital-twin applications, and case studies of MIS implementation in construction.

Text Books:

1. Management Information Systems: Managing the Digital Firm, Kenneth C. Laudon and Jane P. Laudon, Pearson.
2. Management Information Systems, James A. O'Brien and George M. Marakas, McGraw-Hill Education.
3. Management Information Systems: Text and Cases, Waman S. Jawadekar, McGraw-Hill Education.

Reference Books:

1. BIM Handbook: A Guide to Building Information Modeling, Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston, John Wiley & Sons.
2. Project Management Body of Knowledge (PMBOK Guide), Project Management Institute.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 5302(2)	DSE	Strategic Management of Construction Projects	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

On completion of this course, students will be able to analyze the strategic environment of construction organizations, formulate competitive and project-level strategies, align portfolios and resources with organizational objectives, and lead implementation for sustained project and business performance.

Course Outcomes (COs):

1. Explain strategic-management concepts and their relevance to construction organizations, programmes and projects.
2. Analyze the external environment, industry structure, stakeholders and internal capabilities of a construction enterprise.
3. Formulate competitive, bidding, market-entry, partnership and project-portfolio strategies for construction business situations.
4. Plan strategy implementation through governance, organizational design, leadership, resources, procurement and change management.
5. Evaluate strategic performance using financial and non-financial indicators, risk information, digital tools and lessons learned.

Syllabus:

UNIT I

08 Hrs.

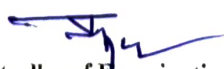
Strategic management in construction: meaning, scope, levels and process; characteristics of the construction industry and project-based organizations; relationship among corporate, business, functional and project strategy; vision, mission, values, objectives and policies; strategic intent and competitive advantage; stakeholder expectations, ethics and corporate responsibility; role of senior management, project directors and construction managers in strategic decision-making.



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Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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UNIT II

09 Hrs.

Strategic analysis for construction organizations: macro-environmental analysis using PESTLE; industry and competitive analysis using the Five Forces framework; market segmentation, client and competitor analysis; stakeholder mapping; internal-resource and capability assessment; value-chain analysis; core competencies and dynamic capabilities; financial, technological and human-resource appraisal; SWOT and scenario analysis; strategic risks, uncertainty and early-warning information.

UNIT III

08 Hrs.

Strategy formulation and choice: cost leadership, differentiation, focus and best-value strategies; growth, stability, retrenchment and turnaround; diversification and internationalization; market-entry and client-selection decisions; bidding and tender strategy, bid/no-bid analysis and pricing considerations; joint ventures, strategic alliances, partnering and public-private partnerships; vertical integration and supply-chain strategy; project, programme and portfolio selection, prioritization and resource balancing.

UNIT IV

08 Hrs.

Strategy implementation in construction: translating strategy into programmes, projects, budgets and action plans; governance structures, roles, accountability and decision rights; functional, divisional, matrix and project-based organization; strategic resource allocation; leadership, culture, communication and change management; strategic human-resource and knowledge management; procurement, contracting and supplier-development strategies; innovation management, lean practices and BIM-enabled organizational transformation.

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(2023-2024)											
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MTCE 5302(2)	DSE	Strategic Management of Construction Projects	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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UNIT V

09 Hrs.

Strategic control and performance improvement: strategic objectives, critical success factors and key performance indicators; Balanced Scorecard; financial, client, process, learning, safety and sustainability measures; benchmarking, earned-value and portfolio dashboards; strategic risk monitoring, claims and crisis response; value engineering and life-cycle value; digitalization, analytics, resilience and low-carbon strategy; governance reviews, strategic audit, benefits realization, lessons learned and case studies of successful and failed construction strategies.

Text Books:

1. Strategic Management in Construction, David Langford and Steven Male, Blackwell Science.
2. Strategic Management and Business Policy, Thomas L. Wheelen, J. David Hunger, Alan N. Hoffman and Charles E. Bamford, Pearson.
3. Exploring Strategy, Gerry Johnson, Richard Whittington, Kevan Scholes, Duncan Angwin and Patrick Regner, Pearson.

Reference Books:

1. Managing Construction Projects, Graham M. Winch, Wiley-Blackwell.
2. Project Management: Strategic Design and Implementation, David I. Cleland and Lewis R. Ireland, McGraw-Hill.

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MTCE 5302(3)	DSE	Urban Transportation Planning	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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Course Educational Objectives (CEOs):

On completion of this course, students will understand the principles, data requirements, analytical models and appraisal methods used in urban transportation planning, and will be able to formulate integrated, inclusive and sustainable mobility strategies for growing urban areas.

Course Outcomes (COs):

1. Explain the urban transportation planning process and the interaction among transport, land use, environment and urban development.
2. Design and analyze transportation surveys, traffic-analysis zones, databases and travel-demand information.
3. Apply trip-generation, trip-distribution, modal-split and traffic-assignment models for urban travel-demand forecasting.
4. Plan integrated road, public-transport, non-motorized transport, parking and freight systems for urban areas.
5. Evaluate transportation alternatives using economic, environmental, social and performance criteria and prepare an urban mobility plan.

Syllabus:

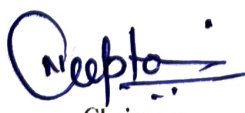
UNIT I

08 Hrs.

Urban transportation systems and planning framework: components and characteristics of urban transport; mobility, accessibility and level of service; urbanization and travel trends; interaction between land use and transport; transportation problems in Indian cities; planning objectives, hierarchy and time horizons; systems approach, planning process and institutional framework; sustainable, equitable and resilient mobility; transport policy, stakeholder participation and overview of comprehensive mobility planning.



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UNIT II

09 Hrs.

Transportation data and surveys: definition of study area, cordon, screen lines and traffic-analysis zones; road-network and land-use inventories; household interview, roadside interview, origin-destination, traffic-volume, speed and delay, parking, public-transport, pedestrian and freight surveys; sampling, questionnaire design and survey management; expansion and validation of data; desire-line diagrams, trip matrices, database development, GIS applications and analysis of existing travel patterns.

UNIT III

08 Hrs.

Urban travel-demand modelling: structure and limitations of the four-stage model; trip generation using growth-factor, category-analysis and regression methods; trip distribution using growth-factor and gravity models; modal-split concepts and logit models; network representation, link performance and route choice; all-or-nothing, capacity-restraint and user-equilibrium traffic assignment; model calibration, validation, forecasting, sensitivity and scenario analysis.

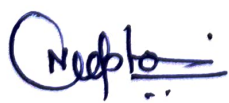
UNIT IV

08 Hrs.

Planning of urban transport systems: functional road hierarchy and network planning; public-transport demand, route and service planning; bus systems, metro rail and multimodal integration; terminals, interchanges and feeder services; pedestrian and bicycle planning, universal accessibility and complete streets; transit-oriented development; parking-demand and management strategies; urban freight and city logistics; travel-demand management, shared mobility and integration of land-use and transport measures.



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UNIT V

09 Hrs.

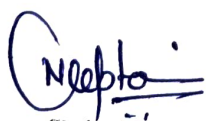
Evaluation and implementation of urban transport plans: identification and comparison of alternatives; capital, operating and user costs; travel-time, vehicle-operating-cost and safety benefits; cost-benefit analysis, net present value, benefit-cost ratio and internal rate of return; environmental and social impact assessment; emissions, energy, equity and accessibility indicators; intelligent transportation systems and data-driven mobility management; phasing, financing, monitoring and preparation of a comprehensive urban mobility plan with case studies.

Text Books:

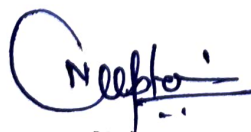
1. Urban Transportation Planning, Michael D. Meyer and Eric J. Miller, McGraw-Hill.
2. Transportation Engineering and Planning, C. S. Papacostas and P. D. Prevedouros, Pearson.
3. Traffic Engineering and Transport Planning, L. R. Kadiyali, Khanna Publishers.

Reference Books:

1. Modelling Transport, Juan de Dios Ortuzar and Luis G. Willumsen, John Wiley & Sons.
2. Guidelines and Toolkits for Urban Transport Planning, Ministry of Housing and Urban Affairs, Government of India.



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