Department: MATHEMATICAL SCIENCES Semester Hours: 3

Course Title and Number: MATH 206 INTRODUCTORY DISCRETE MATHEMATICS

Course Description: The course develops the fundamental principles of discrete mathematics as used in computer science. It covers mastery of elementary skills and facts, understanding of logically correct arguments, learning to think abstractly, and increasing problem solving capacity. The courses includes the study of various binary relations, divisibility and modular arithmetic, graph theory and trees, including common algorithms. The course is offered as a general education course and as a service course for majors in the computer sciences programs.

PRQ: College algebra and trigonometry as measured on the Mathematics Placement Examination.

Course Objectives:

- To understand and connect concepts of discrete mathematics to real world problems and computer modeling.
- To value the discrete facets of mathematical structure, develop an ability to these communicate mathematical notions, and implement them in the development of computer programs.
- To develop mathematical reasoning and problem solving skills associated with discrete and finite structures. A particular emphasis on proceduralism is apropriatley addressed in the context of efficiency of computer programs, thus leading to basic notions of algorithmic complexity.
- To develop abilities in the application of logical reasoning, conventions and usage in mathematics, including mathematical induction.

Content:

- The number systems commonly encountered in computer science - base 2, 8 and 16. Changing bases for numerical representations, computation and connections with binary sequences.
  In particular, the developement of bits, nibbles and bytes is discussed - both as mathematical objects, and as representations in various non-numerical contexts, such as ASCII plain text coding.
- Develop an ability to recognize and implement recursive procedures.
- Develop an appreciation and basic abilities in the development of proofs, including mathematical induction.
- Develop and explore counting methods for subsets and sequences formed from sets and multisets.
- Investigate recurrance relations, including general solutions for first order linear recurrance relations and second order linear homogeneous recurrance relations.
- Devlop a knowledge of the variety of ways that graphs are used to model real world problems and computational processes (e.g., automata, PERT diagrams).
- An in depth study of trees: binary trees and expression trees for numerical computatins; search techniques; spanning trees.
- Topics concerning graphs, weighted graphs, multigraphs, and directed graphs. Including, Eulerian circuits/paths; Hamiltonian cycles/paths; minimal/maximal weight paths; Dykstra's and Primm's Algorithms.

Course Requirements: Written explanation of problem solutions. Short expository writing assignments discussing concepts, along with in class discussions and problem solving in class settings. Competency in the terminology and computations of the course. Solutions of applications to various problems applicable to computer sciences, *e.g.*, search algorithms for directory trees in a file storage system.

Assessment Instruments: Judgement on student involvement and contribution to discussions in the classroom. Homework problems, short quizzes (incorporating some writing in each), hour examinations and a comprhensive final with an emphasis on competency on computational aspects.

Current Textbook: Dossey, Otto, et al, **Discrete Mathematics** (5th Ed.), Pearson, 2006.