



Course Description

MAD2104 | Discrete Mathematics | 3.00 Credits

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. Computational course.

Course Competencies:

Competency 1: The student will identify discrete structures by:

1. Using propositions and compound propositions.
2. Using sets and subsets.
3. Using permutations and combinations.
4. Using relations and functions.
5. Using graph trees.

Competency 2: The student will solve counting problems by performing combinatorial analysis by:

1. Using basic counting principles.
2. Using the principle of inclusion-exclusion.
3. Using the pigeonhole principle and the generalized pigeonhole principle.
4. Using permutations and combinations.
5. Using 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 by:

1. Determining logical equivalences.
2. Using propositional functions and quantifiers.
3. Using rules of inference for statements involving quantifiers.

Competency 4: The student will apply different techniques of mathematical reasoning for proving theorems by:

1. Using direct and indirect proofs.
2. Using proof by contradiction.
3. Using mathematical induction.
4. Using recursive definitions.

Course Competency 5: The student will demonstrate knowledge of the algebra of functions by:

1. Identifying injections, surjections, bijections, and monotonic functions.
2. Recognizing sequences and the summation notation.
3. Comparing the different types of growth of functions using big-O.

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

1. Identifying specific properties in given relations.
2. Combining relations.
3. Representing relations by matrices and diagraphs.

Course Competency 7: The student will apply basic terminology of graph theory by:

1. Classifying graphs.
2. Counting the number of vertices and edges in a graph.
3. Representing graphs by matrices and defining isomorphism of graphs.
4. Applying properties of trees.

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills.
- Use quantitative analytical skills to evaluate and process numerical data.
- Solve problems using critical and creative thinking and scientific reasoning.
- Formulate strategies to locate, evaluate, and apply information.
- Create strategies that can be used to fulfill personal, civic, and social responsibilities.