MS IN CIVIL ENGINEERING
Online Curriculum

To complete the online program in two years, students typically take two courses per semester, each lasting 14 weeks. There are nine core classes, up to two of which may be replaced by the electives shown.

The curriculum is organized as follows:

CORE COURSES

ECIV 411: Elasticity, Theory and Applications

General analysis of deformation, strain and stress. Elastic stress-strain relations and formulation of elasticity problems. Solution of elasticity problems by potentials. Simple beams. The torsion problem. Thick cylinders, disks and spheres. Energy principle and introduction to variational methods. Elastic stability. Matrix and tensor notations gradually introduced, then used throughout the course.

ECIV 420: Finite Element Analysis

Development and application of finite element methods with emphasis on solid mechanics. Development of truss, beam, shell and solid elements will be considered. Formulation of isoparametric elements. Meshing and modeling techniques discussed using commercial finite element software.

ECIV 421: Advanced Reinforced Concrete Design

Properties of plain and reinforced concrete, ultimate strength of reinforced concrete structural elements, flexural and shear design of beams, bond and cracking, torsion, moment redistribution, limit analysis, yield line analysis of slabs, direct design and equivalent frame method, columns, and fracture mechanics concepts.

ECIV 422: Advanced Structural Steel Design

Selected topics in structural steel design, such as plastic design, torsion, lateral buckling, torsional-flexural buckling, frame stability, plate girders and connections, including critical review of current design specifications relating to these topics.

ECIV 423: Prestressed Concrete Design

Design of prestressed concrete structures, mechanical behavior of concrete suitable for prestressing and prestressing steels, load balancing, partial prestressing, prestressing losses, continuous beams, prestressed slab design, and columns.

ECIV 424: Structural Dynamics

Modeling of structures as single and multi-degree of freedom dynamic systems. The eigenvalue problem, damping and the behavior of dynamic systems. Deterministic models of dynamic loads, such as wind and earthquakes. Analytical methods, including modal, response spectrum, time history and frequency domain analyses.

ECIV 425: Structural Design for Dynamic Loads

Structural design problems in which dynamic excitations are of importance. Earthquake, wind, blast, traffic and machinery excitations. Human sensitivity to vibration, mechanical behavior of structural elements under dynamic excitation, earthquake response and earthquake-resistant design, wind loading, damping in structures, hysteretic energy dissipation and ductility requirements.

CORE COURSES (CONT.)

ECIV 426: Structural Reliability

Introduction to probability and random variables. Probability models for structural loads and strength. Estimation of the reliability of structures. Simulation methods. Reliability-based structural design.

ECIV 432: Mechanical Behavior of Soils

Soil statics and stresses in a half-space tri-dimensional consolidation and sand drain theory; stress-strain relations and representations with rheological models. Critical state and various failure theories and their experimental justification for cohesive and noncohesive soils. Laboratory measurement of rheological properties, pore water pressures and strength under combined stresses. Laboratory.

ELECTIVE COURSES

ECIV 601: Independent Study

Elective that can be a substitute for one of the nine courses — this can only be used once and must have faculty approval.

EMAE 450: Advanced Engineering Analysis

This course aims to equip students with tools for solving mathematical problems commonly encountered in mechanical engineering. The goals are to enable the student to properly categorize the problem in a variety of ways, to identify appropriate approaches to solving the problem and to choose effective numerical solution methods. The course covers analytical and computational approaches to linear and nonlinear problems in both discrete and continuous systems. Computational approaches include direct methods such as finite difference methods and approximation methods based on a variational approach, such as finite elements. The course is built around specific examples from solid mechanics, dynamics, vibrations, heat transfer and fluid mechanics, represented by initial value problems, eigenvalue problems and boundary value problems.