

Transportation Science, Ph.D.

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The graduate program in Transportation Science includes faculty from four academic units: the Department of Civil and Environmental Engineering in The Henry Samueli School of Engineering, the Department of Economics in the School of Social Sciences, the Department of Planning, Policy, and Design in the School of Social Ecology, and the Department of Computer Science in the Bren School of Information and Computer Sciences. The program is designed to educate students in a broad set of competencies and perspectives that mirror the actual practice of current transportation research. The M.S. and Ph.D. degrees in Transportation Science are offered.

Admission is limited to a small number of exceptionally talented, independent, and self-disciplined students. The deadline for application for admission is March 1 for fall quarter. A second window for application for admission for winter or spring quarters is open from April 15 through June 1 but funding options for this second window may be very limited. All applicants must take the Graduate Record Exam (GRE) prior to the application deadline. Applicants whose first language is not English must also submit Test of English as a Foreign Language (TOEFL) scores.

The Ph.D. program is a 48-unit program requiring a qualifying examination and dissertation defense.

Prior to the qualifying examination, students must have completed a minimum of 36 units of coursework, a replication project, or a publishable research paper as first author, and a dissertation proposal.

Requirements

Courses are selected from one of the four areas listed below.

Substitutions and exceptions must be approved by the student's advisor and the Director of the Transportation Science program.

The normative time for completion of the Ph.D. is five years and the maximum time permitted is seven years. Core courses must be chosen from lists in each of the four program areas. Each student must choose at least two graduate courses from Area 1 (Transportation Systems Engineering), at least one graduate course from each of Area 2 Urban and Transportation Economics) and Area 3 (Transportation Planning, and at least four additional graduate courses from any of those areas, or the Area 4 (Computer Science). At least five of the eight core courses must be transportation courses (indicated by an asterisk).

Students must complete the following general theory core courses:

Area 1 (Transportation Systems Engineering)

ENGRCEE 220A	Travel Demand Analysis I
ENGRCEE 220B	Travel Demand Analysis II
ENGRCEE 221A	Transportation Systems Analysis I
ENGRCEE 222	Transit Systems Planning
ENGRCEE 223	Transportation Systems III: Planning and Forecasting
ENGRCEE 224A	Transportation Data Analysis I
ENGRCEE 226A	Traffic Flow Theory I
ENGRCEE 228A	Urban Transportation Networks I
ENGRCEE 228A	Urban Transportation Networks I
ENGRCEE 229A	Traffic Systems Operations and Control I

Area 2 (Urban and Transportation Economics)

ECON 210A	Microeconomic Theory I
ECON 281A	Urban Economics I
ECON 281B	Urban Economics II
ECON 282A	Transportation Economics I
ECON 282B	Transportation Economics II
ECON 289A-Z	

Students can only count on ECON 289 course toward the required number of units.

Area 3 (Transportation Planning)

UPPP 202	History of Urban Planning
UPPP 207	Land-Use Law

UPPP 212	Transportation Planning and Policy
UPPP 231	Transportation and Environmental Health
UPPP 235	Geographic Information Systems (GIS) Problem Solving in Planning
UPPP 237	Introduction to Geographic Information Systems
Area 4 (Computer Science)	
COMPSCI 206	Principles of Scientific Computing
COMPSCI 248A	Introduction to Ubiquitous Computing
COMPSCI 260	Fundamentals of the Design and Analysis of Algorithms
COMPSCI 268	Introduction to Optimization
COMPSCI 271	Introduction to Artificial Intelligence
COMPSCI 274A	Probabilistic Learning: Theory and Algorithms
A. Pre-approved upper-division undergraduate courses:	
ENGRCEE 121	Transportation Systems I: Analysis and Design
ENGRCEE 122	Transportation Systems II: Operations and Control
ENGRCEE 123	Transportation Systems III: Planning and Forecasting
ENGRCEE 124	Transportation Systems IV: Freeway Operations and Control
ECON 105A	Intermediate Quantitative Economics I
ECON 105B	Intermediate Quantitative Economics II
ECON 123A	Econometrics I
ECON 123B	Econometrics II
ECON 149	Special Topics in Economics of Public and Private Organizations
I&C SCI 45C	Programming in C/C++ as a Second Language
I&C SCI 46	Data Structure Implementation and Analysis
COMPSCI 115	Computer Simulation
COMPSCI 121	Information Retrieval
COMPSCI 122A	Introduction to Data Management
B. Independent study units	
ENGRCEE 296	Master of Science Thesis Research
ENGRCEE 298	Special Topics in Civil Engineering
ENGRCEE 299	Individual Research
ECON 299	Independent Study
UPPP 298	Directed Studies in Urban Planning
UPPP 299	Independent Study in Urban Planning
COMPSCI 298	Thesis Supervision
COMPSCI 299	Individual Study
C. Students who choose the thesis option may also take up to eight units of the following:	
ENGRCEE 296	Master of Science Thesis Research
UPPP 298	Directed Studies in Urban Planning
COMPSCI 298	Thesis Supervision

After approval from their advisor, students may petition the Director of the Transportation Science Program with requests for substitution of the required courses.

Replication Project or Publishable Paper

Students entering the program with an M.S. are encouraged to transform a course project or thesis from this program or an earlier one into a publishable paper. That paper could be sole-authored, or authored with a student's former or current faculty mentors. The dissertation supervisor and the Director of the Transportation Science Program must approve the replication project or paper prior to the date of the qualifying exam.

Prior to preparing a dissertation proposal, each student who has not completed a master's thesis (or otherwise independently published) must replicate the empirical work of a published paper from a major transportation journal, chosen by the student and approved by the advisor. This replication may involve the collection of new data, the use of better statistical techniques, additional simulations, or the identification and correction of theoretical errors. Through the replication project, students gain direct experience in reducing a general problem to a manageable research project, in using data, and in carrying out a research project.

A replication project involves choosing an empirical paper, obtaining the data necessary to replicate the project and then replicating the project and describing the replication and any related extensions in a research paper. Such projects are most common in economics, but could also be done based on any of the four transportation science research areas.

Dissertation Proposal

Dissertation proposals differ across areas but a typical proposal would be 15-30 pages long and would include an introduction, a review of related literature, a plan for the dissertation research and an indication of the sorts of products that will emerge from the project (publishable papers, case studies, software, technologies, etc.). The proposal is not a binding contract, because research evolves, but it should provide the committee with sufficient information to judge the likelihood that the project will be sufficient to meet the requirements for a Ph.D.

Qualifying Examination

The qualifying exam must include five faculty members of which at least three members must be selected from the Transportation Science core faculty, and at least one of whom must be outside of that group. The qualifying exam is primarily an oral presentation of the dissertation proposal but might also include a discussion of other major research efforts conducted by the candidate and can involve questions from courses taken at UCI, or general transportation related questions.

Upon completion of the coursework and the publication or replication paper requirement, each student must develop a dissertation proposal defining the research problem, related literature, research methods, and data resources. The Ph.D. qualifying examination consists of an oral defense of that proposal before a candidacy committee chosen according to normal campus regulations, upon the recommendation of the Graduate Director. Typically, this is a committee of at least three members of the Transportation Science faculty and at least one faculty member who is not associated with Transportation Science.

UCI is a major research university and has an excellent library collection, as well as special interlibrary loan arrangements with other University of California libraries including the Transportation Library at Berkeley. Research is coordinated with the Irvine branch of the Institute of Transportation Studies (ITS). Approximately 30 to 40 graduate students are employed as research assistants each year in ITS. Research covers a broad spectrum of transportation issues. Current funded research projects focus upon intelligent transportation systems (ITS), particularly advanced transportation management systems; planning and analysis of transportation systems; transportation systems operation and control; transportation engineering; transportation safety; road and congestion pricing; environmental and energy issues and demand for alternative fuel vehicles; public transit operations, transportation-land use interactions, demand for autos, and travel demand.

ITS is part of the University of California Transportation Center, one of ten federally designated centers of excellence for transportation research. The transportation research program at UCI is also supported by the Advanced Transportation Management Systems (ATMS) Laboratories. The Institute maintains a regular publications series documenting research conducted within its programs and is the editorial headquarters of the *Journal of Regional Science*.