Graduate Program in Transportation Science

The graduate program in Transportation Science includes faculty from three 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, and the Department of Planning, Policy, and Design in the School of Social Ecology. 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

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.

Master of Science Degree

The M.S. degree program has two options: (1) thesis; and (2) comprehensive examination. Students will choose one of these two options. For both options, no more than 12 credit hours of non-transportation courses can count toward the required number of course-work units. Exceptions must be approved by the student's advisor and the Director of the Transportation Science program. Opportunities are available for part-time study toward the M.S. degree. The normative time for completion of the M.S. is one year, and the maximum time permitted is four years, as part-time status is allowed.

Transportation courses must be chosen from lists in each of the three program areas. Each student must choose (1) at least three graduate courses from Area 1 (Transportation Systems Engineering), and (2) at least one graduate course from each of Area 2 (Urban and Transportation Economics) and Area 3 (Transportation Planning), and at least one additional graduate courses from either of these two areas.

Specific courses in each of these areas are shown below (transportation courses are indicated with an asterisk):

Area 1 (Transportation Systems Engineering)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ENGRCEE 220A</td>
<td>Travel Demand Analysis I *</td>
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<tr>
<td>ENGRCEE 221A</td>
<td>Transportation Systems Analysis I *</td>
</tr>
<tr>
<td>ENGRCEE 224A</td>
<td>Transportation Data Analysis I *</td>
</tr>
<tr>
<td>ENGRCEE 225A</td>
<td>Transportation Planning Models I *</td>
</tr>
<tr>
<td>ENGRCEE 225B</td>
<td>Transportation Planning Models II *</td>
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<tr>
<td>ENGRCEE 226A</td>
<td>Traffic Flow Theory I *</td>
</tr>
<tr>
<td>ENGRCEE 228A</td>
<td>Urban Transportation Networks I *</td>
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<tr>
<td>ENGRCEE 229A</td>
<td>Traffic Systems Operations and Control I</td>
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Area 2 (Urban and Transportation Economics)

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ECON 210A-210B</td>
<td>Microeconomic Theory I and Microeconomic Theory II</td>
</tr>
<tr>
<td>ECON 281A-281B</td>
<td>Urban Economics I and Urban Economics II *</td>
</tr>
<tr>
<td>ECON 282A-282B</td>
<td>Transportation Economics I and Transportation Economics II *</td>
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Economics 289 A–Z*

Area 3 (Transportation Planning)

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>PP&amp;D 202</td>
<td>History of Urban Planning</td>
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<tr>
<td>PP&amp;D 207</td>
<td>Development Control Law and Policy</td>
</tr>
<tr>
<td>PP&amp;D 212</td>
<td>Transportation Planning *</td>
</tr>
<tr>
<td>PP&amp;D 223</td>
<td>Regional Analysis</td>
</tr>
<tr>
<td>PP&amp;D 231</td>
<td>Transportation and Environmental Health *</td>
</tr>
<tr>
<td>PP&amp;D 233</td>
<td>Transportation, Transit, and Land-Use Policy and Planning *</td>
</tr>
<tr>
<td>PP&amp;D 235</td>
<td>Geographic Information Systems (GIS) Problem Solving in Planning</td>
</tr>
</tbody>
</table>
Graduate Program in Transportation Science

PP&D 237  Introduction to Geographic Information Systems
PP&D 238  Advanced Geographic Information Systems
PP&D 242  Regional Development Theory
PP&D 244  Land-Use Policy
PP&D 252  Issues in Environmental Law and Policy

Pre-approved upper-division undergraduate courses, independent study units, or seminars:
A. Pre-approved upper-division undergraduate courses:
   ECON 105A-105B  Intermediate Quantitative Economics I and Intermediate Quantitative Economics II
   ECON 123A-123B  Econometrics I and Econometrics II
   ECON 149  Special Topics in Economics of Public and Private Organizations
   ENGRCEE 121  Transportation Systems I: Analysis and Design
   ENGRCEE 122  Transportation Systems II: Operations & Control
   ENGRCEE 123  Transportation Systems III: Planning & Forecasting
   ENGRCEE 124  Transportation Systems IV: Freeway Operations and Control
   ENGRCEE 125  Transportation and the Environment

B. Independent study units:
   ECON 299  Independent Study
   ENGRCEE 296  Master of Science Thesis Research
   ENGRCEE 298  Special Topics in Civil Engineering
   ENGRCEE 299  Individual Research
   PP&D 298  Directed Studies in Urban Planning
   PP&D 299  Independent Study in Urban Planning

C. Seminars:
   ECON 285A-285B-285C  Colloquium for Transportation Science I and Colloquium for Transportation Science II and Colloquium for Transportation Science III (At most two of these classes may count toward the required units.)

D. Students who choose the thesis option may also select up to eight units of the following:
   ENGRCEE 296  Master of Science Thesis Research (4 to 12 units)
   PP&D 298  Directed Studies in Urban Planning (2 to 4 units)

1 NOTE: ECON 281A-ECON 281B and ECON 282A-ECON 282B require ECON 210A or consent of the instructor. Students can only count one ECON 289 course toward the required number of units.

Substitutions must be approved by the Transportation Science executive committee. Alternatively, students may petition the Director of the Transportation Science program after approval by their advisor.

Plan I: Thesis Option
Students who select the thesis option must complete at least 36 units of study, up to eight of which can be taken in conjunction with the thesis research topic (thesis units should be taken in the home department of the faculty advisor); they must also complete at least 28 units of course work with no more than eight units of pre-approved upper-division undergraduate courses, independent study units, or seminars. The thesis should reflect an original research investigation and it must be approved by a thesis committee of at least three full-time faculty members (a majority of which must be Transportation Science faculty) with primary appointments in at least two of the following departments: Civil and Environmental Engineering, Economics, and Planning, Policy and Design. Thesis research findings must be presented in a public seminar.

Plan II: Comprehensive Examination Option
Students who select the comprehensive examination option must successfully complete 36 units of course work and pass a comprehensive examination. These units may include no more than six units of pre-approved upper-division undergraduate courses, independent study units, or seminars. The comprehensive examination requirements may be met with a 20-page paper dealing with a transportation topic; this paper must be approved by the student’s advisor and the Director of the Transportation Science program.

Doctor of Philosophy Degree
The Ph.D. degree indicates attainment of an original and significant research contribution to the state-of-the-art in the candidate’s field, and an ability to communicate advanced concepts to a non-specialized audience. All students must complete a core curriculum consisting of eight courses from Civil
Engineering, Economics, and Social Ecology plus the graduate colloquium. Students may apply to the Director of Enrollment and Graduate Academic Affairs for exemption from specific courses based upon the evidence of prior course work. Students also must successfully complete at least six courses from among the four specialization areas: (1) Methods and Analysis; (2) Transportation Systems Economics; (3) Traffic Analysis; and (4) Planning and Policy Analysis.

At least four of these six courses must be from one specialization.

Students must complete the following general theory core courses:

**Civil Engineering:**
- ENGRCEE 220A: Travel Demand Analysis I
- ENGRCEE 225A: Transportation Planning Models I
- ENGRCEE 225B: Transportation Planning Models II

**Urban Planning:**
- PP&D 202: History of Urban Planning
- or PP&D 212: Transportation Planning
- PP&D 223: Regional Analysis
- or PP&D 242: Regional Development Theory

**Economics:**
- ECON 123A-123B: Econometrics I and Econometrics II
- ECON 282A-282B: Transportation Economics I and Transportation Economics II

**Transportation Science:**
- ECON 285A-285B-285C: Colloquium for Transportation Science I and Colloquium for Transportation Science II and Colloquium for Transportation Science III

It is expected that all students will have sufficient background in one of the core disciplines to be exempted from some of the courses. Substitutions may be approved by the program director.

In addition to the general theory core courses, students must take at least six additional courses chosen from among the four specialization areas below.

**Methods and Analysis Specialization**
- ECON 223A: Discrete Choice Econometrics
- ECON 224A: Time Series Econometrics
- ENGRCEE 220B: Travel Demand Analysis II
- ENGRCEE 224A: Transportation Data Analysis I
- ENGRCEE 225A-225B: Transportation Planning Models I and Transportation Planning Models II
- ENGRCEE 228A: Urban Transportation Networks I
- ENGRCEE 283: Mathematical Methods in Engineering Analysis
- PP&D 206: Microeconomic Analysis for Urban Planning
- PP&D 223: Regional Analysis
- PP&D 237: Introduction to Geographic Information Systems
- PP&D 238: Advanced Geographic Information Systems
- PP&D 242: Regional Development Theory
- SOCECOL 264A-264B: Data Analysis and Data Analysis
- SOCECOL 266B: Applied Logistic Regression
- SOCECOL 272A: Structural Equation Modeling I

**Transportation Systems Economics Specialization**
- ECON 241A-241B: Industrial Organization I and Industrial Organization II
Other requirements include a replication project, in which students replicate the empirical work of a published paper from a major transportation journal; the qualifying examination, which consists of the oral defense of the student’s dissertation proposal; and completion of the dissertation.

The normative time for advancement to candidacy is three years. The normative time for completion of the Ph.D. is five years, and the maximum time permitted is seven years.

**Replication Project**

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.

**Qualifying Examination**

Upon completion of the general theory core courses, the specialization area courses, and the replication requirements, 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.

**Dissertation Requirement**

Following advancement to candidacy, the dissertation is supervised by a doctoral committee ordinarily consisting of at least three members of the candidacy committee, a majority of which must be Transportation Science faculty. The dissertation must demonstrate the student’s ability to originate interesting and significant research problems, to investigate such problems both broadly and deeply, and to write scholarly material of publishable quality. Certification of the dissertation will be by the student’s doctoral committee. Dissertation research units should be earned in the department selected by the chair of the candidacy committee (e.g., ECON 290, ENGRCEE 297, or SOCECOL 296).

**Research Facilities**

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*. 