UP 431: Urban Transportation Modeling
Spring 2021, Department of Urban and Regional Planning, University of Illinois at Urbana-Champaign

CLASS MEETINGS: Tuesday and Thursday, 3:30 – 4:50 pm, Zoom

INSTRUCTOR: Bumsoo Lee, bumsoo@illinois.edu

OFFICE HOURS: 2:30 – 3:20 pm on Tuesday and by appointment, Zoom

TEACHING ASSISTANT: Chaeyeon Han, ch55@illinois.edu

Office hours: 2:30 – 3:20 pm on Monday and by appointment, Zoom

COURSE OVERVIEW

“All models are wrong; some are useful.” –George Box

This course provides the basic skills needed to understand how planners and decision makers can use information about travel behavior to plan transportation investments. Travel demand models often support these decisions and have an air of authority because they produce precise estimates of trip-making patterns. But how the models translate inputs to outputs is often opaque and relies on assumptions that may or may not mirror reality. While you will learn practical skills in travel demand modeling applications in this course, you will also learn to understand and critique these models using knowledge of travel behavior theory, methods, and problem-solving skills.

Learning objectives
By the end of the course, you will be able to:

• Apply behavioral theory and discrete choice analysis to understand travel behavior
• Describe transportation data sources and collection methods
• Explain how travel demand models work
• Critique transportation models and their outputs
• Analyze planning scenarios using travel demand modeling software

COURSE AT A GLANCE

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
<th>Assignment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 26, 28</td>
<td>Introduction; Travel behavior fundamentals</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Feb 2, 4</td>
<td>Transportation data collection</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Feb 9, 11</td>
<td>Transportation data analysis</td>
<td>Assignment 1 (Feb 11)</td>
</tr>
<tr>
<td>4</td>
<td>Feb 16, 18</td>
<td>Discrete choice analysis</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Feb 23, 25</td>
<td>Discrete choice analysis</td>
<td>Assignment 2 (Feb 23)</td>
</tr>
<tr>
<td>6</td>
<td>Mar 2, 4</td>
<td>Modeling software and TDM; Guest lecture</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Mar 9, 11</td>
<td>Trip generation</td>
<td>Assignment 3 (Mar 9)</td>
</tr>
<tr>
<td>8</td>
<td>Mar 16, 18</td>
<td>Trip generation &amp; distribution</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mar 23, 25</td>
<td>Trip distribution</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mar 30, Apr 1</td>
<td>Mode choice</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Apr 6, 8</td>
<td>Trip assignment</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Apr 15</td>
<td>Model validation; Related models (MOVES/ITHIM)</td>
<td>Assignment 4 (Apr 15)</td>
</tr>
<tr>
<td>13</td>
<td>Apr 20, 22</td>
<td>Evaluating alternatives</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Apr 27, 29</td>
<td>Model critiques &amp; emerging applications</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>May 4</td>
<td>Final presentations</td>
<td>Final project (May 10)</td>
</tr>
<tr>
<td>16</td>
<td><em>Finals week</em></td>
<td></td>
<td>Grad term paper (May 14)</td>
</tr>
</tbody>
</table>
**PREREQUISITE**

UP 430 or CEE 417, or consent of instructor, Junior standing required.

Familiarity with basic statistics and R program will be helpful for the success in UP 431.

All students are **STRONGLY** encouraged to attend “Introduction to R for Planners 2-day workshop” on Jan 30 and Feb 6, 9am-2pm. For more information on the workshop, [https://urban.illinois.edu/about-us/events/introduction-to-r-for-planners-2-day-workshop/](https://urban.illinois.edu/about-us/events/introduction-to-r-for-planners-2-day-workshop/) Please register here: [https://illinois.zoom.us/meeting/register/tZUvdOqgqzkoE9EXd75j8KOgpOB5eWrmU3KW](https://illinois.zoom.us/meeting/register/tZUvdOqgqzkoE9EXd75j8KOgpOB5eWrmU3KW)

**EVALUATION**

<table>
<thead>
<tr>
<th></th>
<th>Undergraduate students</th>
<th>Graduate students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments (1/4 each)</td>
<td>60 %</td>
<td>40 %</td>
</tr>
<tr>
<td>Final project</td>
<td>30 %</td>
<td>30 %</td>
</tr>
<tr>
<td>Term Paper</td>
<td>-</td>
<td>20 %</td>
</tr>
<tr>
<td>Participation and attendance</td>
<td>10 %</td>
<td>10 %</td>
</tr>
</tbody>
</table>

RUBRIC:

A: Demonstrates original thought and synthesis of ideas and cogent analysis, and is clearly written and presented. Outstanding work.

B: Presents above average analysis with appropriate evidence to support ideas, and is clearly written or presented. Good work.

C: Shows a basic level of understanding, with analysis limited to obvious arguments. Writing is competent. Adequate work.

D: Misunderstands or misrepresents the material, or is so poorly written or presented as to obscure the analysis. Inadequate work.

Transformation of numerical grade to letter grade will be according to the schedule below:

<table>
<thead>
<tr>
<th></th>
<th>A+</th>
<th>97-100</th>
<th>A</th>
<th>93-96.9</th>
<th>C+</th>
<th>77-79.9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A-</td>
<td>90-92.9</td>
<td>B+</td>
<td>87-89.9</td>
<td>C-</td>
<td>70-72.9</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>83-86.9</td>
<td>B-</td>
<td>80-82.9</td>
<td>D-</td>
<td>60-66.9</td>
</tr>
</tbody>
</table>

**POLICIES**

SPECIAL ACCOMMODATIONS

This course will accommodate students with documented disabilities. Please refer to [http://disability.illinois.edu/disability-resource-guide](http://disability.illinois.edu/disability-resource-guide) for more information and provide the appropriate documentation at the beginning of the semester.

ACADEMIC INTEGRITY

This course follows the guidelines set forth by the University student code. See [http://studentcode.illinois.edu/article1_part4_1-401.html](http://studentcode.illinois.edu/article1_part4_1-401.html) for specific guidelines, examples, and punishment associated with academic dishonesty.

CLASS CLIMATE

The Department of Urban and Regional Planning (DURP) is committed to creating an environment of inclusion and opportunity that is rooted in the very
goals and responsibilities of practicing planners. Conduct that interferes with the rights of another or creates an atmosphere of intimidation or disrespect is inconsistent with the environment of learning and cooperation that the program requires. By enrolling a course in the Department of Urban and Regional Planning, students agree to be responsible for maintaining a respectful environment in all DURP activities, including lectures, discussions, labs, projects, and extracurricular programs. We will be governed by the University Student Code. See Student Code Article 1—Student Rights and Responsibilities, Part 1. Student Rights: §1-102 In the Classroom.

EMERGENCY RESPONSE RECOMMENDATIONS

The Department of Homeland Security and the University of Illinois at Urbana-Champaign Office of Campus Emergency Planning recommend the following three responses to any emergency on campus: RUN > HIDE > FIGHT

For more information, http://police.illinois.edu/emergencyplanning/general/

COUNSELING CENTER

The Counseling Center is committed to providing a range of services intended to help students develop improved coping skills in order to address emotional, interpersonal, and academic concerns. The Counseling Center provides individual, couples, and group counseling. All of these services are paid for through the health services fee. The Counseling Center offers primarily short term counseling, but they do also provide referrals to the community when students could benefit from longer term services. https://counselingcenter.illinois.edu/

COURSE SCHEDULE


Week 1: Introduction to travel demand models and planning; travel behavior fundamentals


Weeks 2 & 3: Transportation data collection and analysis


Weeks 4 & 5: Introduction to discrete choice analysis


Week 6: Introduction to modeling software


Week 7 & 8 (Mar 16): Trip generation

TDF, Sections 4.3 and 4.4.

[Optional] Chapter 4 in Modelling Transport.

Week 8 (Mar 18) & 9: Trip distribution

TDF, Sections 4.5 and 4.6.

[Optional] Chapter 5 in Modelling Transport.

Week 10: Mode choice

TDF, Section 4.7

[Optional] Chapter 6 in Modelling Transport.

Week 11: Trip assignment

TDF, Sections 4.8, 4.9, 4.11, and 4.12.

[Optional] Chapter 10 in Modelling Transport.

Week 12: Model validation; Air quality models and health impact modeling

TDF, Chapter 5. Model validation and reasonableness checking


Week 13: Evaluating alternatives


Week 14: Model critiques and emerging applications (Activity-based models, integrated models, microsimulation, big data)


TDF, Chapter 6. Emerging modeling practices


Week 15: Final project presentations