

Transportation Science, Ph.D.

This program is currently not admitting students. Please visit the program website (<http://www.transci.uci.edu/>) for more information.

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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)

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| 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)

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| 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)

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| UPPP 202 | History of Urban Planning |
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| 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 and Environmental 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*.