

University of North Alabama  
Departmental Syllabus

**COURSE:** CS 245

**COURSE TITLE:** Introduction to Discrete Structures

**PREREQUISITE:** MA 112 and CS 155

**COURSE DESCRIPTION:** Sets, functions and relations, basic logic, proof techniques, basics of counting, graphs and trees, discrete probability and number systems with applications to various areas of computer science.

**ACTIVITIES REQUIRED:** Demonstration of concept understanding through homework and laboratory experience.

**COURSE OUTLINE:**

1. Functions: definition, operations and application.
2. Relations: definition, properties and basic operations
3. Sets: definition, operations and application
4. Basic counting principles including diagonalization and the pigeonhole principle.
5. Basic logic with application to areas of computer science
  - a. Propositional logic
  - b. Logical connectives
  - c. Truth tables
  - d. Normal forms
  - e. Predicate Logic
  - f. Universal and existential quantification
  - g. Modus ponens and modus tollens
6. Proof techniques
  - a. Structure of formal proofs
  - b. Direct proofs
  - c. Proof by counterexample
  - d. Proof by contraposition
  - e. Proof by contradiction
  - f. Mathematical induction
  - g. Strong induction
  - h. Recursive mathematical definitions
  - i. Well orderings
7. Basic of counting
  - a. Counting arguments
    - i. Sum and product rule
    - ii. Inclusion-exclusion principle
    - iii. Arithmetic and geometric progressions
    - iv. Fibonacci numbers
  - b. Solving recurrence relations
  - b. Permutations and combinations
    - i. Basic definitions
    - ii. Pascal's identity
    - iii. The binomial theorem
8. Graphs and Trees
9. Discrete probability
10. Number Systems (Binary, Octal, Hexadecimal)
  - a. Representation
  - b. Conversion
  - c. Application

**Assessment of Student Progress:** Three to five tests, final homework and lab assignments.

**Accommodation Statement:** In accordance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973, the University offers reasonable accommodations to students with eligible documental learning, physical and/or psychological disabilities. Under Title II of the Americans with Disabilities Act (ADA) of 1990 and Section 504 of the Rehabilitation Act of 1973, a disability is defined as a physical or mental impairment that substantially limits one or more major life activities as compared to an average person in the population. It is the responsibility of the student to contact Developmental Services prior to the beginning of the semester to initiate the accommodation process and to notify instructors within the first three class meetings to develop an accommodation plan. Appropriate, reasonable accommodations will be made to allow each student to meet course requirements, but no fundamental or substantial alteration of academic standards will be made. Students needing assistance should contact Development Services.