

## Discrete Mathematics

Semester: I

Subject Code: BS11503

Lectures : 40

### Objectives:

The syllabus aims in equipping the students with

- ability to develop the skills of mathematical reasoning : Deduction, Proof and Recursive Thinking.
- a solid foundation in some of the new and different branches of Mathematics like Logic, Set Theory, Lattices.
- knowledge and understanding of the wide nature of the subject and applications in different disciplines.
- capacity to represent the given information in the mathematical form using mathematical techniques and draw the relevant conclusion.
- ability to inculcate a positive attitude towards Mathematics and enjoy the triumph of solving interesting problems from different areas of the subject.

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Unit 1: Logic	No. of Lects.
	6

- Introduction
- Propositional Logic
- Propositional Equivalences
- Predicates & Quantifiers
- Argument in propositional logic
- Rules of inference for propositional logic
- Validity of arguments – Truth Table Method, Direct and Indirect Proof method

Unit 2: Mathematical Induction	No. of Lects.
	4

- First Principle of Mathematical Induction
- Second Principle of Mathematical Induction
- Related Problems

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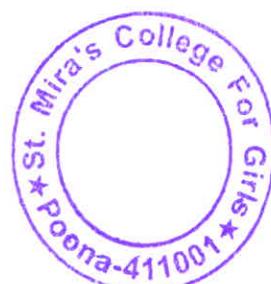
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Unit 3: Counting Principles	No. of Lects.
	11

- Introduction
- Cardinality of set
- Cartesian Product of sets
- Addition Principle (Sum Rule)
- Multiplicaton Principle (Product Rule)
- The Principle of inclusion-exclusion ( with proof – for 2 sets and 3 sets )
- Pigeonhole Principle
- Generalized Pigeonhole Principle
- Applications of Pigeonhole Principle
- Problems based on all above mentioned Principles
- Problems based on i) Permutations & Combinations
  - ii) Permutations with repetition & without repitition.
  - iii) Combinations with repetition & without repitition.
- Proofs of some standard identities using Combinatorial Arguments.
- ( 5 Properties )

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Unit 4: Recurrence Relations	No. of Lects.
	9

- Introduction
- Recurrence Relation
- Linear Recurrence Relation with constant coefficients
- Homogeneous Solution
- Particular Solution
- Total Solution

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Unit 5: Lattices	No. of Lects.
	10

- Poset , Toseet, Comparability and Hasse diagram.
- Lattices: Types, Properties and Results ( 6 results with proof )
- Definition of Boolean Algebra
- Identities of Boolean Algebra
- Operations in Boolean Algebra
- Boolean Expressions and Boolean Functions
- Duality
- Disjunctive Normal Form- D.N.F. ( Product of Sums ) and Conjunctive Normal Form- C.N.F. ( Sum of Products )

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**Recommended Text Books:**

- C. L. Liu. *Elements of Discrete Mathematics*. Tata McGraw Hill.

**Reference Books:**

- Kenneth Rosen. *Discrete Mathematics and It's Applications*. Tata McGraw Hill.
- Bernard Kolman, Robert C. Busby, Sharon Cutler Ross and Nadeem-ur-Rehman. *Discrete Mathematical Structures*. Indian Subcontinent Adaptation: Pearson Education, 2004.

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