MATHEMATICS 376
MATHEMATICAL STATISTICS

I. Introduction

A. Catalog Description

This course provides an introduction to statistical concepts for students with a background in probability theory. Building on this background in probability, the course develops statistical theory based on likelihood functions and other standard topics in estimation and testing. Through the analysis of real data the application of basic statistical concepts is introduced, and some familiarity with statistical software is developed At the conclusion of the course the student should be familiar with the "why, when, and how" of statistical analysis and with basic statistical theory. *Prerequisite: Math 375 or equivalent.* Satisfies the proof-based requirement in major contracts.

B. Objectives

The primary objective of the course is to provide students with a knowledge of the mathematical theory of statistics. Nearly equal is the emphasis on applications of the derived statistical techniques. At the conclusion of the course the student should be familiar with the "why, when, and how" of statistical analysis and with basic statistical theory. Students who complete both Math 375 and Math 376 should be prepared to study for the first actuarial examination (Course 1).

C. Prerequisites

Mathematics 375 or equivalent.

II. Required Topics

A. Point and Interval Estimation

1. Optimality Criteria
2. Sufficiency
3. Decision Theoretic Models

B. Testing Hypotheses

1. General concepts of the Neyman-Pearson Theory
2. UMP tests for certain composite hypotheses
3. Likelihood ratio tests
4. Decision-Theoretic interpretations

C. The Linear Model

1. Introduction
2. Least Squares Estimates and Normal Equations
3. Estimation of s^2
4. Hypothesis Tests about Model parameters
5. Derivation of the F statistics

    D. Multiple Regression

    E. Analysis of Variance

    F. Nonparametric Inference

III. Bibliography

Roussas, G.   Mathematical Statistics, Addison-Wesley

Hoel, P., S. Port., & C. Stone, Statistical Theory, Houghton-Mifflin

Larson, H. Introduction to the Theory of Statistics,
                                      John Wiley & Sons

Larsen, R. & M. Marx An Introduction to Mathematical Statistics
                          & its Application, Prentice Hall

Hogg, R. & C. Craig. Introduction to Mathematical Statistics,
                Prentice Hall

De Groot, M. Probability & Statistics, Addison-Wesley

Hogg, R. & Tanis, E.   Probability and Statistical Inference, Prentice Hall

Rice, J. Mathematical Statistics and Data Analysis, Wadsworth

IV. Assessment

Student learning is assessed through the use of homework problems, in-class examinations, take-home examinations with detailed written solutions, computer simulation exercises, and the analysis of case studies involving real data.