

# M.S. in Civil Engineering (Transportation Systems Management)

*Candidates must satisfy a total of 30 credit hours (CH) with a minimum G.P.A. of 3.000 on a 4.000 scale.*

*All students must complete 15 credit hours (CH) of the core curriculum.*

## **CEE 7323 Project Management**

Role of project officer; systems and techniques for planning, scheduling, monitoring, reporting, and completing environmental projects; total quality management; project team management; development of winning proposals; contract management and logistics; case study application of project management to all environmental media and programs; community relations, risk communication, crisis management, consensus building, media and public policy.

## **CEE 7378 Transportation Planning and Traffic Engineering**

This course is concerned mainly with the analysis and modeling of urban transportation systems. The course consists of three main parts: 1) an overview of main definitions and terminologies involved in the planning and modeling of urban transportation systems, 2) the concept of urban transportation planning systems along with an overview of various models used in travel demand forecasting, and 3) the principles of traffic operations, analysis and control. *Prerequisites:* Basic principles of probability and statistics.

## **CEE 7379 Highway Design and Safety**

Provides an overview of the principles of highway design and traffic safety. Topics include highway functional classification, design control and criteria, driver performance, sight distance, horizontal and vertical alignments, cross section elements, design of freeway intersections and interchanges, traffic safety, and environmental impact assessment.

## **EMIS 7370 Probability and Statistics for Scientists and Engineers**

Introduces fundamentals of probability, probability distributions, and statistical techniques used by engineers and physical scientists. Topics include basic concepts and rules of probability, random variables, probability distributions, expectation and variance, sampling and sampling distributions, statistical analysis techniques, statistical inference estimation and tests of hypothesis, correlation and regression, and analysis of variance. *Prerequisite:* Knowledge of calculus.

## **EMIS 8360 Operations Research Models**

A survey of models and methods of operations research. Deterministic and stochastic models in a variety of areas will be covered. Credit is not allowed for both EMIS 3360 and EMIS 8360. *Prerequisites:* A knowledge of linear algebra and an introduction to probability and statistics.

*All students must complete 15 credit hours (CH) of specialization electives chosen from the following courses:*

## **CEE 7(0,1,2,3,6)96 Thesis**

Variable credit, but no more than six term hours in a single term and no more than four in each summer term. Registration in several sections may be needed to obtain the desired number of thesis hours. For example, four term hours of thesis would require enrollment in CEE 7196 and CEE 7396.

## **CEE 7324 Geographical Information Systems and Mapping**

Introduces modern GIS software and tools, including map design, geodatabases, geospatial and attribute data, geocoding, and simple spatial analysis. Students use research-based projects to explore GIS as a tool for innovative spatial thinking and as a catalyst for sustainable strategies.

## **CEE 7331 Air Pollution Management and Engineering**

This course covers the science, engineering, public health, and economic aspects of air quality. Students will develop in-depth understanding and broad knowledge of the sources and properties of air pollutants, air quality management, fate and transport of pollutants in the environment, regulations of air quality, and the operation and design of air pollution control systems. In addition, the class will review the current status of science, policy and regulation on several selected topics such as urban smog, regional haze, greenhouse gas and global climate change, stratospheric ozone depletion, and mercury emissions and control.

### **CEE 7350 Introduction to Environmental Management Systems**

An in-depth introduction to environmental management systems (EMSs). Includes systems such as EMAS, Responsible Care, OHSAS 18000, ISO 14000, and the Texas EMS program. Takes a step-by-step look at the ISO 14001 standard from the policy statement to management to review, and allows students to fully understand the plan-do-check-act approach of the system. Also introduces students to management systems auditing, the requirements of a system auditor, and the certification process.

### **CEE 7365 Introduction to Construction Management**

Construction practice techniques and current technological tools are examined. Included are cost estimates, bidding, contracts and contract bonds, risk and umbrella excess insurance, labor law and labor relations. Building codes and regulations are examined. Business methods with respect to managing project time and cost, including typical forms used in construction, are addressed.

### **CEE 7391 Special Projects (Topics in Transportation Engineering)**

Intensive study of a particular subject or design project, not available in regular course offerings, under the supervision of a faculty member approved by the department chair.

### **CEE 8378 Transportation Demand Analysis**

An overview of the theory of discrete choice and applications related to modeling travel demand. Topics include theories of choice behavior, theory of estimation, binary choice models, multinomial choice models, multi-dimensional choice and nested logit, aggregate forecasting techniques, and estimation software. *Prerequisite:* Basic principles of probability and statistics.

### **CEE 8379 Analysis of Transportation Systems**

An overview of techniques used to model and analyze transportation systems. Topics include queuing theory, graph theory, network modeling, development of algorithms, shortest path problems, vehicle routing problem, and simulation techniques. Applications to transportation systems. *Prerequisites:* Basic principles of probability and statistics.

### **CSE 7345 Advanced Application Programming**

Covers advanced programming techniques that span a range of programming languages and technologies. Topics include server-side application development, client graphical user interface implementation, application frameworks, design patterns, model-based development, and multithreading. The specific programming language or languages covered may vary from term to term.

*Prerequisite:* CSE 3345 or consent of instructor.

### **CSE 7365 (MATH 5315) Introduction to Numerical Analysis**

Numerical solution of linear and nonlinear equations, interpolation and approximation of functions, numerical integration, floating-point arithmetic, and the numerical solution of initial value problems in ordinary differential equations. Students use of the computer is emphasized. *Prerequisite:* Graduate standing or grades of C- or higher in MATH 3315/CSE3365 and MATH 2343.

### **CSE 8355 Graph Theory: Algorithms and Applications**

Development of algorithmic and computational aspects of graph theory, with application of concepts and techniques to solving problems of connectivity, set covering, scheduling, shortest paths, traveling salesmen, network flow, matching, and assignment.

*Prerequisite:* CSE 7350 or permission of instructor.

### **EMIS 7313 Integrated Logistics Support**

Integrated Logistics Support is an integrated and iterative process to (1) influence product design for supportability and (2) design and develop the support (logistics) system concurrently with design and development of the product as an integral element of the systems engineering process. Topics include product design interface for reliability; maintainability and maintenance (i.e.: preventive, predictive and corrective) planning; and support system development consisting of supply support, support and test equipment, manpower and personnel, training and training support, technical data/publications, computer resources support, facilities; and packaging, handling, storage, and transportation (PHS&T). *Prerequisites:* EMIS 7305 and EMIS 7311

### **EMIS 7377 (STAT 5377) Statistical Design and Analysis of Experiments**

Introduction to statistical principles in the design and analysis of industrial experiments. Completely randomized, randomized complete and incomplete block, Latin square, and Plackett-Burman screening designs. Complete and fractional experiments. Descriptive and inferential statistics. Analysis of variance models. Mean comparisons. *Prerequisites:* EMIS 4340 and senior standing with a science or engineering major, or permission of instructor.

### **EMIS 8361 Engineering Economic Decision Analysis**

Introduction to economic analysis methodology. Topics include engineering economy and cost concepts, interest formulas and equivalence, economic analysis of alternatives, technical rate-of-return analysis, and economic analysis under risk and uncertainty. Credit not allowed for both EMIS 2360 and EMIS 8361. *Prerequisite:* Knowledge of introductory probability and statistics.

### **EMIS 8371 Linear Programming**

A complete development of theoretical and computational aspects of linear programming. *Prerequisite:* Knowledge of linear algebra.

### **EMIS 8373 Integer Programming**

A presentation of algorithms for linear integer programming problems. Topics include complexity analysis, cutting plane techniques, and branch-and-bound. *Prerequisite:* EMIS 8360 or EMIS 8371.

### **EMIS 8374 Network Flows**

A presentation of optimization algorithms and applications modeling techniques for network flow problems. Topics include pure, generalized, integer, and constrained network problems, plus special cases of each, including transportation, assignment, shortest-path, transshipment, multicommodity, and nonlinear networks. Case studies illustrate the uses of network models in industry and government settings.

### **STAT 6336 Statistical Analysis**

Emphasis on application of statistical principles in the design of experiments. Complete and fractional factorials, blocking, nesting, replication, randomization. Analysis of data from one and two samples assuming normal distributions and independent errors. Discussion of paired sample analyses and of nonparametric location tests.