BNQF Code: 06111209, Departmental Code: ICT-1209

Course Title: Discrete Mathematics

Credit Hr.: 3.00, **Contact Hr.:** 3.00, **Course Type:** Core
Pre-requisites (if any**):** None

Rationale

Discrete methods underlie the areas of data structures, computational complexity and the analysis of algorithms. Recent advances in technology - particularly in applications of
Computing - have enhanced the importance of discrete mathematics as a basis for understanding the foundations of computing and for further studies in computer analysis.

Course Objectives

1. To introduce students to language and methods of the area of Discrete Mathematics.
2. The focus of the module is on basic mathematical concepts in discrete mathematics and on applications of discrete mathematics in algorithms and data structures.
3. To show students how discrete mathematics can be used in modern computer science.

Course Learning Outcomes (CLO)

After completing the course, students will be able to:

CLO1 Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.

CLO2 Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem solving.

CLO3 Be able to use effectively algebraic techniques to analyze basic discrete structures and algorithms.

CLO4 Understand asymptotic notation, its significance, and be able to use it to analyze asymptotic performance for some basic algorithmic examples.

CLO5 Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

Mapping Course Learning Outcomes (CLOs) with the PLOs

CLO	PLO											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3		√										
CLO4		√										
CLO5	√											

Course Content and Mapping CLOs with the Teaching-Learning& Assessment Strategy

Week	Contents	Teaching-Learning Strategy	Assessment Strategy	CLO
1.	Set theory – Definitions and Set Identities, Venn Diagrams, Operations of Sets;	Lecture, Discussion	Class Test	CLO1
2.	Definition of Relation, Inverse Relation, Composition, Types of Relations, Closure Properties, Equivalence	Lecture, Discussion	Class Test	CLO2

	Relations, Partial Ordering;			
3.	Functions– Functions as Relations, Composition of function, One-to-One, Onto, and Inverse function.	Lecture, Discussion	Class Test	CLO1, CLO2
4.	Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence	Lecture, Discussion	Class Test	CLO1, CLO2, CLO4
5.	Predicate and Quantifiers, Interpretations of predicate logic, Predicate calculus.	Lecture, Discussion	Assignment	CLO2
6.	Basic Counting principle, Permutation, Combination, Pigeonhole Principle, Inclusion-Exclusion principle	Lecture, Discussion Problem Solving	Exam	CLO2, CLO3
7.&8.	***Mid Term Exam***			CLO1, CLO2, CLO3, CLO4
9.	Graphs and Multigraph, Subgraphs, Isomorphic Graphs and Homeomorphic Graphs, Paths and Connectivity, Labeled and Weighted Graphs,	Lecture, Discussion Problem Solving	Class Test, Exam	CLO3, CLO5
10.	Tree Graphs, Planar Graphs, Graph Coloring, Hamiltonian Graph, Euler Graphs, BFS, DFS. Dijkstra's Algorithm, Checking whether a graph is Euler graph.	Lecture, Discussion Problem Solving	Class Test	CLO4, CLO5
11.	Definition of Formal Language, Words and Sub words, Languages – Operations on Languages, Regular Expressions and Regular Languages,	Lecture, Discussion	Exam	CLO4
12.	Finite State Automata – Pumping and Kleene Theorem, Phrase-structure Grammars – Types of Grammars, Derivation Tree, Backus-Naur form.	Lecture, Discussion Problem Solving	Assessment	CLO5, CLO2
13	Order Sets, Lattices as Partially Ordered Sets and Their Properties, Lattices and Algebraic Systems,	Lecture, Discussion Problem Solving	Assessment	CLO5
14.	Sub Lattices, Complimented, Bounded and Distributive Lattices, Direct Products and Homomorphism. **Review and Makeup class (if any)**	Lecture, Discussion Problem Solving	Assessment	CLO5
15.&16.	***Final Term Exam & Feedback***			CLO1, CLO2 CLO3, CLO4, CLO5