

**MATHEMATICS 174**

**DISCRETE MATHEMATICS FOR COMPUTER SCIENCE**

**BULLETIN INFORMATION**

MATH 174 – Discrete Mathematics for Computer Science (3 credit hrs)

**Course Description:**

Logic, number theory, sequences, series, recursion, mathematical induction, set theory, enumeration, functions, relations, graphs, and trees. Connections to computers and to programming are emphasized when possible.

Prerequisites: C or better in any 100-level MATH course or placement through either version of the Mathematics Placement Test: <http://assess.math.sc.edu/>

**SAMPLE COURSE OVERVIEW**

The purpose of this course is to provide students with an understanding of and ability to apply discrete structures and thinking patterns that are the foundation of computer science. Problem solving and understanding the logic behind such notions is of paramount importance. We begin with the study of truth tables, basic equivalent statements, and arguments in logic. This sets the tone of the course and establishes a mindset of understanding as opposed to simple rote memorization. We continue and deepen this mindset through the study of mathematical induction, number theory, sets, and counting. We also study sequences, recursion, and graph theory that have direct application to computer science.

**ITEMIZED LEARNING OUTCOMES**

**Upon successful completion of MATH 174, students will be able to:**

1. Demonstrate understanding of the following concepts:

 a. Basic Logic

 b. Basic Number Theory

 c. Sequences, Series, and Recursion

 d. Mathematical Induction

 e. Set Theory

 f. Enumeration

 g. Functions and Relations

 h. Graphs and Trees

1. Apply these concepts and thought processes to solving problems drawn from computer science.

**SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS**

Susanna S. Epp: *Discrete Mathematics*, current edition

**Calculator:**A good scientific calculator is needed to be successful in this course. Basic combinatorial functions will be especially useful.

**SAMPLE ASSIGNMENTS AND/OR EXAMS**

1. **Homework:**I will assign problems from each section we cover but they will not be handed in or graded. However some quiz and test problems will be taken from these assignments. I recommend working them all carefully and compiling them into a dedicated notebook for easy reference. Answers, hints, and partial solutions are in the back of your book.
2. **Tests and Quizzes:** There will be 3 tests, a final exam, and random quizzes

**SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ ASSIGNMENTS, EXAMS/PROJECTS**

*The following schedule is appropriate for sections that meet for three (3) 50-minute class periods. This schedule is easily adapted for sections that meet twice (2) each week for 75-minute class periods.*

**Class 1:** 2.1 Logical Form and Equivalence **Class 2:** 2.2 Conditional Statements **Class 3:** 2.3 Valid and Invalid arguments **Class 4:** 4.1 and 4.2 Direct proof and counterexamples **Class 5:** 4.3 Divisibility **Class 6:** 4.4 Quotient-Remainder Theorem **Class 7:** 4.5 Indirect Arguments **Class 8:** 4.6 Irrationality and the Infinitude of prime numbers **Class 9:** 5.1 Sequences **Class 10:** 5.2 Mathematical Induction 1 **Class 11:** 5.3 Mathematical Induction 2 **Class 12:** 5.5 Defining Sequences Recursively **Class 13:** 5.6 Solving Recurrence Relations by Iteration **Class 14:** Review **Class 15:** Test 1 **Class 16:** 6.1 Set Theory **Class 17:** 6.2 Set Properties **Class 18:** 6.3 Disproofs and Algebraic Proofs **Class 19:** 6.4 Boolean Algebras and Russell's Paradox **Class 20:** 7.1 Functions defined on General Sets **Class 21:** 7.2 One to one and Onto, Inverse fun**ctions
Class 22:** 7.3 Composition of functions **Class 23:** 7.4 Cardinality and sizes of infinity **Class 24:** 8.1 Relations on sets **Class 25:** 8.2 Reflexivity, Symmetry, and Transitivity **Class 26:** 8.3 Equivalence Relations **Class 27:** Review **Class 28:** Test 2 **Class 29:** 9.1 Introduction **Class 30:** 9.2 Multiplication Principal **Class 31:** 9.3 Addition Principal **Class 32:** 9.4 The Pigeonhole Principal **Class 33:** 9.5 Permutations and Combinations **Class 34:** 9.6 Pascals Formula and the Binomial Theorem **Class 35:** 10.1 Graph Theory definitions and Basic Properties **Class 36:** 10.2 Trails, Paths, and Circuits **Class 37:** 10.3 Trees **Class 38:** 10.4 Rooted Trees **Class 39:** Review **Class 40:** Test 3 **Class 41:** Review **Class 42:** Review **Final Exam**