Course Type	Course Code	Name of Course	L	T	P	Credit
DC2	CSC202	**Discrete Mathematics**	3	0	0	9

Course Objective

The course will provide the basic and fundamental knowledge on Discrete Mathematics along with various applications based techniques to solve problems in Computer Science.

Learning Outcomes

Upon successful completion of this course, students will:

- Have a broad understanding of Discrete Mathematics course.
- Understand and construct mathematical arguments.
- Develop recursive algorithms based on mathematical induction.
- Know basic properties of relations.
- Know essential concepts in Graph, Tree and related applications.
- Apply knowledge about discrete mathematics in problem solving.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Mathematical Logic: Introduction; Conjunction, Disjunction, Negation; Tautology; De Morgan's Laws; Satisfiability Problem; Predicates and Quantifiers; Rules of Inference; Methods of Proofs; Conjunctive and Disjunctive Normal Forms; Program Correctness..	7	Usefulness of mathematical logic in reasoning and its application in Artificial Intelligence.
2	Set Theory: Introduction; Types of Set; Set Operations; Partitions of Sets; Set Identities; Addition Principle; Computer Representation of Sets.	3	Comprehensive study of Set Theory with different set operations and applications.
3	Relations: Introduction; Representation of Relations; Properties of Relations; Closures of Relations; Equivalence Relations; Partial Orderings; Hasse Diagram; Extremal Elements of Partially Ordered Set; Lattices.	4	Basic idea of Relations in terms of representation and properties. Basic understanding of equivalence relations, Hasse diagram, and partial ordered set.
4	Functions: Introduction; Injective, Surjective, Bijective Functions; Inverse of a Function; Composition of Functions.	3	Basic understanding about Function and its properties, inverse function, and composition function.
5	Induction and Recurrence Relations: Mathematical Induction, Strong Induction; Linear Recurrence Relations; Divide-and-Conquer Recurrence Relations.	6	Basic understanding about how to use induction method to a mathematical problem and how to solve recurrence relation.
6	Combinatorics: Basic Counting Principles; Inclusion-Exclusion Principle; Pigeonhole Principle; Permutations and Combinations.	5	Solve counting problems by applying elementary counting techniques, permutations, combinations, the pigeonhole principle and its application.
7	Algebraic Structures: Introduction; Binary Operation and its various Properties; Group: Definition and its Properties; Types of Group; Lagrange's Theorem; Ring: Definition and its Properties; Types of Ring; Integral Domain; Field.	5	Basics of Group and Ring Theory and its applications.
8	Congruence Arithmetic: Elementary properties; Linear Congruence Equation; Chinese Remainder Theorem.	3	Understanding the application of congruence to solve equations.
9	Graph Theory: Basic Terminologies; Operations on Graph; Trees.	3	To understand the basics of Graph and Trees.
10	Boolean Algebra: Introduction; Boolean Functions; Representation of Boolean functions; Duality Principle.	3	Relate Boolean expressions to truth tables and logic diagrams and apply Duality Principle.

Text Books:

1. K. H. Rosen, "Discrete Mathematics and its Applications" McGraw Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" McGraw Hill.
2. B. Kolman, R. C. Busby, and S. C. Ross, "Discrete Mathematical Structures", PHI.
3. J. L. Mott, A. Kandel, and T. P. Baker, "Discrete Mathematics for Computer Scientist & Mathematicians", Prentice-Hall.