

**Miami-Dade Community College**  
**MAD 2104-Discrete Mathematics**

Course Description: This course is designed for those students who are majoring in computer science, engineering, mathematics, and other highly technological fields. Topics include formal logic, set theory, combinatorics, mathematical induction, relations and functions, recursion and graph theory. *3 Credits*  
Prerequisites: MAC 1140.

Course Competencies:

Competency 1: The Student will identify discrete structures such as,

- a. propositions and compound propositions,
- b. sets and subsets,
- c. permutations and combinations,
- d. relations and functions,
- e. graph and trees.

Competency 2: The Student will solve counting problems by performing combinatorial analysis such as,

- a. basic counting principles,
- b. the principle of inclusion-exclusion,
- c. the pigeonhole principle and the generalized pigeonhole principle,
- d. permutations and combinations,
- e. basic properties of the combinatory numbers.

Competency 3: The Student will demonstrate proficiency in applying the rules of logic to specify the precise meaning of mathematical statements including,

- a. logical equivalences,
- b. propositional functions and quantifiers,
- c. rules of inference for statements involving quantifiers.

Competency 4: The Student will apply different techniques of mathematical reasoning for proving theorems such as,

- a. Direct and indirect proof,
- b. Proof by contradiction,
- c. Mathematical induction,
- d. Recursive definitions,

Competency 5: The Student will demonstrate knowledge of the algebra of functions by,

- a. identifying injections, surjections, bijections, and monotonic functions,
- b. recognizing sequences and the summation notation,
- c. comparing the different types of growth of functions using big-O.

Competency 6: The Student will demonstrate knowledge of the binary relations and their properties by

- a. identifying specific properties in given relations,
- b. combining relations,
- c. representing relations by matrices and diagraphs.

Competency 7: The Student will apply basic terminology of graph theory for

- a. classifying graphs,
- b. counting the number of vertices and edges in a graph,
- c. representing graphs by matrices and defining isomorphism of graphs,
- d. applying properties of trees.