

**Faculty of Computers and Information Technology**

**Discrete Mathematics**

**Information :**

**Course Code :** MT111

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Faculty of Computers and Information Technology

**Instructor Information :**

Title	Name	Office hours
Associate Professor	Khaled Ahmed Mohamed Elshafey	8
Teaching Assistant	Nada Mohamed Saied Shoaib	
Teaching Assistant	Linah Mohammed Ibrahim Elsayed Ahmed Elnaghi	

**Area Of Study :**

Apply the basic concepts and theories of sets, relations and functions in different applications.  
Combine and evaluate the principles of logic calculus and Boolean algebra.  
Use basic mathematics to learn the principles of recursion and mathematical induction.  
Analyze the analytical requirements of some applications for graphs to design a solution for these requirements.  
Carry out a self-learning and research in Discrete Math.

**Description :**

The course introduces the concept of Sets; sequences, algorithms, induction and recursion; relations and functions; Graphs, lattices, number systems and codes, Boolean algebra; Formal logic; trees and languages; semi groups

**Course outcomes :**

**a.Knowledge and Understanding: :**

- 1 - Describe the fundamental concepts and theories related to sets, relations and functions
- 2 - Define the methodologies and practices of counting techniques
- 3 - Explain analytical requirements in developing some applications for graphs.

**b.Intellectual Skills: :**

- 1 - Analyze set operations, types of relations and functions
- 2 - Determine measurement criteria to illustrate the concepts of logic calculus and logical reasoning
- 3 - Evaluate the solution of short path problems in graphs, and the solution of minimum spanning trees

**c.Professional and Practical Skills: :**

- 1 - Realize relational Algebra concepts to create simple relational database
- 2 - Use different methods to implement modular arithmetic functions for cryptography
- 3 - Analyze and design some logical rules to perform the logical reasoning

**d.General and Transferable Skills: :**

- 1 - Exploit a range of learning resources of discrete math topics
- 2 - Work in a team effectively and efficiently considering time and stress management

3 - Apply quantitative methods in understanding different case studies

**ABET Course outcomes :**

- 1 - Recognize the methodologies of Logic & Proofs.
- 2 - Define the fundamental concepts and theories related to sets, relations and functions.
- 3 - Recognize methodologies and practices of counting techniques.
- 4 - Define analytical requirements to develop typical graph-based applications.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Sets, Special Sets, Venn Diagrams, the Size of a Set, Power Set and Set Operations.	4	2	2
Relations, Inverse Relation, Graphical Representatives of Relations, Types of Relations.	4	2	2
Composition of Relations, n-array Relations and their applications.	4	2	2
Function Definition, Compositions of Functions, Inverse Function, Modular Arithmetic Function, Cryptography Applications (Caesar Cipher).	4	2	2
Recursively Defined Functions, Sequences, Arithmetic Progression, Geometric Progression, Recurrence Relations.	4	2	2
Logic and Proofs, Propositional Logic, Compound Statements, Logic and Bit Operations, and Propositional Equivalences.	4	2	2
Predicates, Quantifiers, Negating Quantified Expressions, Nested Quantifiers, Rules of Inference, and Logical Reasoning.	4	2	2
Mathematical Induction, Recursion	4	2	2
Mid-Term Exam	2		
Techniques of Counting, Sum/Product Rule, Tree Diagrams, Permutations, Combinations, Binomial Theorem, Permutations with Repetition, Combinations with Repetition.	4	2	2
Graph Terminology, Directed Graphs, Representing Graphs, Graph Connectivity,	4	2	2
Euler Circuits and Paths, Hamilton Circuits and Paths, Shortest-Path Problems (Dijkstra's Algorithm), Planar Graphs.	4	2	2
Trees and Minimum Spanning Trees	4	2	2
Final Exam	2		

**Teaching And Learning Methodologies :**

- Interactive Lectures including Discussions
- Tutorials
- Self-Study (Project / Reading Materials / Online Material / Presentations)
- Problem Solving

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	10.00	4	

Final Exam	40.00	14	
Midterm Exam (s)	20.00	9	
Others (Participations)	10.00		
Quizzes	20.00	5	

**Course Notes :**

An Electronic form of the Course Notes and all the slides of the Lectures is available on the Students Learning Management System (Moodle)