CS102: Discrete Structure	**L**	**T**	**P**	**NIL**
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Course Objective:
To provide knowledge of combinatorial problems, algebraic structures and graph theory required for building mathematical foundation of computer science.

S. No.	Course Outcomes (CO)
CO1	Understand the fundamentals of lattices, sublattices, and Boolean algebra, including their properties and homomorphisms.
CO2	Learn to represent and minimize Boolean functions and expressions.
CO3	Explore key concepts in graph theory, including isomorphic graphs, Euler's formula, and chromatic numbers.
CO4	Analyze tree structures and search algorithms like depth-first and breadth-first, with their associated trees.
CO5	Apply Warshall's algorithm, Euler paths, Hamiltonian circuits, and minimal spanning trees in problem-solving.

S. No	Contents	Contact hours
UNIT 1	Formal Logic:Statement, Symbolic Representation and Tautologies,Quantifiers, Predicator and validity, Normal form, Prepositional Logic, Predicate Logic, Logic Programming and Proof of correctors	**6**
UNIT 2	Proof, Relation and Analysis of Algorithm: Technique for theorem proving : Direct Proof, Proof by Contra position, proof by exhausting cases and proof by contradiction, Principle of mathematical induction, principle of complete induction, recursive definition, solution methods for linear, first-order recurrence relations with constant coefficients, analysis of algorithms involving recurrence rotations recursive selection sort, binary search, quick sort, solution method for a divide-and-conquer recurrence relation.	**10**
UNIT 3	Sets and Combinations:Sets, Subsets, powersets, binary and unary operations on a set, set operations/set identities, fundamental counting principles, principle of inclusion, exclusion and pigeonhole, permutation and combination, Pascal's triangles, binomial theorem, representation of discrete structures.	**8**
UNIT 4	Relation/function and matrices:Rotations, properties of binary rotations, operation on binary rotation, closures, partial ordering, equivalence relation, properties of function, composition of function, inverse, binary and n-ary operations, characteristics of permutation function, composition of cycles, Boolean matrices, Boolean matrices multiplication.	**8**
UNIT 5	Lattices & Boolean Algebra: Lattices: definition, sublattices, direct product, homomorphism Boolean algebra: Definition, properties, isomorphic structures (in particular, structures with binary operations) subs algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function.	**8**
UNIT 6	Graph Theory Terminology, isomorphic graphs, Euler's formula (Proof) four color problem and the chromatic number of a graph, five color theorem. Trees terminology, directed graphs, Computer representation of graphs, Warshall's algorithms, Decision Trees, Euler path & Hamiltonian circuits, Shortest path & minimal spanning trees, Depth-first and breadth first searches, analysis of search algorithm, trees associated with DFS & BFS Connected components, in order, preorder & post order tree traversal algorithms	**8**
Total		**48**