University of South Carolina
Carolina Core

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
2. 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