CE 614
Statistical and Econometric Methods I

The objective of this course is to provide students with a general background in the application of various statistical and econometric analysis techniques and to provide new ideas for analyzing data in their research. The course will present a number of model-estimation methods that are used in transportation data analysis and other subject areas that deal with data analysis. While examples will be drawn primarily from transportation, the methods presented have broad applications to a variety of data-analysis applications in civil engineering and beyond, and these will be discussed in the course. The material covered goes well beyond the techniques typically covered in statistics courses. While, the course will emphasize model estimation and application, the underlying theory and limitations will be discussed to ensure that the methods are properly applied and understood.

Time and location: Fall semester, Thursdays 5:30-8:30, in room HAMP 1252

Website: https://engineering.purdue.edu/~flm/CE614(13).htm. In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. These changes will be reported as soon as possible on the course website.

Course requirements:

- Nine empirical assignments. All involve data analysis with existing databases. Students will present their results with a short write-up.
- There will be take home mid-term exam that will have students work on a database and perform an appropriate write-up. The intent of this exam is to develop modeling and paper-writing techniques. Because the exam is intended as a learning experience, its value is only 10% of the course grade.
- There will be a comprehensive final exam.
- Students will have two options for the term project:
    1. They can define a problem and work with data in their field of interest.
    2. Work with class-survey data. The class will design a survey that will include questions tailored to each individual student's research interest.

Grade distribution: Empirical assignments (20%), Mid-term exam (10%), Term project (40%), Final exam (30%)

Prerequisites: Graduate standing in Engineering, Economics or Statistics (STAT 511 or equivalent recommended as a minimum).

Required materials:

Text: Washington, S., M. Karlaftis, and F. Mannering (2011) Statistical and econometric methods for transportation data analysis, Second Edition, Chapman & Hall/CRC.

Notes: F. Mannering (2013) Statistical and Econometric Methods I, CE614 course notes, available at Copymat, 135 S. Chauncey Ave. West Lafayette, 743-5995.

Course contents

Lecture 1	Course introduction; review of estimators and their properties (Text chapters 1 and 2)
Lecture 2	Review of least squares regression; maximum likelihood estimation (Text chapter 3)
Lecture 3	Specification errors; simultaneous equation models (Text chapters 4 and 5)
Lecture 4	Count-data models; Poisson regression; negative binomial; zero-inflated models count-data models (Text chapter 13)
Lecture 5	Discrete outcome models and analysis of discrete data; economic theory and discrete choice models (Text chapter 13)
Lecture 6	Properties and estimation of multinomial logit models (Text chapter 13)
Lecture 7	Data sampling (stratified, cluster, choice-based, double, enriched, and exogenous sampling) (Text chapter 13)
Lecture 8	Nested logit/generalized extreme value models (Text chapter 13)
Lecture 9	Hypothetical data; compensating variation and consumer welfare effects (Text chapter 13)
Lecture 10	Ordered probability models with fixed and random effects (Text chapter 14)
Lecture 11	Mid-term exam
Lecture 12	Self-selectivity and discrete/continuous models (Text chapter 15)
Lecture 13	Duration models; censored data; parametric and nonparametric estimation (Text chapter 10)
Lecture 14	Introduction to random parameter models (Text chapter 16)
Lecture 15	Project presentations