MATHEMATICS 150
FINITE MATHEMATICS

(Course number changed from Math 257 Spring 2006)

I. Introduction

A. Catalog Description

An introduction to the theory of linear systems and discrete probability, with applications from business and the physical and social sciences. The study of linear systems includes a discussion of matrix theory and linear programming. The concepts from linear systems and probability are integrated in the study of Markov Chains and Game Theory. The use of graphing calculators and computer software will be an integral part of the course. This course is recommended for students wanting to complete a minor in mathematics, and contains topics of particular interest to students studying business or business related topics. Offered Spring term only. Prerequisite: Three years of high school mathematics. Satisfies the Mathematical Reasoning core requirement.

B. Objectives

The primary objective of the course is to introduce students to mathematical tools that can be used to model problems from business and the physical and social sciences. When the level is appropriate, the underlying theory is developed. The theory and tools discussed are distinguished from the tools of calculus that fundamentally depend on infinite limiting processes. The course is designed also to give students a broader view of mathematics, to develop their ability to reason quantitatiively, and to help students understand certain aspects of the mathematical modeling process in terms of its power and limitations.

This course satisfies the Mathematical Approaches category of the university's core curriculum by developing an appreciation of the power of Mathematics and formal methods to provide a way of understanding a problem unambiguously, describing its relation to other problems, and specifying clearly an approach to its solution. A student in this course will develop a variety of mathematical skills, an understanding of formal reasoning, and a facility with applications. Specifically, this course will develop the study of formal logic, at least to the extent that is required to understand mathematical proof.

C. Prerequisites

Three years of high school mathematics.

II. Required Topics

A. Linear Systems

1. Linear equations and inequalities.
2. Methods for solving systems of linear equations.
   - Substitution
   - Gaussian elimination method
   - Gauss-Jordan elimination method
   - Matrix solution
3. Matrix theory
   - Arithmetic operations on matrices.
   - The inverse of a matrix
   - Leontieff Input-Output analysis
4. Linear Programming

- Geometric approach to solving linear systems
- Simplex method for solving linear systems

B. Discrete Probability
   1. Combinatorics and Set theory
      - Inclusion-exclusion principle.
      - Multiplication principle
      - Permutations and combinations.
      - The Binomial theorem
      - The Multinomial theorem
   2. Probability models of random phenomena.
      - Sample Space and Events
      - Equiprobable outcomes
      - Union, intersection, and complement of events
      - Independent events
      - Conditional probability
      - Bayes' Theorem

C. Markov Chain Processes
   1. The types of problems that can be viewed as a Markov Chain process.
   2. Regular Markov Chain processes
   3. Absorbing Markov Chain processes

D. Game Theory
   1. The nature of game theory problems.
   2. The goals of game theory stategy.
   3. Strictly determined and nonstrictly determined games.
   4. Determining pure and optimal mixed strategies.
   5. The application of Linear Programming to the problems of Game Theory.

III. Optional Topics
   A. Difference equations
   B. Graph theory
   C. Mathematics of finance

IV. Bibliography

Goldstein, Schneider, & Siegel	Finite Mathematics and Its Applications, Prentice Hall
Mizrahi & Sullivan	Finite Mathematics With Applications, Wiley
Larson & Edwards	Finite Mathematics, Houghton Mifflin

V. Assessment Tools
Assessment of the extent to which a student meets the course objectives could be measured with homework assignments, quizzes, computer and calculator exercises, case studies and/or projects, and examinations.