Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Computer Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER4C1 DISCRETE STRUCTURES	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce students to ideas and techniques from discrete mathematics that are widely used in Computer Science.
- Provide the fundamentals of formal techniques for solving the problems in mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modelling.

Prerequisites: Nil

Course Contents

Unit-I

Sets: Algebra of sets, laws of sets, computer representation, cardinality of a set, principle of inclusion-exclusion.

Functions: Characteristic function of a set, floor and ceiling functions**,** mod function, hashing function.

Relations: Binary Relation, properties, closure of a relation, equivalence and partial order relations, partially ordered set, Hasse Diagram, totally ordered set, maximal and minimal elements, upper bound, lower bound, greatest lower bound and least upper bound, lattice, sub lattice, properties of lattices, distributive lattices, complemented lattices, modular lattices, topological sorting.

Unit-II

Propositional Logic: Proposition, logical connectives, bit operations, conditional and bi-conditional propositions, logical equivalence, algebra of propositions, tautology, contradiction and contingency, normal forms, logic in proof, predicates and quantifiers, rules of inferences, Applications of propositional logic to logic puzzles, Boolean searches, logic circuits and system specifications.

Unit-III

Mathematical Induction: Strong induction, well-ordering, Recursive definitions.

Advanced Counting techniques: Pigeon-hole principle, sequences and summations, generating functions.

Recurrence relations:-Formation, methods of solution and application.

Unit-IV

Graph Theory: Terminology, graph representation-incidence and adjacency matrices, walk, path, cycle, graph isomorphism, connectedness, Euler & Hamiltonian graphs, planar graph, graph coloring, shortest paths algorithms.

Trees: Terminology, spanning trees, minimum spanning trees, tree traversals; prefix codes.

Unit-V

Binary operation, groupoid, semi group, monoid, group, subgroup, cyclic group, permutation group, definition and examples of Rings, Integral domain and Fields; Application to coding theory.

Boolean Algebra-Definition, laws of Boolean algebra, Boolean functions, sum of products and product of sum form, normal form, simplification of Boolean function by algebraic method, Boolean expression for logic and switching network, Karnaugh Map Method for simplification of Boolean expressions.

Learning Outcomes:
Upon completing the course, students will be able to:

- Learn a particular set of mathematical facts and know how to apply them.
- Think logically and mathematically.
- Use and analyze recursive definitions.
- How to count some different types of discrete structures.
- Techniques for constructing mathematical proofs and to reason about the efficiency of an algorithm.

Books Recommended:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th ed., Tata McGraw-Hill Edition 2007.
2. Kolman, Busby & Ross, Discrete Mathematical Structures, 6th edition, Pearson Education, 2008.
3. C.L.Liu, Introduction to Discrete Mathematics, McGraw Hill, 1986.
4. Trembley and Manohar, Discrete Mathematical structures for Computer Science, McGraw Hill, 1986.
5. Edgar G. Goodaire, Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd edition Prentice Hall, 2005.