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

2. **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.

3. **Course Outcomes**: By the end of the course, the student will be able to

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

**UNIT-I: MATHEMATICAL LOGIC** (12 Periods)


(Sections: 1.5 to 1.10 of Text book [1])
UNIT-II: RELATIONS AND ALGEBRAIC SYSTEMS (12 Periods)


(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, 3-5.1,3-5.11 and 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-Exclusion.

(Sections: 2.1 to 2.8 of Text book [1])

UNITIV: 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])

UNITV: GRAPHS (16 Periods)


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

TEXT BOOKS:


REFERENCE BOOKS: