

STATISTICS 350-3

LINEAR MODELS IN APPLIED STATISTICS II

Fall 2001
DAY COURSE

Instructor: Dr. T. Swartz

Prerequisites:

STAT 330 and MATH 251.

Textbook:

Supplementary Text - *Applied Linear Regression* by Sanford Weisberg, Wiley

Calendar Description:

Theory and application of linear regression. Normal distribution theory. Hypothesis tests and confidence intervals. Model selection. Model diagnostics. Introduction to weighted least squares and generalized linear models.

Outline:

1. Linear models. Matrix notation, examples of linear and non-linear models. Fitting linear models to data. Least squares. Geometrical interpretation of least squares.
2. Theoretical development of the behaviour of least squares: Matrix expectation, mean and variance of random vectors, singular and non-singular distributions, factorization theorem. Means, variances and covariances of least squares estimators. Standardized residuals, standardized coefficients. Expected value of residual sum of squares.
3. Normal, t, Chi-squared and F distributions. Multivariate normal distribution. Joint density, independence property, orthogonal transformations.
4. Significance tests and confidence intervals for linear models with independent homoscedastic normal errors. Distributions of estimates, fitted values, residuals, residual sum of squares. Inference about variance, inferences for a linear function of the regression coefficients. Prediction.
5. General Linear Hypotheses. Linear models and vector spaces. Singular and non-singular cases, changing basis vectors. Additional Sum of Squares Principle. Analysis of Covariance: fitting families of straight lines, checking equal slopes, checking equal variances.