USP 587: Travel Demand Modeling
Portland State University, Winter 2016

Room and Times: Urban Center 220, Thursdays 4:00-6:30pm
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Course Website: https://sites.google.com/a/pdx.edu/usp587/

Synopsis: This course provides an introduction to travel demand analysis and forecasting. Students will understand travel demand models from a theoretical, applied and practical perspective. Students will become familiar with the traditional four-step travel forecasting process, including model development, application and interpretation of outputs. Instruction and practice in econometric model formulation, model estimation, and use of models in transportation data analysis and prediction will be included. Practice problems are assigned to provide experience in data handling, model formulation, estimation and interpretation.

Prerequisite: College-level algebra and introductory probability and statistics (i.e., regression analysis, hypothesis testing, etc.). The most critical elements of this material will be reviewed in class.

Format: Classes will be a combination of lecture and discussion. Students are expected to read assignments before class and to participate in class discussions. Homework assignments will be given and analysis of these assignments will be the basis for some class discussion during the class immediately following their due date, so it is essential to complete assignments on time.

Textbook and Reading: There is no specific textbook for the class. The course will draw on materials from a wide range of sources and will provide students with book excerpts and journal papers as appropriate to supplement lecture notes. The following textbook is recommended as a general reference to transportation planning modeling and analysis:


Grading: The course requirements include assigned readings, four assignments, attendance and class participation, and a final exam.

Assignments (65%): Four homework assignments that involve completing analytical exercises designed to build skills in travel demand modeling and to reinforce concepts discussed in the class lectures. Clarity in writing and presentation will be taken into account in grading. Students
may collaborate on the approach to and analysis of homework assignments but are expected to prepare and present results and interpretations independently.

**General Attendance and Class Participation** (10%): The class participation section of the grade does not merely measure attendance in class, but also reflects the student’s understanding of the subject matter, as reflected through insightful questions and discussion in class. There will be occasional in-class quizzes.

**Course Project** (25%): For the final project we will use a travel demand model to do a traffic analysis.

Late assignments will be penalized by a full letter grade per class late; so that an ‘A’ would become a ‘B’ after one class period, a ‘C’ after two class periods. Assignments more than two classes late will not be accepted. However, if you have a serious conflict with another class, software problems, or some other personal issues, deadlines can be extended when a request for such an extension is made before the due date.

**Lecture Schedule:**

**Lecture 1 (1/7): Introduction; Transportation Data**
Topics Covered: Introduction; Transportation Data
Reading:
1. [O] Chapter 1: Introduction
2. [O] Chapter 3: Data and Space

**Lecture 2 (1/14): Overview of Travel Demand Model**
Assignment: Homework 1 assigned (15%)
Topics Covered: Overview of the Four Step Model; Overview of the Model Development Process

Reading:

**Lecture 3 (1/21): Trip Generation and Linear Regression Analysis**
Topics: Overview of Trip Generation, Factors Affecting Trip Generation, Categorical Analysis, Using Trip Rates, Regression Model of Trip Generation, Linear Regression Estimation
Readings:
1. NCHRP Report 365 Chapter 3 Trip Generation
3. (optional) [O] Chapter 4: Trip Generation Modeling

**Lecture 4 (1/28): Linear Regression Analysis (Computer Lab)**
Assignment: Homework 2 assigned (15%); Homework 1 due.
Location: TBA
Topics: Hypothesis Testing, Market Segmentation, Non-Linearity, Aggregation Issues, and Estimating Linear Regression Models
Reading:

Lecture 5 (2/4): Trip Distribution
Topics: Overview of Trip Distribution, Gravity Model, Balancing Trip OD-Matrices
Readings:
   1. NCHRP Report 365 Chapter 4 Trip Distribution
   2. [O] Chapter 5: Trip Distribution Modeling

Lecture 6 (2/11): Mode Choice and Discrete Choice Models
Assignment: Homework 3 assigned (15%); Homework 2 due.
Topics: Overview of Mode Choice, Modal Split, Binary Choice Models, Multinomial Choice Models
Readings:
   1. NCHRP Report 365 Chapter 6 Mode Choice Analysis.
   2. (Optional) [O] Chapter 6: Modal Split and Direct Demand Models

Lecture 7 (2/18): Discrete Choice Models
Topics: Destination Choice Models, Interpreting Discrete Choice Models, Elasticity Values, Value-Of-Time, and Hypothesis Testing
Readings:
   1. [O] Chapter 7: Discrete Choice Models

Lecture 8 (2/25): Traffic Assignment
Assignment: Homework 4 assigned (20%); Homework 3 due.
Topics: Overview of Traffic Assignment, Concept of Equilibrium, User-equilibrium
Readings:
   2. (Optional) [O] Chapter 10: Assignment
Lecture 9 (3/3): Model Calibration and Validation
Assignment: Final project handed out (25%); Topics: Travel demand models in practice; Model calibration, validation, and reasonableness check
Readings:
1. NCHRP Report 716 Chapter 5 (pp 80-88), Chapter 7 (pp 100-113)
3. (Optional) FHWA, Travel Model Validation and Reasonableness Checking Manual, Second Edition

Lecture 10 (3/10): Synthesis and Miscellaneous Topics
Assignment: Homework 4 due.
Topics: Innovations in travel demand modeling; integrated land use – transportation models; activity-based travel models
Readings:
1. [O] Chapter 14: Activity Based Models