

school of sustainable engineering and the built environment

civil, environmental and sustainable
engineering



transportation
engineering

The ASU Transportation Engineering program has two general themes: [Transportation Systems](#), and [Pavements and Materials](#). First, the Transportation Systems program addresses a broad range of education and research focus areas. Faculty in transportation systems focus on traffic operations and simulation, intelligent transportation technologies, traveler safety and risk, travel behavior, transportation systems simulation, and transportation planning applications. Second, the Pavements and Materials program addresses pavement analysis and design, pavement performance and management, material testing and characterization, and consideration of developing new and more efficient construction materials, such as asphalt and concrete that are applicable to transportation needs.

Recent graduates have been employed in a variety of different organizations and companies both in the private and the public sector. Job opportunities include academia (tenure track and research faculty positions), small and large consulting firms that deal with transportation systems and pavements, federal agencies such as Federal Highway Administration (FHWA), state agencies such as the Arizona Department of Transportation (ADOT), county and city engineering offices etc., and large companies such as Tetra Tech. Students typically confront employment and career opportunities that span the spectrum and fulfill the needs and desires of our graduates.

TRANSPORTATION SYSTEMS FACULTY

- [Xuesong Zhou](#), Associate Professor
- [Mikhail Chester](#), Assistant Professor
- [Yingyan Lou](#), Assistant Professor

PAVEMENTS AND MATERIALS FACULTY

- [Matthew Witczak](#), Professor Emeritus
- [Michael Mamlouk](#), Professor
- [Shane Underwood](#), Assistant Professor
- [Kamil Kaloush](#), Associate Professor (Specialty Area Coordinator)

M.S. PROGRAM

The advisor, in consultation with the student, will establish a Graduate Supervisory Committee (GSC). The GSC shall be composed of a minimum of three members from the CEE tenure-track faculty with at least two being from the Transportation Faculty.

Participation of individuals from institutions external to the ASU is encouraged but these shall be non-voting members. The advisor shall serve as the chair of the GSC.

The Plan of Study (POS) must be in accordance with Graduate College and Civil, Environmental and Sustainable Engineering (CESE) Program requirements. The candidate must complete at least 30 semester hours of approved course and research work distributed as follows:

- 1) at least twelve (12) hours of Graduate Transportation courses,
- 2) at least six (6) hours of CEE Graduate (non-Transportation) courses,
- 3) at least three (3) hours of Statistics or Math course (see course list at bottom of page),
- 4) not more than three (3) hours of CEE590, and
- 5) 6 hours of thesis (CEE599)

M.S.E. PROGRAM

The Graduate Supervisory Committee (GSC) shall consist of all tenure-track Transportation faculty. The advisor shall serve as the chair of the GSC.

The Plan of Study (POS) must be in accordance with Graduate College and Civil, Environmental and Sustainable Engineering (CESE) Program requirements. The candidate must complete at least 30 semester hours of approved course and research work distributed as follows:

- 1) at least fifteen (15) hours of Graduate Transportation courses,
- 2) at least six (6) hours of CEE Graduate (non-Transportation) courses,
- 3) at least three (3) hours of Statistics or Math course (see course list at bottom of page), and
- 4) not more than three (3) hours of CEE590.
 - A final written comprehensive exam will be administered by the Transportation Group twice per year, usually the last week of classes during the regular fall and spring semesters. The exam is intended to demonstrate proficiency in at least 4 of the 8 core class subjects depending on the courses covered by the student. The core subject areas are Pavement Analysis and Design, Highway Materials and Construction, Pavement Performance and Management, Highway Geometric Design, Transportation Systems Planning, Transportation Operations, Transportation System Design and Evaluation, Mathematical and Statistical Analysis of Transportation, traffic flow theory, and intelligent transportation systems. The exam will be 4 hours and students are expected to spend roughly one hour per core subject area. The exam is open book. The exam will be graded by the GSC and a pass/fail decision made as a collective group. A student who fails the comprehensive exam the first time may petition to retake the exam once more no sooner than 90 days after the first exam and no later than one year. A student must be registered for at least one credit every fall and spring until they are officially completed with their degree and pass the comprehensive exam..

It is important for all doctoral students to read the [Civil, Environmental and Sustainable Engineering Ph.D. program manual](#).

LIST OF COURSES

Undergraduate

CEE 372 Transportation Engineering
CEE 412 Pavement Analysis and Design
CEE 475 Highway Geometric Design
CEE 483 Highway Materials,
Construction, and Quality
CEE 498 Sustainable Transportation
Systems

Graduate

CEE 511 Pavement Analysis and Design
CEE 512 Pavement Performance and
Management
CEE 573 Transportation Operations
CEE 574 Transportation Systems Planning
CEE 576 Highway Geometric Design
CEE 598 Activity-Travel Behavior
Analysis
CEE 598 Computer Applications for
Travel Demand Modeling
CEE 598 Transportation Systems Planning
CEE 598 Intelligent Transportation
Systems
CEE 598 Statistical and Econometric
Methods in Civil Engineering
CEE 598 Sustainable Transportation
Systems
CEE 598 Traffic Flow Theory
CEE 598 Transportation Safety Analysis

The following courses qualify as courses satisfying the mathematics/statistics course requirement. Students may petition their graduate advisory committee to take (graduate) courses outside this list.

IEE572 Design of Engineering Experiments
IEE578 Regression Analysis
IEE582 Response Surfaces and Process Optimization
MAE501 Linear Algebra in Engineering
MAE502 Partial Differential Equations in Engineering
MAT521 Iterative Methods
MAT523 Numerical Optimization
MAT524 Parallel Numerical Algorithms
MAT530 Numerical Solution of Ordinary Differential Equations
MAT533 Computational Elliptic and Parabolic Differential Equations
MAT576 Theory of Partial Differential Equations

TRANSPORTATION SYSTEMS PROGRAM

The Transportation Systems program in CEE at ASU is a multi-disciplinary program with a core set of courses offered in CEE and many complementary courses offered in other departments across campus, including Planning, Business, Industrial and Systems Engineering, Mathematics, Computer Science, and Psychology. There are numerous faculty members across the ASU campus involved in transportation-related research, leading to numerous opportunities to explore and pursue a wide range of research topics and interests across departments. The core Transportation Systems faculty conduct research in travel behavior, traffic operations, traffic safety, statistical and econometric methods, traffic simulation, sustainable transportation, transportation planning, intelligent transportation systems, and transportation, land-use, and health.

In addition to the undergraduate and graduate courses offered in CEE, a number of complementary courses are offered in various departments around campus. Students in Transportation Systems often pursue minors in economics, business, industrial engineering, mathematics, statistics, computer science, geography, psychology, sociology, and planning. There are at least 50 additional graduate level courses at ASU that may serve to fulfill the graduate coursework requirements (upon approval of GSC), reflecting a wide-range of minors and complementary skills. The courses listed above and courses satisfying minor requirements-representing a student's Plan of Study (POS), are selected by the student with help and approval of the student's GSC.

LIST OF COURSES

Undergraduate

CEE 372 Transportation Engineering
CEE 412 Pavement Analysis and Design
CEE 475 Highway Geometric Design
CEE 481 Civil Engineering Project Management
CEE 483 Highway Materials, Construction, and Quality
CEE 494 Sustainable Urban Engineering
CEE 494 Sustainable Transportation Systems

Graduate

CEE 511 Pavement Analysis and Design
CEE 512 Pavement Performance and Management
CEE 515 Properties of Concrete
CEE 526 Finite Elements for Engineers
CEE 550 Soil Behavior
CEE 554 Shear Strength and Slope Stability
CEE 576 Highway Geometric Design
CEE 583 Highway Materials, Construction, and Quality
CEE 598 Advanced Pavement Systems
CEE 598 Civil Engineering Project Management
CEE 598 Statistical Applications in Pavement Engineering
CEE 598 Pavement Evaluation, Maintenance and Rehabilitation
CEE 598 Statistical and Econometric Methods in Civil Engineering
CEE 598 Sustainable Urban Engineering
CEE 598 Sustainable Transportation Systems

The following courses qualify as courses satisfying the mathematics/statistics course requirement. Students may petition their graduate advisory committee to take (graduate) courses outside this list.

IEE572 Design of Engineering Experiments
IEE578 Regression Analysis
IEE582 Response Surfaces and Process Optimization
MAE501 Linear Algebra in Engineering
MAE502 Partial Differential Equations in Engineering
MAT521 Iterative Methods
MAT523 Numerical Optimization
MAT524 Parallel Numerical Algorithms
MAT530 Numerical Solution of Ordinary Differential Equations
MAT533 Computational Elliptic and Parabolic Differential Equations
MAT576 Theory of Partial Differential Equations

PAVEMENTS AND MATERIALS PROGRAM

The Pavements and Materials Program at Arizona State University encompasses a multitude of areas such as analysis and design of flexible and rigid pavements, pavement performance and evaluation, pavement maintenance and rehabilitation, characterization of base, subbase and subgrade materials, finite elements methods, asphalt mix design, properties of Portland cement concrete, life-cycle cost analysis, probabilistic methods, viscoelastic and nonlinear behavior of materials, statistical and computer applications in pavement engineering, etc.

Pavements and Materials Engineering is an interdisciplinary field that synthesizes knowledge from a wide range of subjects. People who have careers in transportation engineering often study, provide solutions, and implement strategies for the design of roads, highways, airport runways, and continually develop better and more efficient transportation facilities.

The pavements and materials faculty is engaged in statewide, national, and international research in these areas, and graduate students typically become involved in these exciting and cutting-edge research projects. The graduate course offerings at ASU reflect these pavements and materials specialty areas, and provide a broad-based yet rigorous graduate student education. The graduate curriculum is designed to provide a strong foundation in pavements and materials, but remains flexible to meet changing needs within the field. The pavements and materials students enjoy a thriving Arizona economy, highly competitive job market, and typically secure jobs in state or federal government agencies, consulting firms, and academe.