MCA I Semester
Discrete Mathematical Structures

Course Objectives:
The objective of this course is to provide the necessary back ground of discrete structures with particular reference to the relationships between discrete structures and their data structure counterparts including algorithm development.

Course Outcomes(COs): At the end of the course, student will be able to
- Perform operations on various discrete structures such as sets, functions, relations, and sequences.
- Ability to solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions
- Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems
- Use of K-Maps and Truth Tables to construct and verify correctness of a Boolean expression
- Create the various properties of algebraic systems like Rings, Monoids and Groups

UNIT I:
Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

UNIT II:
Set theory & Relations: Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering, Hasse diagram. **Functions:** composition of functions, Inverse Function, Recursive Functions, Lattice and its Properties, Pigeon hole Principles and its application. **Algebraic structures**: Algebraic systems, Examples and general properties, Semi groups and monoids, groups, sub groups, Definitions, Examples, mom orphism, Isomorphism and related problems.

UNIT III:
Elementary Combinatorics: Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, principles of Inclusion – Exclusion

UNIT IV:
Recurrence Relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

UNIT V:

Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Kruskals Algorithm, Binary trees, Planar Graphs, Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

Text Books:

1. Discrete Mathematical Structures with Applications to computer science J.P   Tremblery, R.Manohar, TMH
2. Discrete Mathematical for computer Scientists & Mathematicians " J.L. Molt, A.Kandel, T.P.Baker, PHI

Reference Books:

1. Elements of Discrete Mathematics, C L Liu, D P Mohanpatra, TMH
2. Discrete Mathematics, Schaum's Outlines, Lipschutz, Lipson, TMH
3. Discrete Mathematical Structures, 6th edition, Kolman, Busby, Ross, PHI, 2009
4. Discrete Mathematics, 6th edition Johnsonbaugh, Pearson, 2005
5. Discrete Mathematics, Malik, Sen, 6th ed., Cengage Learning, 2004
6. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005