Annexure 2

DISCRETE MATHEMATICS

Course Code : CSE 401 **Credit Units: 04**
Total Hours: 40

Course Objectives:
Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

(1) Use mathematically correct terminology and notation. (2) Construct correct direct and indirect proofs.
(3) Use division into cases in a proof. (4) Use counterexamples.
(5) Apply logical reasoning to solve a variety of problems.

Course Contents:

Module I: Fundamentals-Sets, Relations and Functions: (10 Hours)
Sets, Subsets, power sets, set operations/set identities, upper and lower bounds of a set, least upper bound (lub)/supremum, greatest lower bound (glb)/infimum. Relation, properties of binary relation, operation on binary relation, closures, partial ordering, equivalence relation, Matrix Representation of relations. Functions, properties of functions, composition of functions, inverse, unary, binary and n-ary operations, Characteristic function, Permutation function, composition of cycles. Growth of functions: big theta, little oh, big oh and big omega notations.

Module II: Counting: (8 Hours)
The Fundamental Principles, Permutations, Combinations, Combinatorial Identities, Principle of Inclusion and Exclusion (PIE), Pigeonhole Principle, Pascal's triangle. Recurrence relations, solution methods for linear, first-order recurrence relations with constant coefficients.

Module III: Logic: (8 Hours)
Propositions and Logical Operations, Conditional Statements, Equivalences, Tautologies and Contradictions, Normal Forms, The Theory of Inference. Predicate calculus: Predicates, The Statement Function, Free and Bound Variables, Universal and Existential Quantifiers, Universal Specifications. Methods of Proof: Direct Proof, Proof by Contradiction, Principle of Mathematical Induction.

Module IV: Lattices and Boolean Algebra: (8 Hours)
Partially Ordered Sets, Lattices, Lattices as algebraic structures, Sublattices, Direct product and Homomorphisms, Boolean Algebra: Definitions and Examples, Subalgebra, Direct Product and Homomorphisms, Boolean Functions, Representation and Minimization of Boolean Functions.

Module V: Graphs and Trees: (6 Hours)
Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring. Tree, Properties of Tree, Spanning Tree, Fundamental Circuit, Cut-Set, Cut-Vertices. Incidence Matrix, Adjacency Matrix.

Course Outcomes:

- For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
- For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference.
- For a given a mathematical problem, classify its algebraic structure
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
- Develop the given problem as graph networks and solve with techniques of graph theory.

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Text/Reference Books:

- Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw –Hill
- Susanna S. Epp., Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
- C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw –Hill.
- J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, Tata McGraw -Hill
- Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
- Discrete Mathematics, Tata McGraw -Hill