Department of Mathematics
Faculty of Mathematics & Computer Science
M.Sc. (Applied Mathematics), 1st Semester

Course Code	AM105
Course Name	Discrete Mathematics
Course Credits	04

Course objectives:

To introduce a number of Discrete Mathematical Structures (DMS) found to be serving as tools even today in the development of theoretical computer science. Course focuses on of how Discrete Structures actually helped computer engineers to solve problems occurred in the development of programming languages. Also, course highlights the importance of discrete structures towards simulation of a problem in computer science and engineering. Introduction of a number of case studies involving problems of Computer Technology. The mathematics of modern computer science is built almost entirely on discrete math, in particular combinatorics and graph theory. This means that in order to learn the fundamental algorithms used by computer programmers, students will need a solid background in the subject. The course will help to solve real world problems that are challenging and interesting.

Minimum pre-requisites:

Counting & Probability, Introduction to Number Theory, Little Algebra background.

Course structure:

Permutations, Combinations, Permutation and combinations of Multi-sets, Pigeon hole Principle, Inclusion-Exclusion principle, Derangement.

Propositional Logic: Mathematical Logic, basic connectives, Truth Tables, Rules of Inference, Methods of Proof.

Predicate Logic: Predicate, statement of functions, variables and quantifiers, Predicate Formula, Free and Bound Variable, Rules of Inference.

Sets and multisets, Relations and functions-properties of binary relations, Equivalence relations, Partial order relations, Chains and antichains, Posets, Lattices, Duality.

Number Systems: Binary 1’s and 2’s compliments.

Boolean Algebra: Basic concepts of Boolean Algebra, Duality principle, Boolean Functions, Applications to Boolean Algebra.

Logic Gates, Combinatorial circuits, uniqueness of finite Boolean Lattices, Karnaugh Map.

Basic concepts of graph theory, Directed graph. Euler graph. Hamiltonian graph. Matrix representation of graphs. Shortest path in a weighted graph. K-connected and K-edge-connected graphs. Planar graphs. Coloring of graphs, Vertex colouring of graphs, Edge colouring of graphs, Vizing's theorem.

Trees: Rooted trees, Spanning tree and Cut set, Minimum-spanning tree. Flow network in a graph, max-flow-min cut theorem.

Discrete numeric functions, Generating functions, Recurrence relations, linear recurrence relation with constant coefficients and their solutions. Solution by the method of generating functions.

Reading suggestions:

- Liu, C.L.: Elements of Discrete Mathematics, McGraw Hill, International editions, 1985.
- Rosen, K. H.: Discrete Mathematics and it's Applications. McGraw Hill, 1999.
- West, D.B.: Introduction to Graph Theory. Prentice-Hall of India, 2001.

Evaluation and weightage:

- 10% 1st test
- 20% Assignment
- 20% Mid Sem Exam
- 10% 2nd Test

- 40% End Sem Exam