UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING

CVEG 563V SPECIAL PROBLEMS: TRAVEL DEMAND MODELING
Fall 2020

Instructor: Dr. Suman Kumar Mitra, Assistant Professor
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Office Hours: Wednesdays 3 PM-4 PM (or by appointment)

Lectures: Mondays, Wednesdays, & Fridays 2 PM-3 PM.

"Teachers can open the door, but you must enter it yourself." — Chinese proverb

"Genius is 10% inspiration, 90% perspiration." — Thomas Edison

"A person who never made a mistake never tried anything new." — Albert Einstein

Instruction Mode: This course will be taught remotely using Blackboard Collaborate Ultra. The lecture will be delivered on scheduled lecture times, and every student is expected to join the session. However, if you cannot join any lecture session due to the internet or any other issues, please let the instructor know beforehand. Each lecture video will also be uploaded on the blackboard.

Note: All the course materials, lecture slides, and recorded videos are the property of this class. You are not allowed to share or distribute any of these contents outside of this class.

Course Description:
This graduate-level course will provide an in-depth understanding of the theoretical aspects of travel demand. Students will become familiar with the methods of discrete choice analysis and their applications in the modeling of transportation systems. Emphasis will be given to developing a sound understanding of the theoretical aspects of discrete choice modeling that are useful in many applications in travel demand analysis.

Course Learning Outcomes:
Students who successfully complete this course will be able to:

- Understand the basic theory of transportation demand and supply
- Familiarize with the different modeling tools for travel demand analysis
- Understand the theoretical aspects of discrete choice modeling
- Apply and interpret different models of travel demand analysis
- Familiarize with the activity-based modeling

Grading Criteria:

Items	Percentage
Homework/Quizzes	30%
Final Exam	30%
Term Project	40%

Term Project:

The term project should be a maximum 10-12-page paper (Times New Roman 12 points double-sided) that could be related to any topics discussed in the class. A one-page proposal is due on **Friday of the Fourth week (September 18)**. The final paper is due on **Monday of week 15th** (**December 4, 2020**). Class presentations (8-10 minutes per project) will take place on the Final week (**December 7 and 9**). It is expected that student will analyze a real-world data by using a model discussed in the class. Possible data sources are:

- National Household Travel Survey; https://nhts.ornl.gov/
- Longitudinal Employer-Household Dynamics; https://lehd.ces.census.gov/data/
- US census commuting data; https://www.census.gov/topics/employment/commuting/data.html
- Any other data sources that are not listed here needs to be approved by the course instructor.

Textbooks:

1. de Dios Ortúzar, J., & Willumsen, L. G. (2011). *Modelling transport*. John wiley & sons.
2. Ben-Akiva, M. E., Lerman, S. R., & Lerman, S. R. (1985). *Discrete choice analysis: theory and application to travel demand* (Vol. 9). MIT press.
3. Train, K. E. (2009). *Discrete choice methods with simulation*. Cambridge university press.
4. Profillidis, V. A., & Botzoris, G. N. (2018). *Modeling of Transport Demand: Analyzing, Calculating, and Forecasting Transport Demand*. Elsevier.
5. Course Notes: pdf version of lecture slides

Tentative Course Outline (It may be modified as the semester progresses):

Lecture Topics

Part 1: Travel Demand Theory

1. Relationship to Economic Demand Theory
    a. Supply Curve
    b. Demand Curve
    c. Elasticity

2. Microeconomic Demand Theory
- Market Demand

i. Demand Curves
ii. Supply Curves
iii. Equilibrium and Consumer Surplus
iv. Pricing

- Consumer Demand
  i. Consumer Demand Function
  ii. Empirical Demand Function
  iii. Preference and Indifference

Part II: Travel Demand Modeling

3. Travel Demand Modeling
   - Direct Demand Models
   - Trip Classification

4. Trip Generation Modeling
   - Productions and Attractions
   - Cross-Classification / Category Analysis
   - Multiple Classification Analysis (MCA)
   - Multivariate Linear Regression

5. Trip Distribution Modeling
   - Gravity Models

6. Discrete Choice Modeling
   - Discrete Choice Theory
   - Multinomial Logit Choice Model
   - Multinomial Logit Model (MNL) Estimation
   - Choice Elasticities
   - MNL Independence from Irrelevant Alternatives (IIA) Property
   - Joint Logit Model
   - Nested Logit Model
   - Estimation of Nested Logit Models
   - Multinomial Probit Choice Model
   - Estimation of Multinomial Probit Choice Model
   - Random Coefficients and Mixed Logit Choice Models
   - Estimation of Random Coefficients and Mixed Logit Choice Models

7. Introduction to Activity Based Modeling