MATH 224: Discrete Mathematics
(Adopted - Spring 2012; Committee: M. Agustin, V. Kieftenbeld, S. Rigdon, G.S. Staples)

Catalog Description: [Dist.NSM] Mathematical concepts and techniques essential to computer science: logic, sets, algorithms, methods of proof, induction and recursion, simple counting techniques, graph theory. Does not count toward a major in mathematics.   Prerequisite: CS 140 or 141.

Textbook: *Discrete Mathematics and Its Applications*, 7th Edition, by K. H. Rosen, WCB-McGraw-Hill: Boston

1 The Foundations: Logic and Proofs
1.1 Propositional Logic
1.2 Applications of Propositional Logic
1.3 Propositional Equivalences
1.4 Predicates and Quantifiers
1.5 Nested Quantifiers
1.6 Rules of Inference
1.7 Introduction to Proofs
1.8 Proof Methods and Strategy

2 Basic Structures: Sets, Functions, Sequences, Sums, and Matrices
2.1 Sets
2.2 Set Operations
2.3 Functions
2.4 Sequences and Summation
2.5 Cardinality of Sets

3 Algorithms
3.1 Algorithms
3.2 Growth of Functions
3.3 Complexity of Algorithms

4 Number Theory and Cryptography
4.1 Divisibility and Modular Arithmetic
4.2 Integer Representations and Algorithms
4.3 Primes and Greatest Common Divisors
4.4 Solving Congruences
4.6 Cryptography

5 Induction and Recursion
5.1 Mathematical Induction
5.2 Strong Induction and Well-Ordering
5.3 Recursive Definitions and Structural Induction
5.4 Recursive Algorithms
5.5 Program Correctness

6 Counting
6.1 The Basics of Counting
6.2 The Pigeonhole Principle
6.3 Permutations and Combinations
6.6 Generating Permutations and Combinations

7 Discrete Probability
7.1 An Introduction to Discrete Probability

8 Advanced Counting Techniques
8.1 Applications of Recurrence Relations
8.2 Solving Linear Recurrence Relations

9 Relations
9.1 Relations and Their Properties
9.2 *n*-ary Relations and Their Applications

10 Graphs
10.1 Introduction to Graphs
10.2 Graph Terminology and Special Types of Graphs
10.3 Representing Graphs and Graph Isomorphism
10.4 Connectivity
10.5 Euler and Hamilton Paths

11 Trees
11.1 Introduction to Trees

Any instructor should cover all of the material specified; additional sections are optional.