Instructor: Konstadinos Goulias, 231PSackett Building, 863-7053 and 205 Research Office Bld, 863-7926; E-mail: KXG2@psu.edu

Goals: A) Understand the fundamentals of travel demand analysis; B) Formulate and estimate statistical/econometric models; C) Gain hands-on experience on demand modeling using real data; D) Develop the skills needed to write scientific papers.

COURSE OUTLINE

1. Course Overview
   - Travel Demand Overview
   - Activity Analysis and Travel Patterns
   - Traveler Surveys in Travel Demand
   - Typology of Variables and Examples
   - The LIMDEP and SPSS Software
   - Input and Output Files
   - Plots, Descriptive Statistics, Frequencies

2. Statistical Inference
   - Sampling and Descriptive Statistics
   - Point Estimation (Finite-sample and large-sample properties)
   - Maximum Likelihood Estimation: Poisson Model
   - Hypothesis Testing: Likelihood Ratio
   - NPTS, The Puget Sound Transportation Panel, Other surveys

3. Multiple Linear Regression Models
   - Review of Linear Model and Ordinary Least Squares
   - Violation of the Gauss-Markov Theorem Assumptions: Heteroskedasticity
   - Omission of Relevant and Inclusion of Irrelevant Variables
   - Autocorrelated Disturbances
   - Trip generation models using cross-sectional and panel data

4. Models with Discrete Dependent Variables
   - Models with Binomial Outcomes: Linear, Probit, and Logit
   - Models of Proportions: Aggregate Modal Split
   - Index Functions and Random Utility Models
   - Discrete choice model and Mode choice

5. Unordered Multiple Choice(or Outcome) Models
   - Unordered Multiple Choices: Conditional Logit Model (Mode Choice Models)
   - Independence from Irrelevant Alternatives and Related Tests
   - Nested Logit Model: Mode Choice, Survey Participation
   - Bivariate Probit Models: Panel Attrition and Residential Relocation

6. Ordered Dependent Variables
   - Ordered Logit and Probit: Opinions and Attitudes, Car Ownership
   - Count Data and the Poisson Regression Model

7. Contingency Tables
   - 2X2 Tables
   - Testing Collapsibility of Tables
   - Goodman's Hierarchical Models
   - CHAID and an application for TDM

8. Multilevel Models
   - Linear Models
   - Non-linear Models
   - Mixed continuous and discrete variable models
9. Data Problems
   Multicollinearity, Missing Data, Aggregation
   Measurement Error in X and in Y
10. Limited Dependent Variable Models
    Truncation and Censoring
    Single and Double Censored Regression Model: One limit and two Limit Tobit
11. Selectivity
    Selectivity and Truncation:
    Program Participation and Travel Behavior (Telecommuting)
    Residential Relocation (RR) and Trip Frequency
    Dummy Endogenous Variable: RR and Modal Split
    Switching Regressions: Disequilibrium with Known Sample Separation
12. Systems of Equations and Simultaneous Equations
    Systems of Regression Equations: Modal Split Equations
    Correlated Disturbances and Estimation (SURE, GLS, FGLS)
    Notions of Simultaneous Equations: structural and reduced forms
13. Dynamic Models
    Heckman's General Model
    Time Series of Cross Sections: The Dutch and Puget Sound Panels
    Fixed and Random Effects Linear Models
14. Duration Models
    Duration Data
    Hazard Models - Survival Analysis
15. Current Research Topics in Travel Demand
    Activity-based Approaches
    Time-Use Studies
16. Course Presentations