MAT 654: Linear Models (Fall, 2011)
Course Information

Instructor: Professor H. Hyune-Ju Kim
Carnegie 304E
443-1494, 443-1471(message)
hjkim@syr.edu
Office Hours: M 11-noon, T 1 p.m.-2 p.m.

Course Description: The course will discuss general procedures of least squares estimation and hypothesis testing for linear statistical models, especially simple and multiple regression models and analysis of variances models. The assumptions underlying the least squares theory and various methods of testing the validity of these assumptions will be considered. Also, applications will be discussed.

Text: Linear Regression Analysis, Seber and Lee, 2nd edition, Wiley

References: Draper and smith, Applied Regression Analysis, Second Edition
Searle, Linear Models

Grading Policy

Homework (30 %)
Midterm Exam (25 %)
Project (15 %)
Final Take Home Exam (30 %)

Prerequisite: Mathematical Statistics in the level of MAT 521 and 525 or higher,
Linear Algebra,
Knowledge of one of the statistical packages (such as MINITAB, SAS, SPSS)

Course structure:

1. Lectures: See the attached course outline.
2. Assignments
3. Exams: A midterm exam will be given during our regular class time. The final exam is a take-home exam and its schedule will be announced later in class.
4. Project: Students will conduct research and/or survey by applying and extending what he/she learned in class. Project will be evaluated based upon originality, creativity, completeness, and the quality of the written report and presentation. During the last two classes of the semester, each student will present his/her project.

Course Outline

I. Introduction and Basic Theory (Week 1-Week 2)
   1. Linear Models (Chapter 1)
   2. Multivariate Normal Distribution (Chapter 2)

II. Linear Regression (Week 3- Week 7)
   1. Basic Theory (Chapter 3)
   2. Hypothesis Testing (Chapter 4)
   3. Confidence Interval (Chapter 5)

********** Midterm on October 12 (Thursday) **********

III. Regression Models (Week 8- Week 10)
   1. Simple Linear Regression (Chapter 6)
   2. Departures from Assumptions (Chapter 9, 10)
   3. Model Selection (Chapter 12)

IV. Analysis of Variance (Week 11– Week 13))
   1. One-Way Classification
      a. Fixed Effects: ANOVA, Multiple Comparisons, Monotone Alternatives, Nonnormality, Unequal Variances
      b. Random Effects: ANOVA, Nonnormality
   2. Two-Way Classification
      a. Fixed Effect: ANOVA, MC, MA, Nonnormality, Unequal Variances, Dependence
      b. Mixed Effect: ANOVA, MC, MA
      c. Random Effects: Crossed and Nested Models, ANOVA, Departures from Assumptions
   3. Additional Designs
      Higher-way Classifications, Latin Squares, Repeated Measures

V. Miscellaneous Topics (if time permits)
   1. Analysis of frequency data: Log-linear models, logistic regression
   2. Recent developments: Bootstrapping, Smoothing techniques, CART, Wavelets