Math 542L – Analysis of Variance and Regression

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The Course: This course is an introduction to two of the most widely-used tools statistics: Regression and analysis of variance models. We will cover their theory and see some applications to real data sets in lecture examples and data analysis lab assignments. We will cover least squares estimation in the linear model, analysis of variance and covariance, the F-test, multiple comparisons, multiple regression, non-linear and non-parametric regression, and applications. The course includes an introductory laboratory on computing techniques using the statistical computing package R.

Course information, assignments, solutions, and grades will be posted on `Blackboard`.

Here is a tentative schedule:

Week	Date	Topic
1	12.Jan	Expectation and covariance, quadratic forms (QFs)
2	19.Jan	Moment generating functions, multivariate normal distribution
3	26.Jan	Distribution of QFs, regression
4	2.Feb	Estimation of regression parameters
5	9.Feb	MLE in regression, linear constraints, orthogonal design matrices
6	16.Feb	**Midterm Exam 1**, generalized least squares
7	23.Feb	Hypothesis testing in regression, the F-test
8	2.Mar	Goodness of fit testing
9	9.Mar	Bonferroni & maximum modulus t confidence intervals
10	16.Mar	*–Spring Break–*
11	23.Mar	**Midterm Exam 2**, Scheffe's S-Method, equivariance
12	30.Mar	Prediction intervals
13	6.Apr	Straight line & two-phase regression
14	13.Apr	ANOVA: One-way layout
15	20.Apr	ANOVA: One-way layout
16	27.Apr	ANOVA: Two-way layout
	8.May	**Final Exam, 8-10 AM**

Textbooks: *Linear Regression Analysis*, 2nd edition, by Seber & Lee will be our main reference for the theory in this class, and *Handbook of Statistical Analyses in R* by Everitt & Hothorn for the data labs. Two good supplementary books are *Introduction to Linear Regression Analysis* by Montgomery et al., and *Applied Regression Analysis* by Draper & Smith.

Homework: There will be about seven problem sets and about three data analysis assignments. R is the recommended statistical computing package for the data analysis assignments. It is available for free on the web and on the computers in the Math department's computer lab on the second floor of KAP. You are encouraged to work together on the assignments but each student must write up the assignment in his/her own words and show all work/code. Assignments will be turned in to the grader's mailbox by 5 PM on the date due. Any late assignments must be cleared with the instructor.

Exams: There will be two midterms, the first on Wednesday, 15.Feb and the second on Wednesday, 25.Mar. The final exam will be Friday, 8.May, 8-10 AM. Some of these exams may be take-home exams.

Grades: Grades will be computed from 1/3 assignments, 1/6 each midterm, and 1/3 final exam.