

## **MAD 1100: Discrete Mathematics for Computer Science. (3 credits)**

**Course Description** This course introduces students to the principles of discrete mathematics that apply to computer science. Topics include set theory, logic, Boolean algebra, number theory, vectors and matrices, combinatorics, probability, relations, functions, and basic graph theory. Prerequisite: MAC1105.

### **Course Competencies**

#### **Competency 1: The student will demonstrate a comprehension of set theory by:**

- a. Using set notation to represent collections of objects.
- b. Performing various set operations such as union, intersection, and complementation.
- c. Relating sets and set operations to Venn diagrams.
- d. Finding the Cartesian product of two sets.

#### **Competency 2: The student will demonstrate a comprehension of mathematical logic by:**

- a. Constructing truth tables for the basic connectives “not,” “and,” “or,” and “if, then.”
- b. Constructing truth tables for complex propositions.
- c. Using truth tables to determine the validity of arguments.
- d. Using truth tables to determine whether two propositions are logically equivalent.
- e. Using appropriate quantifiers in statements.
- f. Negating quantified statements.

#### **Competency 3: The student will demonstrate a comprehension of Boolean algebra by:**

- a. Explaining the connection between Boolean algebra and set theory.
- b. Explaining the connection between Boolean algebra and mathematical logic.
- c. Applying Boolean algebra operations and properties to simplify or rewrite a Boolean expression.
- d. Applying Boolean algebra properties to design models of switching circuits.

#### **Competency 4: The student will demonstrate a comprehension of number theory by:**

- a. Performing calculations in various number bases.
- b. Applying various tests for divisibility to determine factors of positive integers.
- c. Finding the prime factorizations of positive integers.
- d. Applying the division algorithm to find the quotient and the remainder for a specified division.
- e. Applying the Euclidean algorithm to find the greatest common divisor of two integers.
- f. Finding specified terms of a recursively defined sequence.

**Competency 5: The student will demonstrate a comprehension of vectors and matrices by:**

- a. Performing the operations of scalar multiplication and vector addition on two- and three-dimensional vectors.
- b. Multiplying matrices by scalars.
- c. Adding or subtracting two conformable matrices.
- d. Multiplying two conformable matrices.
- e. Finding the transpose of a given matrix.

**Competency 6: The student will demonstrate a comprehension of combinatorics by:**

- a. Applying the fundamental counting principle to determine the number of ways two or more actions can be performed.
- b. Distinguishing between permutations and combinations.
- c. Calculating permutations.
- d. Calculating combinations.

**Competency 7: The student will demonstrate a comprehension of probability by:**

- a. Identifying a sample space and related events.
- b. Computing the probability of a given event.
- c. Determining whether or not two events are independent.
- d. Computing a conditional probability.
- e. Applying principles of combinatorics to compute a probability.

**Competency 8: The student will demonstrate a comprehension of relations and functions by:**

- a. Recognizing a relation as a subset of a Cartesian product of two sets.
- b. Describing the domain and the range of a given relation or function.
- c. Adding, subtracting, multiplying, dividing, and composing functions.
- d. Finding the inverse of a relation or function.

**Competency 9: The student will demonstrate a comprehension of basic graph theory by:**

- a. Representing a graph as a collection of vertices and edges.
- b. Constructing a binary search tree to store and sort data.
- c. Representing networks as graphs.

**Upon completing MAD 1100, the student will have a comprehension of the basic concepts of Discrete Mathematics that are essential for successful computer programming.**