DISCRETE MATHEMATICAL STRUCTURES

[Common to CSE , CSD, CSM & I.T.]

[R – 20 Regulation]

Prerequisites: Elementary knowledge of Set theory, Matrices and Algebra.

Course Objective :

The main objectives of the course are to:

- Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
- Use sets for solving applied problems binary relations and introduce concepts of algebraic structures
- Work with an ability to solve problems in Combinatorics
- Solve problems involving recurrence relations and generating functions.
- Introduce basic concepts of graphs, digraphs and trees

Course Outcomes: At the end of the course student should be able to do

1	Understand mathematical logic, mathematical reasoning and to study about the validity of the arguments and also prove mathematical theorems using mathematical induction.
2	Determine properties of binary relations; identify equivalence and partial order relations, sketch relations and Familiarize with algebraic structures.
3	Apply counting techniques to solve combinatorial problems and identify, formulate, and solve computational problems in various fields.
4	Understand Recurrence Relation, Generating functions and solving problems Involving recurrence equations.
5	Familiarize with the applications of graphs , trees and algorithms on minimal spanning tress and apply graph theory in solving computing problems

CO – PO Mapping :

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2										1
CO-2	3	2										1
CO-3	3	2										1
CO-4	3	2										1
CO-5	3	2										1

SYLLABUS

UNIT - I: MATHEMATICAL LOGIC (12 Periods)

Fundamentals of logic – Logical inferences – Methods of proof of implication – First order logic and other proof methods – Rules of inference for quantified propositions – Mathematical induction.

Sections: 1.5 to 1.10 of Text book [1].

UNIT - II: RELATIONS AND ALGEBRAIC SYSTEMS (12 Periods)

RELATIONS: Cartesian products of sets – Relations – Properties of binary relations in a set – Relation matrix and graph of a relation – Partition and covering of set – Equivalence relations – Composition of binary relations – Transitive closure of a relation – Partial ordering – Partially ordered set.

Sections: 2-1.9, 2-3.1 to 2-3.5, 2-3.7, 2-3.8, 2-3.9 of Text book [2].

ALGEBRAIC SYSTEMS: Definitions and simple examples on Semi groups – Monoids – Group – Ring and Fields.

Sections: 3-1.1, 3-2.1,3-2.2, 3-5.1,3-5.11and 3-5.12 of Text book [2].

UNIT - III: ELEMENTARY COMBINATORICS (10 Periods)

Basics of counting – Combinations and permutations – Their enumeration with and without repetition – Binomial coefficients – Binomial and multinomial theorems – The principle of inclusion and exclusion.

Sections: 2.1 to 2.8 of Text book [1].

UNIT - IV: RECURRENCE RELATIONS (10 Periods)

Generating functions of sequences – Calculating their coefficients – Recurrence relations – Solving recurrence relations – Method of characteristic roots – Non-homogeneous recurrence relations and their solutions.

Sections: 3.1 to 3.6 of Text book [1].

UNIT – V: GRAPHS (16 Periods)

Introduction to graphs – Types of graphs – Graphs basic terminology and special types of simple graphs – Representation of graphs and graph isomorphism – Euler paths and circuits – Hamilton paths and circuits – Planar graphs – Euler's formula.
Introduction to trees and their properties – Spanning trees – Minimum spanning trees – Kruskal's algorithm .

Sections: 5.1 to 5.4, 5.7, 5.8, 5.9, and 5.10 of Text book [1].

TEXT BOOKS:

1). **Joe L. Mott, Abraham Kandel & T. P. Baker**, *Discrete Mathematics for computer scientists & Mathematicians,* Prentice Hall of India Ltd, New Delhi., 2008

2). **J. P. Tremblay, R. Manohar**, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw-Hill Publishing Company Limited,1997

REFERENCE BOOKS:

1. **Keneth. H. Rosen**, *Discrete Mathematics and its Applications*, 6/e, Tata McGraw-Hill, 2009.

2. **Richard Johnsonburg**, *Discrete mathematics*, 7/e, Pearson Education, 2008.