

CIS 1166 Syllabus

Course Title: Mathematical Concepts in Computing.

Course Text

Discrete Mathematics and Its Applications , 7th Edition”, Kenneth H. Rosen, McGraw Hill
Student Solutions Guide, 7th Edition (recommended), Kenneth H. Rosen, McGraw Hill

Course Goals

This course provides students with an introduction to the mathematical concepts fundamental to computer science.

Topics Covered

Topics include an introduction to predicate and propositional calculus; sets and set operations; functions, sequences and matrices; big-O notation and the growth of functions; algorithms; number theory; mathematical induction and recursive definitions; combinations, permutations, and binomial coefficients; probability, relations. Students will also learn formal methods for writing mathematical proofs

The following is a detailed listing of the topics covered in the course. The section numbers refer to the current text.

1. The Foundations: Logic and Proof

- 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

2. Basic Structures: Sets, Functions, Sequences, and Sums

- 2.1 Sets
- 2.2 Set Operations
- 2.3 Functions
- 2.4 Sequences and Summations
- 2.6 Matrices

3. Algorithms

- 3.1 Algorithms
- 3.2 The 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 (except Modular Exponentiation)

4.3 Primes and Greatest Common Divisors

5. Induction and Recursion

5.1 Mathematical Induction

5.2 Strong Induction (PP 334 – 338)

5.3 Recursive Definitions (PP 344 – 348)

6. Counting

6.1 The Basics of Counting

6.2 The Pigeonhole Principle

6.3 Permutations and Combinations

6.4 Binomial Coefficients and Identities (Optional)

6.5 Generalized Permutations and Combinations

7. Discrete Probability

7.1 An Introduction to Discrete Probability

7.2 Probability Theory

9. Relations

9.1 Relations and their Properties

9.2 n-ary Relations and Their Applications

9.3 Representing Relations

9.4 Closure of Relations (Optional)

9.5 Equivalence Relations