

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 Construction Engineering & Management

Programme Code: 040

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

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Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Faculty of Engineering and Technology (FET)

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

Programme Outcomes (POs)

M.Tech. graduates will be able to:

- PO 1. Modern construction materials, methods and equipment
- PO 2. Planning and formulation of design alternatives and solutions for construction projects
- PO 3. Developing and administering project budgets and fiscal controls, contract and quality control provisions
- PO 4. Selection of materials, construction method and designing of construction process
- PO 5. Reviewing the contract strategies for construction projects and to suggest the appropriate contract forms and payment methods
- PO 6. Planning and controlling project cost including cost estimating, risk analysis, determination of contingencies, progress reporting and value engineering
- PO 7. Application of IT tools in project planning, design and management
- PO 8. Corporate and construction industry practice, process, standards and their impact on project activities giving general perspective and opportunities for a career in the construction industry
- PO 9. Teamwork, lifelong learning and continuous improvement.

Programme Specific Outcomes (PSOs)

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

- PS1: Produce tender and contract documents along with the ability to carry out estimation of costs and expenditures during all project stages
- PS2: Use appropriate software packages relevant to construction industry
- PS3: Conduct physical tests to evaluate performance of civil construction materials
- PS4: Perform laboratory tests on model structures to understand their behavior

Program Educational Objectives (PEOs)

After undergoing the programme, a student will be able to:

- PEO1: Manage information, develop technical reports and make presentations
- PEO2: Build, Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives
- PEO3: Work under various constraints to meet project targets
- PEO4: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy


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Course Outcomes (COs)

Course Title & Code: Advanced Concrete Technology and Modern Construction Techniques (19CMC501A)

After the successful completion of this course, the student 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: Design of Formwork and Precast Structures (19CMC502A)

After the successful completion of this course, the student 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

Course Outcomes (COs)

Course Title & Code: Construction Planning and Contract Management (19CMC503A)

After the successful completion of this course, the student 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
- 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


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Course Outcomes (COs)

Course Title & Code: Design of Building and Allied Services (19CME511A)

After undergoing this course students will be able to:

- CO-1. Explain the concepts of Planning, analysis and design of buildings
- CO-2. Discuss the sewage, storm water drainage and wastewater treatment systems
- CO-3. Discuss Electrification, Lighting & Acoustics for buildings
- CO-4. Design mobility, air-conditioning and sewerage systems for buildings
- CO-5. Analyse and Design all the structural components of building

Course Outcomes (COs)

Course Title & Code: Management Information System in Construction Engineering (19CME512A)

After undergoing this course students will be able to:

- CO-1. Discuss the importance of management information system in improving performance of construction project
- CO-2. Discuss the functions of and the differences among various types of information systems and technologies in construction industry.
- CO-3. Analyse data in construction, data base systems: how they function, how they are used, when they are used, and why they are used.
- CO-4. Develop an implementation framework of Management information systems for construction industry.
- CO-5. Apply ethical and social factors in development of information systems.

Course Outcomes (COs)

Course Title & Code: Risk and Reliability in Civil Infrastructure system (19CME513A)

After undergoing this course students will be able to:

- CO-1. Discuss the concepts and principals of risk and reliability engineering and their potential applications to different engineering problems.
- CO-2. Discuss and assess appropriate approaches to the collection and interpretation of data in the application of risk and reliability engineering methods
- CO-3. Apply appropriate techniques and tools for qualitative and quantitative risk analysis and reliability assessment,
- CO-4. Analyse and evaluate failure distributions, failure likelihood and potential consequences, and develop solutions for control/mitigation of risk
- CO-5. Recommend techniques of overcoming risk in various domains of construction using reliability engineering Recognize the scope for finite element analysis in civil structural design


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Course Outcomes (COs)

Course Title & Code: Probability and Statistics for Civil Engineers (19CME514A)

After undergoing this course 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 behavior 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 (19CME521A)

After undergoing this course students will be able to:

- CO-1. Describe basic concepts, background review, theory of elasticity, energy concepts, equilibrium, energy methods for analyzing 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 (19CME522A)

After undergoing this course 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 (19CME511A)

After undergoing this course students will be able to:

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

Course Outcomes (COs)

Course Title & Code: Advanced Structural Materials (19CME524A)

After undergoing this course 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
- 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: Construction firm and Value engineering (19CME525A)

After undergoing this course students will be able to:

- CO-1. Discuss various type of organizations and roles of engineers in typical construction project.
- CO-2. Discuss various techniques in value engineering to increase value of the project.
- CO-3. Analyze and evaluate solution alternatives based on value engineering principles
- CO-4. Apply value engineering techniques to reduce cost of the project.
- CO-5. Create value engineering programs for effective management of construction projects.


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Course Outcomes (COs)

Course Title & Code: Construction Economics and Financial Management (19CMC511A)

After undergoing this course students will be able to:

- CO-1. Develop and interpret cash flow diagrams and discuss their applications in effective financial management of projects
- CO-2. Calculate capital lockups and cash requirements of a project using economic principles and methods
- CO-3. Evaluate the opportunities and pitfalls of alternative engineering investments from an economic point of view by reducing them to a common platform
- CO-4. Analyze, interpret and present accounting information in order to assist management in the process of decision making, creation of policy and day to day operation of a project/ organization
- CO-5. Derive compound interest factors and their corresponding formulae to determine unknown amounts from known values of varying cash flows

Course Outcomes (COs)

Course Title & Code: Resource Management in Civil Construction (19CMC512A)

After undergoing this course students will be able to:

- CO-1. Solve resource planning, allocation and leveling problems of Civil Engineering projects
- CO-2. Compare and contrast between various methods of effective management of cost and time towards successful completion of the project
- CO-3. Discuss the various resources utilized in a construction project such as materials, equipment, labour and time
- CO-4. Analyze the various aspects of manpower management such as manpower planning, organization, human relations, welfare and development methods and their effects on a construction project
- CO-5. Explain and summarize purchase, utilization and storage processes and management of materials

Course Outcomes (COs)

Course Title & Code: Construction Quality and Safety Management (19CMC513A)

After undergoing this course students will be able to:

- CO-1. Generalize the objectives of quality management, quality systems and methods of quality planning
- CO-2. Compare and contrast between the type of construction accidents, their causes and the scope of construction safety programme and problem areas in construction safety
- CO-3. Discuss the responsibilities and authorities of architects, engineers, contractors and consultants in quality management
- CO-4. Design safety procedures to be adopted for various construction operations


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- CO-5. Suggest safety remedies for common hazards and accidents resulting from use of construction equipment

Course Outcomes (COs)

Course Title & Code: Big Data Analytics (19CME526A)

After undergoing this course students will be able to:

- CO-1. Understand the role and characteristics of big data and data analytics in construction projects.
- CO-2. Understand the key issues in big data management and its associated applications in construction project management.
- CO-3. Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
- CO-4. Interpret construction business models and scientific computing paradigms, and apply software tools for big data analytics.
- CO-5. Apply principles of big data analytics in various applications like project data classification, data warehouse and database creation, prediction, statistical decision making.

Course Outcomes (COs)

Course Title & Code: Bridge Engineering and Road Projects (19CME531A)

After undergoing this course students will be able to:

- CO-1. Discuss the different types of bridges and loads and stresses acting on bridges.
- 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: Fire and Safety Engineering Design (19CME532A)

After undergoing this course students will be able to:

- CO-1. Interpret the intentions of code requirements for fire safety
- CO-2. Discuss the concepts of fire severity and fire resistance
- CO-3. Discuss the various methods of testing structures for fire resistance
- CO-4. Calculate fire resistance, Depth of temperature reached, temperature in plane and bar type structures and change in strength of structures due to temperature variations
- CO-5. Design of concrete and steel structures to resist fire exposure


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Course Outcomes (COs)

Course Title & Code: Smart cities and Sustainable Infrastructure (19CME533A)

After undergoing this course 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 (19CME534A)

After undergoing this course 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 safety at construction project

Course Outcomes (COs)

Course Title & Code: Condition assessment, Repair, Rehabilitation and Artificial Intelligence (19CME541A)

After undergoing this course 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 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-3. Identify suitable Sensor and SHM technique for a given structure, and AI models for applications Specialisations of civil engineering
- CO-4. Design Efficient and cost-effective approaches for repair, rehabilitation and retrofitting of structures Conduct forensic investigations, issue reports and provide expert testimony during depositions and trials
- CO-5. Apply concepts of ANN, FL and ES in specializations of Civil Engineering
- CO-6. Compare and contrast different failures and recommend code standards and practicesto avoid failures in the future


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Course Outcomes (COs)

Course Title & Code: Circular Economy in Construction Industry (19CME542A)

After undergoing this course students will be able to:

- CO-1. Discuss historic and future projections of natural resource use and associated sustainability challenges
- CO-2. Describe visions and underlying principles of various approaches to resource-efficiency and circular economy
- CO-3. Discuss the implications of increased resource-efficiency and circularity for sustainable development
- CO-4. Determine the role of actors, their options, barriers and drivers for transitioning to a more resource-efficient and circular economy.
- CO-5. Formulate strategies towards increased resource-efficiency and circularity based on relevant theories, methods and tools from multiple disciplines.

Course Outcomes (COs)

Course Title & Code: BIM and fabrication of steel structures (19CME543A)

After undergoing this course students will be able to:

- CO-1. Discuss the techniques, skills, and modern engineering tools necessary for engineering practice
- CO-2. Discuss the advantages of BIM for various areas and disciplines across the Architecture, Engineering and Construction (AEC) supply chain
- CO-3. Prepare of a Floor Plan, Column Plans and Steel Framing Plans of Structural drawings
- CO-4. Design and Detail structural elements from a design drawing
- CO-5. Interpret and draw design / erection drawing

Course Outcomes (COs)

Course Title & Code: Advanced quantity surveying in civil engineering (19CME544A)

After undergoing this course students will be able to:

- CO-1. Understand the various standards and role of quantity surveyor in cost management.
- CO-2. Apply different methods of cost estimation across various phases of construction projects.
- CO-3. Apply project management principles to determine realistic cost estimation of projects.
- CO-4. Analyze and evaluate the variations or deviations in projects to control the costs of project
- CO-5. Develop the total cost management framework for managing cost of construction projects.


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Course Outcomes (COs)

Course Title & Code: Internship (19CMP521A)

After undergoing this course 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 (19CMP522A)

After undergoing this course 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

Course Outcomes (COs)

Course Title & Code: Dissertation and Publication (19CMP522A)

After undergoing this course 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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