DISCRETE MATHEMATICAL STRUCTURES

II/IV B.Tech. I - Semester

[R-19 Regulation]

Common for CSE & IT

	Credits:3
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

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, the student will be able to:

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: 2.1to 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.