Course Descriptions

Course descriptions for Master in Infrastructure Engineering courses are shown below: (X:Y:Z), where X = Course credit hours, Y = Lecture hours, Z = Practical hours.

MIEN 510 Direct Research Project (3:3:0)
Pre-requisite(s): None; Co-requisite: None

Under the guidance of an engineering faculty member, the Directed Research Project provides the student with a meaningful capstone project/research experience. It requires that the student conduct a research topic or issue of significance to the field of infrastructure engineering. Direct research work should be ready for submission to a journal in civil and infrastructure engineering or closely related field.

MIEN 511 Infrastructure Planning (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course addresses in greater depth aspects of planning and policy making related to infrastructure. The course focuses on planning concepts, methodologies and applications, considering and analyzing legal, institutional, financial, economic, environmental and social impacts of project alternatives with the aim of prioritization. The course will address issues such as stakeholders' analysis and community-based participatory planning approaches. It is designed to critically examine contemporary planning and related policy practices.

MIEN 512 Municipal Infrastructure Design (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course applies the principles of hydraulics and hydrology in the design of municipal stormwater drainage infrastructure systems needed to meet urban demand and changing climate, water conveyance and distribution systems and the design of gravity sewers and pumping systems. It introduces selection of pipe materials, corrosion and structural design of pipes and modern trenchless technologies. Student must have completed an introductory course in fluid mechanics.

MIEN 513 Systems Analysis and Optimization in Civil Engineering (3:3:0)
Pre-requisite(s): None; Co-requisite: None

The course focuses on the understanding and use of systems approach, simulation and optimization to enhance and facilitate decision making and solving complex problems in civil and infrastructure engineering planning, design and management. Course includes simulation, optimization and multi-objective analysis. It covers linear programming, uncertainty analysis, and their use in infrastructure engineering decision-making. The course introduces dynamic and nonlinear programming.

MIEN 514 Environmental and Social Impact Assessment for Sustainable Infrastructure (3:3:0)

Pre-requisite(s): None; Co-requisite: None

This course covers a systematic process for conducting and evaluating environmental and social impacts, identifying consequences and prescribing mitigation measures of proposed projects, and making comparisons among alternatives in terms of such impact and sustainability. It covers consideration of legislative issues and community engagement in the process, and covers advanced approaches of impact assessment at a strategic and urban scale.

MIEN 515 Engineering Economics and Decision Making (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course covers aspects of studying the economic feasibility of engineering projects and applying engineering economic analysis for selection among alternatives and competing projects. It deals with the role and purpose and describes the steps of the economic decision-making process. It presents an up-to-date presentation of engineering economic analysis, including present worth, future worth, internal rate of return and utilization of concepts of depreciation and uncertainty in appraising engineering projects.

MIEN 523 Advanced Bridge Design and Management (3:3:0)
Pre-requisite(s): None; Co-requisite: None

The course covers types of bridges; AASHTO specifications for the design of bridges; loads on bridges; materials of bridge construction; bridge geometry and methods of analysis; deflection and fatigue consideration in design of bridges; design of reinforced concrete bridges; design of slab-steel beam bridges; and inspection, rehabilitation, and maintenance of bridges. Students must have completed courses in structural analysis, and concrete and steel structures design.

MIEN 531 Earth Retaining Structures (3:3:0)
Pre-requisite(s): None; Co-requisite: None

The overall objective of this course is to provide students with the fundamentals and tools needed for the design and analysis of earth retention infrastructure. Specifically, this course covers the selection, design, and performance evaluation of earth retaining structures used for support of fills and excavations. The theory involving earth pressures and soil-reinforcement interaction is covered in detail. Class discussions also include case histories as well as demonstrating the selection, design and performance of various earth retaining structures. Students must have completed a course in soil mechanics and a course in concrete structures design

MIEN 541 Construction Contract Administration (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course provides an overview of the formation of construction contracts, types of contracts, pitfalls leading to disputes during award and execution of contracts, strategies to reduce and manage these disputes, and administrative functions, such as changes and

claims, documentation, project budgeting, costing and financial control, safety, quality, environment and project closeout.

MIEN 542 Risk Assessment and Management in Engineering Projects (3:3:0)
Pre-requisite(s): None; Co-requisite: None

The course addresses the principles and theory of project risk management and planning. It covers the risk identification process, qualitatively and quantitatively. Also, it covers planning for risk responses, risk monitoring and controlling. The course will also discuss risk allocation in construction projects.

MIEN 544 Construction Planning and Scheduling (3:3:0)
Pre-requisite(s): None; Co-requisite: None

The course introduces advanced construction planning techniques for construction projects. The course will also introduce the best practices in construction planning, earned value management, and cash flow management. Students must have completed a course in construction management.

MIEN 551 Advanced Water and Wastewater Treatment (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course offers an overview of the physical and chemical properties of wastewater, wastewater flowrates and constituents loading, selection, design and performance evaluation of biological, physical and chemical treatment processes of wastewater, energy considerations and process upgrading. It also provides a review of physicochemical processes of water treatment and their design, considering feasibility and environmental impacts. Students must have completed a course in environmental engineering.

MIEN 555 Solid and Hazardous Waste Management (3:3:0)
Pre-requisite(s): None; Co-requisite: None

This course provides an overview of municipal solid waste (MSW), industrial and hazardous waste management, including design and economic analysis. Subjects covered include the planning needed to tackle the treatment and control of such wastes created by developing societies. Treatment processes discussed include landfilling, incineration and composting, and new and emerging technologies leading to waste to energy conversion. Issues such as Federal regulation, public awareness and participation, and innovative management practices will be covered.

MIEN 561 Smart Cities (3:3:0)

Pre-requisite(s): None; Co-requisite: None
The course aims to present students with topics and trends in sustainable and smart cities. It includes the role of information in the design of network resources and impact on urban design.

MIEN 563 Transportation Planning and Traffic Safety (3:3:0)

Pre-requisite(s): None; Co-requisite: None

Concepts and methods of transportation planning, including network modeling, travel demand forecasting, and systems evaluation of multi-modal transportation systems. Overview of new sustainable designs and practices in transportation engineering. Accidents and road safety: the problem, and traffic safety studies analysis. Statistical models for safety analysis. Accident countermeasure selection and evaluation methodology. Students must have completed a course in transportation engineering.

MIEN 564 Management and Rehabilitation of Pavements (3:3:0)

Pre-requisite(s): None; Co-requisite: None

Overview of Pavement Management Systems (PMS) project and network levels; determination of serviceability indices; required needs; rehabilitation and maintenance strategies and procedures in pavements; life cycle cost analysis; identifying needs and priority programming of rehabilitation and maintenance. Students must have completed a course in pavement design.

MSRE 524 Sustainable Desalination (3:3:0)

Pre-requisite(s): None; Co-requisite: None

Basic science and technology of water desalination to ensure sustainable water supply. Water production via desalination within the water-energy-cost nexus, evaluation of renewable-energy-powered desalination processes, power-desalination cogeneration analysis, evaluation and applications of novel desalination systems, such as thermal desalination, membrane distillation and forward osmosis. Recent technological improvements for enhanced desalination processes and fouling issues in current technologies. Assessing economic feasibility and the environmental impact of new desalination processes.

MSRE 526 Green Buildings (3:3:0)

Pre-requisite(s): None; Co-requisite: None

Green building initiatives, their origin, characteristics of a green building, certification of green buildings rating systems, and criteria for rating. Policies and drivers that are leading to the more widespread uptake of green building technologies; green building codes, policies and planning from the past, present and future from around the globe. Integrated design: urban micro-climate design, passive and active architectural interventions.