

M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

PO, PSO, PEO & CO

Programme: M.Tech. in Transportation Engineering

Programme Code: 078

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

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Faculty of Engineering and Technology (FET)

Programme Name: M.Tech. (Environmental Engineering and Management)

Programme Outcomes (POs)

M.Tech. graduates will be able to:

- PO 1. Evaluate different modes of transportation based on travel demand forecasting and travel demand distribution models
- PO 2. Select appropriate materials and technology to design, construct, maintain and rehabilitate highways
- PO 3. Apply artificial intelligence and Intelligent Transportation System (ITS) to solve urban transportation issues
- PO 4. Use various software tools to model and simulate traffic flow to manage traffic issues
- PO 5. Analyze and design various types of bridges for road and railway projects
- PO 6. Develop and administer project budgets, fiscal control, contract and quality control provisions
- PO 7. Develop a career in transportation industry
- PO 8. Practice teamwork, lifelong learning and continuous improvement

Programme Specific Outcomes (PSOs)

The programme specific outcomes are listed under four headings:

1. Knowledge and Understanding
2. Cognitive skills
3. Practical skills and
4. Capability/Transferable skills

Cognitive Skills: After undergoing this programme, a student will be able to:

- CS1: Analyze and design various pavement systems, maintenance techniques to meet the overall expectation of the road project
- CS2: Analyze and propose traffic study, simulation and remedial measure essential for solving a broad set of traffic problems in transportation industry considering societal and economic impacts
- CS3: Plan surveys to collect and analyze data required for transportation planning
- CS4: Propose and design various types of bridges for a road/railway project

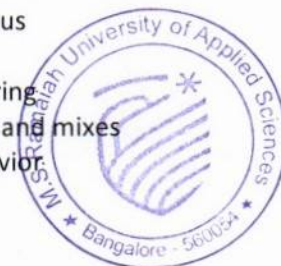
Practical Skills: After undergoing this programme, a student will be able to:

- PS1: Produce detailed project report along with the ability to carry out various studies essential for the preparation of DPR in different stages
- PS2: Use appropriate software packages relevant to transportation engineering
- PS3: Conduct physical tests to evaluate performance of pavement materials and mixes
- PS4: Perform laboratory tests on model structures to understand their behavior



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Capability Skills / Transferrable Skills: After undergoing the programme, a student will be able to:

- TS1: Evaluate and appraise the context within which transportation industry operates
- TS2: Adopt a reflective approach to personal development and embrace the philosophy of continual professional development
- TS3: Present information concisely in narrative and verbal form
- TS4: Work effectively in groups and lead the group

Course Outcomes (COs)

Course Title & Code: Pavement Engineering (19TRC501A)

After undergoing this module students will be able to:

- CO-1. Discuss the different types of materials used for pavement construction
- CO-2. Recommend the material for construction of different type of pavement for different site condition
- CO-3. Compare and contrast different pavement design methods for both flexible and rigid pavements
- CO-4. Design surface and subsurface drainage system for various pavements.
- CO-5. Design various types of flexible and rigid pavement and overlays for different site condition

Course Outcomes (COs)

Course Title & Code: Traffic Engineering and Transport planning (19TRC502A)

After undergoing this module students will be able to:

- CO-1. Explain traffic stream parameters and traffic flow theory
- CO-2. Discuss the issues in transportation planning
- CO-3. Analyse planning process using four stage models
- CO-4. Formulate procedures for various traffic studies
- CO-5. Develop and apply simulation techniques in traffic engineering

Course Outcomes (COs)

Course Title & Code: Construction Planning and Contract Management (19TRE503A)

After undergoing this module students will be able to:

- CO-1. Discuss the concepts of construction projects, project management functions, Legal and regulatory requirements, and administration of contract
- CO-2. Solve scheduling and tracking problems of a construction programme using suitable software
- CO-3. Analyze the procedures involved in undertaking technical, financial, economic and ecological feasibility studies for the preparation of construction project reports
- CO-4. Evaluate a construction project to develop the scope of work, plan various activities involved in a construction project, and optimize the construction projects using Big-M method



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- CO-5. Optimize the construction projects using Simplex and transportation techniques
- CO-6. Prepare the tendering and contracting documents for infrastructure development projects covering technical, commercial and legal aspects

Course Outcomes (COs)

Course Title & Code: Geometric Design of Highways and Expressways (19TRE511A)

After undergoing this module students will be able to:

- CO-1. Discuss the significance and design of various geometrical elements.
- CO-2. Design Horizontal and vertical alignment as per relevant Indian standards.
- CO-3. Analyse and design various roadway intersections
- CO-4. Analyse and design various pedestrian and parking facilities.
- CO-5. Develop a design report using suitable highway design software.

Course Outcomes (COs)

Course Title & Code: Advanced Concrete Technology and Modern Construction Techniques (19TRE512A)

After undergoing this module students will be able to:

- CO-1. Discuss the properties of fresh and hardened concrete along with the relevant test details
- CO-2. Compare and contrast the different technologies involved in manufacture, mix design and placement methods of concrete
- CO-3. Apply different codal provisions and prepare mix design of concrete and recommend suitable type of concrete for a given set of conditions
- CO-4. Discuss and compare different equipment and construction techniques adopted in the construction of substructures, superstructures and special structures
- CO-5. Discuss the retrofitting, dismantling and demolition procedures adopted for existing structures

Course Outcomes (COs)

Course Title & Code: Transportation Geotechnics (19TRE513A)

After undergoing this module students will be able to:

- CO-1. Analyse the wheel load effects on pavement materials
- CO-2. Evaluate and compare the shear strength of soil and stability of slopes when used as pavement component
- CO-3. Design proper drainage system by knowing the permeability characteristics of soils
- CO-4. Design surface runoff and sub-surface drainage system as per field conditions
- CO-5. Propose suitable strengthening methods for soil from the knowledge of lack of strength or instability in soils

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Course Outcomes (COs)

Course Title & Code: Applied Statistics for Transportation Engineers (19TRE514A)

After undergoing this module students will be able to:

- CO-1. Use statistical tools to express the traffic data for better interpretation.
- CO-2. Apply probability concept to understand the vehicular flow behaviour helping the planners to predict traffic flow.
- CO-3. Use appropriate statistical testing tools to check the degree of accuracy in the traffic data analysis.
- CO-4. Test the hypothesis and assess the error involved in the data analysis.
- CO-5. Use software tools like MATLAB, MINITAB etc., for analysis of traffic data and also use curve fitting techniques for predicting the performance trends

Course Outcomes (COs)

Course Title & Code: Direct Stiffness Method and Finite Element Analysis (19TRE521A)

After undergoing this module students will be able to:

- CO-1. Describe basic concepts, background review, theory of elasticity, energy concepts, equilibrium, energy methods for analysing structures concepts of discretization and element formulation for finite element analysis
- CO-2. Recognize the scope for finite element analysis in civil structural design
- CO-3. Develop Interpolation models and shape functions in generalized and natural coordinates for 1D, 2D, 3D elements and axisymmetric elements
- CO-4. Model and analyse manually 1D and 2D structures
- CO-5. Compare and contrast analyses structures by using different elements

Course Outcomes (COs)

Course Title & Code: Green construction and Alternative building materials (19TRE522A)

After undergoing this module students will be able to:

- CO-1. Discuss the green concepts, components of sustainable design and construction, modern, green and alternate building materials.
- CO-2. Discuss building economics and cost effective design for green construction
- CO-3. Apply sustainable techniques in planning and execution of construction projects
- CO-4. Compare and contrast different equipments and construction techniques adopted in the construction of substructures, superstructures and special structures
- CO-5. Compare and choose different alternate building materials and technologies suitable for a particular construction project
- CO-6. Design green building and construction process


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Course Outcomes (COs)

Course Title & Code: Tunnel Engineering (19TRE523A)

After undergoing this module students will be able to:

- CO-1. Discuss the general aspects of tunnel components
- CO-2. Discuss the methods and stages in tunnelling
- CO-3. Design and construct the tunnel components
- CO-4. Discuss about the safety norms and maintenance measures in transportation tunnelling

Course Outcomes (COs)

Course Title & Code: Advanced Structural Materials (19TRE524A)

After undergoing this module students will be able to:

- CO-1. Discuss the different types of advanced structural materials used in building construction
- CO-2. Discuss the application of fibre reinforced plastics and smart materials in engineering structures
- CO-3. Develop and design high strength, high density and high performance concrete mix
- CO-4. Discuss the microstructure of cementitious materials and durability and deterioration of concrete structures
- CO-5. Compare and choose different structural materials and technologies suitable for a particular construction project
- CO-6. Recommend technologies for production of advanced structural materials for engineering construction

Course Outcomes (COs)

Course Title & Code: Design of Formwork and Precast Structures (19TRE525A)

After undergoing this module students will be able to:

- CO-1. Compute different types of loads acting on formwork and check for their stability
- CO-2. Design formworks for various civil engineering structures
- CO-3. Propose suitable construction and scaffolding technology for the construction of special structures
- CO-4. Suggest a cost effective solution for usage of equipment, formwork and technology
- CO-5. Compare and contrast the different technologies involved in manufacture, mix design and placement methods of concrete
- CO-6. Classify and design precast elements



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Course Outcomes (COs)

Course Title & Code: Intelligent Transport System (19TRC511A)

After undergoing this module students will be able to:

- CO-1. Discuss remote sensing and GIS
- CO-2. Explain ITS and its applications
- CO-3. Apply GIS, remote sensing and ATS techniques in solving real world transportation problems
- CO-4. Analyse ITS functional areas and its operations
- CO-5. Develop integrated ITS models with GIS
- CO-6. Design and implement ATIS and AVLS

Course Outcomes (COs)

Course Title & Code: Railway Engineering (19TRC512A)

After undergoing this module students will be able to:

- CO-1. Discuss various components of railway tracks
- CO-2. Discuss various types of railway fixtures and fastenings
- CO-3. Analyse construction renewal and maintenance of railways
- CO-4. Develop economics and financial viability of railways
- CO-5. Propose suitable geometrical designs and technologies to be adopted for the construction processes and maintenance railways

Course Outcomes (COs)

Course Title & Code: Airport Engineering (19TRC513A)

After undergoing this module students will be able to:

- CO-1. Discuss various characteristics of airport
- CO-2. Discuss various components of airport
- CO-3. Design various elements of an airport
- CO-4. Develop methods of orienting runway
- CO-5. Design airfield pavements with FAA and ICAO guidelines.

Course Outcomes (COs)

Course Title & Code: Bridge Engineering and Road Projects (19TRE531A)

After undergoing this module students will be able to:

- CO-1. Discuss the different types of bridges and loads and stresses acting on bridges.


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- CO-2. Discuss various surveys and investigations used in feasibility report and detailed project report (DPR).
- CO-3. Design various types of foundation for a bridge structure.
- CO-4. Design various components of RCC and PSC bridges.
- CO-5. Analyse the social and environmental impact of a road project.
- CO-6. Prepare feasibility report and DPR.

Course Outcomes (COs)

Course Title & Code: Harbours and Dock Engineering (19TRE532A)

After undergoing this module students will be able to:

- CO-1. Discuss the general aspects of Harbours, Ports and Dock
- CO-2. The factors influencing Harbours, Ports and Dock
- CO-3. Plan and design the facilities involved in Harbours, Ports and Dock
- CO-4. Construct and maintain the facilities involved in Harbours, Ports and Dock

Course Outcomes (COs)

Course Title & Code: Smart cities and Sustainable Infrastructure (19TRE533A)

After undergoing this module students will be able to:

- CO-1. Discuss the concepts concept and socio-economic policies of Sustainable Development
- CO-2. Discuss the various approaches of energy systems leading to smart city and sustainable planning
- CO-3. Discuss and assess appropriate strategies of eco development, resource conservation and management
- CO-4. Discuss principles and practice of sustainable development, within the context of planning
- CO-5. Recommend techniques and tools used for sustainability planning

Course Outcomes (COs)

Course Title & Code: Environmental Impact assessment of Construction Projects (19TRE534A)

After undergoing this module students will be able to:

- CO-1. Discuss the importance of EIA as an integral part of planning process of construction project
- CO-2. Discuss methodologies to predict and assess the impacts of project on various aspects of Environment
- CO-3. Discuss the role of public participation in environmental decision making process
- CO-4. Emphasis on environmental management plan and environmental health and safety at construction project



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Course Outcomes (COs)

Course Title & Code: Applications of AI in Transportation Engineering (19TRE541A)

After undergoing this module students will be able to:

- CO-1. Explicate characteristics of AI that make it useful to real-world civil engineering problems, different causes of structural failures of buildings, bridges and other constructed facilities, sensors
- CO-2. Discuss applications of AI in traffic and transportation engineering
- CO-3. Discuss Artificial Neural Network (ANN), Fuzzy logic (FL) and expert systems (ES), sensors and Data acquisition systems and their applications in specialisations of civil engineering
- CO-4. Apply concepts of ANN, FL and ES in specializations of Civil Engineering

Course Outcomes (COs)

Course Title & Code: Pavement Construction Evaluation Maintenance and Management System (19TRE542A)

After undergoing this module students will be able to:

- CO-1. Discuss various distresses observed in pavements
- CO-2. Design various types of flexible and rigid pavement and overlays for different site condition
- CO-3. Recommend the material of construction, type of pavement, method of construction or maintenance specific to the site
- CO-4. Analyze pavement management system and its implementation using HDM
- CO-5. Analyze the various defects of pavement and suggest suitable maintenance method

Course Outcomes (COs)

Course Title & Code: Highway Economics, Finance and Road Safety (19TRE543A)

After undergoing this module students will be able to:

- CO-1. Understand the principles of highway economics and finance
- CO-2. Apply economics for different types of highway projects.
- CO-3. Analyse for economic and financial feasibility of highway projects.
- CO-4. Evaluate techno-economic feasibility of highway projects
- CO-5. To appraise the road safety audit and suggest suitable mitigation measures.



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Course Outcomes (COs)

Course Title & Code: Construction Equipment Management (19TRE544A)

After undergoing this module students will be able to:

- CO-1. Achieve Knowledge of Planning and management of construction Equipments.
- CO-2. Understand the selection of equipments used for construction.
- CO-3. Develop equipment management skills.
- CO-4. Summarize the solution of Equipment inventory.
- CO-5. Manage construction equipments in projects to enhance the efficiency

Course Outcomes (COs)

Course Title & Code: Internship (19TRP501A)

After undergoing this module students will be able to:

- CO-1. Describe the organization structure of the industry/business
- CO-2. Identify Business objectives of the organization
- CO-3. Describe the various departments of the organization and their activities and Responsibilities to meet the business objectives
- CO-4. Discuss the limitations and new opportunities for growth of the organization
- CO-5. Express the education and skill requirement of graduates to pursue their career in Industry

Course Outcomes (COs)

Course Title & Code: Group Project (19TRP502A)

After undergoing this module students will be able to:

- CO-1. Work in a team and undertake a project in the area of Transportation Engineering
- CO-2. Apply Transportation Engineering methodologies and reconfigurable techniques for Executing road project
- CO-3. Apply appropriate research methodology while formulating a project
- CO-4. Define Specifications, Synthesize, Analyse, Develop and Evaluate a project
- CO-5. Develop a video which explains the project, exhibit, make a presentation and Document the work



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Course Outcomes (COs)

Course Title & Code: Dissertation and Publication (19TRP522A)

After undergoing this module students will be able to:

- CO-1. Critically review scholarly literature collected from various sources for the project Purpose and formulate a research problem
- CO-2. Prepare and present a research proposal
- CO-3. Conduct research to achieve research objectives
- CO-4. Propose new ideas/methodologies or procedures for further improvement of the Research undertaken
- CO-5. Create research document and write research papers for publications
- CO-6. Defend the research findings in front of scholarly audience



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