4th Semester	**RIT4C001**	**Discrete Mathematics**	**L-T-P 3-0-0**	**3 CREDITS**

Course Objectives:

- To discuss the concepts associated with set theory, propositions, predicate calculus, relations and functions, and their applications.
- To discuss the concepts and terminologies associated with graph theory, graph coloring problem various graph traversal techniques, trees and cut-sets.
- To describe the concepts of discrete numeric functions and various types of recurrence relations and the methods to find out their solutions.
- To present the concepts of groups and rings. Also, we aim at describing the applications of groups to error detection and correction.
- To present the principles and properties of boolean algebra and the application of Boolean algebra to switching circuits.

Course Outcomes:

After reading this subject, students will be able to:

1. Understand set theory, propositions, predicate calculus, relations and functions and their applications in Problem solving.
2. Understand graph-theory, and trees.
3. Understand discrete numeric functions and generating functions and their applications.
4. Understand concepts of groups, rings and field and their applications in error detection & correction.
5. Understand Boolean algebra & their applications in switching network.

Module-I (7 Hours)

Sets and Propositions: Principle of Inclusion and Exclusion, Mathematical induction, Propositions, Logical Connectives, Conditionals and Bi-conditionals, Logical Equivalences, Predicate Calculus, Quantifiers, Theory of inference, Methods of proof.

Module-II (8 Hours)

Relations and Functions: properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations, Partial ordering relations and lattices, Chains and antichains, Functions, Composition of Functions, Invertible Functions, Recursive Functions, Pigeonhole principle.

Module-III (8 Hours)

Numeric Functions and Generating Functions: Discrete Numeric functions, Generating Functions, Recurrence Relations and Recursive Algorithms:Recurrence relations, Linear recurrence relations with constant coefficients, Solution of recurrence relations by the method of generating functions, Divide and conquer algorithms,

Module-IV (12 Hours)

Groups and Rings: groups and subgroups, Cosets and Lagrange's theorem, Codes and Group codes, Error detection and correction using Group codes, Isomorphism, Homomorphism and normal subgroups, Rings, Integral domains and Fields,
Boolean Algebras: Lattices and algebraic systems, Principle of duality, Distributive and complemented lattices, Boolean functions and Boolean expressions, Simplification of logic expressions using Karnaugh Map, Design and Implementation of Digital Networks, Switching Circuits.

Module-V (10 Hours)

Graphs and Trees: Basic terminology, Diagraphs and relations, representation of Graphs, operations on graphs, paths and circuits, graph traversals, shortest path in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, Traveling sales person's problem, Planar graphs, Graph Coloring, Trees, Rooted trees, Binary search trees, Spanning trees, Minimum spanning trees, Kruskal's Algorithm, Prim's Algorithm.

Book:

- C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A computer Oriented Approach, McGraw Hill Education (India) Private Limited, 4th Edition, 2013.
- Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill, 5th Edition, 2003.
- J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications, to Computer Science, TataMc-Graw Hill, 2001.
- Joe L. Mott, A. Kandel, and T. P. Baker, Discrete Mathematics for Computer Scientists & Mathematics, Prentice Hall of India, 2nd Edition, 2006.
- N. Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India, 2006.
- S. Lipschutz, Discrete Mathematics, Tata McGraw Hill, 2005.