UP 431: Travel Behavior Analysis       Spring 2020
University of Illinois at Urbana-Champaign
Department of Urban and Regional Planning

Meeting time and duration: TR 2:30 pm – 3:50 pm (3 hours per week)
Meeting location: Computer Lab TBD
Credit hours: 3 undergraduate or graduate hours

Instructor: Professor Jesus Barajas
Email: barajasj@illinois.edu
Office: M218 Temple Buell Hall
Office hours: Wednesdays by appointment; sign up at https://calendly.com/barajasj/

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
• Understand the basics of air quality modeling
• Identify advanced and emerging applications of travel demand modeling
Course at a glance

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment Due</th>
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<tr>
<td>1</td>
<td>Introduction; Travel behavior fundamentals</td>
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<td>2</td>
<td>Data collection</td>
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<td>3</td>
<td>Data collection</td>
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<tr>
<td>4</td>
<td>Discrete choice analysis</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>5</td>
<td>Discrete choice analysis</td>
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<td>6</td>
<td>Modeling software and TDM</td>
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<td>7</td>
<td>Trip generation</td>
<td>Assignment 2</td>
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<td>8</td>
<td>Trip distribution</td>
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<td>9</td>
<td>Mode choice</td>
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<td>10</td>
<td>Trip assignment</td>
<td>Assignment 3</td>
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<tr>
<td>11</td>
<td>Model validation; Related models (MOVES/ITHIM)</td>
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<td>12</td>
<td>Evaluating alternatives</td>
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<td>13</td>
<td>Model critiques</td>
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<td>14</td>
<td>Emerging applications</td>
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<td>15</td>
<td>Final presentations</td>
<td>Final project</td>
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<td>16</td>
<td>Finals week</td>
<td>Final paper</td>
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Course requirements

Course structure and assignments

Most Mondays will be dedicated to lecture, discussion, and tutorials. Many Wednesdays will be dedicated to practice exercises so students can familiarize themselves with the modeling software. We will have hands-on activities with the R software environment (for statistical analysis, visualization, and transportation planning applications) and Cube (for travel demand modeling). I will run an optional R boot camp at the beginning of the semester to cover the basics; beyond that, students will be expected to learn on their own or rely on widely-available resources to get up to speed. We will learn Cube during the course of the semester.

Class assignments (All students): There are three assignments in this course: (1) Understanding and analyzing survey data, (2) Discrete choice analysis, and (3) Computing travel demand. Each assignment will be weighted equally. These will be individual assignments.

Final project (All students): The final project will require students to model a scenario for changes along a transportation corridor, present their findings to the class, and submit a report. This will be a group project. Graduate students will be expected to be “project managers” for the assignment and will be appointed to coordinate group activities.

Paper (Graduate students only): Students will submit a 2,000-word paper summarizing, reflecting on, and critiquing the analysis process in a long range transportation plan from an MPO of their choice. This will be an individual assignment.

More details on the assignments will be provided during the course of the semester.
Grades

Grade percentages will be distributed as follows:

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<th>Undergraduate</th>
<th>Graduate</th>
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<tr>
<td>Assignments (1/3 each)</td>
<td>45%</td>
<td>30%</td>
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<tr>
<td>Final project</td>
<td>45%</td>
<td>45%</td>
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<tr>
<td>Paper</td>
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<td>15%</td>
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<tr>
<td>Participation and attendance</td>
<td>10%</td>
<td>10%</td>
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Percentage grades will be converted to letter grades using the following scale:

- A: 94.0 or higher
- A-: 90.93.99
- B+: 87.0-89.99
- B: 84.0-86.99
- B-: 80.0-83.99
- C+: 77.0-79.99
- C: 74.0-76.99
- C-: 70.0-73.99
- D+: 67.0-69.99
- D: 64.0-66.99
- D-: 60.0-63.99
- F: Less than 60.0

The general grading rubric is as follows:

- An “A” assignment demonstrates original thought and synthesis of ideas and sophisticated, cogent analysis. It is clearly written and presented. Exemplary work.
- A “B” assignment includes above average analysis with appropriate evidence to support ideas. It is clearly written and presented. Above average, competent work.
- A “C” assignment shows a basic level of understanding, with analysis limited to obvious arguments. Writing is competent. Developing but adequate work.
- A “D” assignment misunderstands or misrepresents the material or is so poorly written that it obscures the analysis. Beginning and inadequate work.

Due dates and times will be provided with each assignment. Anything turned in late will lose one full letter grade per day.

Readings

There is no textbook for this course. Readings, when not freely available online, will be made available on Compass. Several optional readings listed give more background on the methods and techniques we will use in class. I may give unannounced reading quizzes from time to time, which will count toward the participation grade.

Participation and attendance

Class participation, and therefore attendance, is mandatory at all sessions. However, I understand that life happens and you’ll occasionally need to miss a class because of emergency, illness, or another other need. There is no need to notify me in advance, but more than three absences for any reason will result in a lower participation grade. But do notify the instructors in advance if you will have a prolonged absence for a legitimate reason.
Whatever the reason for your absence, you are responsible for acquiring class materials when you do not attend, and assignments are still due on the date posted.

**Course policies**

*Respect, civility, and inclusivity*

We bring our own life experiences with us to the university, which means that we may have quite different perspectives about the issues we will discuss in this class. Any thoughtful viewpoints as they relate to the course material are welcome. I ask that you be mindful of our differences as you engage with your fellow classmates in a respectful manner. Skills in empathetic dialogue will serve you well as a professional planner.

The Department of Urban and Regional Planning (DURP) is committed to maintaining a learning environment that is rooted in the goals and responsibilities of professional planners. By enrolling in a class offered by the Department of Urban and Regional Planning, students agree to be responsible for maintaining an atmosphere of mutual respect in all DURP activities, including lectures, discussions, labs, projects, and extracurricular programs. See [Student Code, Article 1-Student Rights and Responsibilities, Part 1. Student Rights, §1-102](#).

**Academic accommodations**

If you need academic accommodations due to a documented disability, please inform me as soon as possible. You should also contact the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-4603, email disability@illinois.edu, or go to the DRES website.

**Counseling**

Academic settings can be stressful and it’s easy to get overwhelmed. If you feel that you need help, consider making an appointment at the Counseling Center. The Counseling Center provides a range of services intended to help students develop improved coping skills to address emotional, interpersonal, and academic concerns. Services are paid for through the health services fee.

**Academic integrity**

Don’t cheat and don’t plagiarize. Any work you turn in with your name on it is presumed to be your own. If it is not, and you do not attribute the work to its source, it is grounds for sanctions that range from a written warning to course failure to dismissal or suspension. Refer to the [University of Illinois Student Code](#) for more details.

**Digital distractions**

This course relies heavily on computer software, and so I expect that you’ll follow along with tutorials and exercises while online. But this serves as a reminder that it’s easy to get pulled away from what you should be doing by shiny bells and whistles. Be aware of distractions and do what you need to do to stay focused during class.
Course reading list and schedule

Note 1: This reading list is subject to revision.


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


Weeks 2 & 3: Data collection

TDF, Chapter 3.


Weeks 4 & 5: Introduction to discrete choice analysis


Week 6: Introduction to modeling software


Week 7: Trip generation
TDF, Sections 4.3 and 4.4.
[Optional] Chapter 4 in Modelling Transport.

Week 8: Trip distribution
TDF, Sections 4.5 and 4.6.
[Optional] Chapter 5 in Modelling Transport.

Week 9: Mode choice
TDF, Section 4.7
[Optional] Chapter 6 in Modelling Transport.

Week 10: Trip assignment
TDF, Sections 4.8, 4.9, 4.11, and 4.12.
[Optional] Chapter 10 in Modelling Transport.

Week 11: Model validation; Air quality models and health impact modeling
TDF, Chapter 5.


Week 12: Evaluating alternatives

Week 13: Model critiques


Week 14: Activity-based models, integrated models, microsimulation, big data

TDF, Chapter 6.


Week 15: Final project presentations