

24MA211

LINEAR ALGEBRA AND DISCRETE MATHEMATICS

Category: Major -5

3L 1T 0P 4C

Pre-requisite: 10+2 Mathematics

Course Description:

This course provides fundamental concepts in Linear Algebra and Discrete Mathematics, focusing on determinants, matrices, logic, proofs and counting techniques. Students will develop analytical and problem-solving skills essential for various applications in computer science and engineering.

Course Aims and Objectives:

- To introduce determinants and matrices with their properties and operations.
- To equip students with systematic techniques to solve linear equations and transformations.
- To develop logical reasoning and proof-writing skills.
- To understand and apply counting techniques in combinatorial problems.
- To explore recurrence relations and their solutions for computational applications.

Course Outcomes: At the end of the course, students will be able to:

- CO1: Understand and apply determinants and matrix operations for problem-solving.[K3]
- CO2: Solve linear equations using the Gauss-Jordan method and understand matrix transformations.[K5]
- CO3: Apply logical reasoning and write formal proofs using different techniques.[K3]
- CO4: Utilize basic counting principles to solve combinational problems.[K3]
- CO5: Solve recurrence relations and analyze their applications in discrete structures.[K5]

UNIT-I: Linear Algebra- Determinants(12Hrs)

Introduction – Determinants, Properties of Determinants, Multiplication of determinants, Matrices, Matrix operations, related matrices, Rank of a matrix (Echelon form), Finding the inverse by Gauss-Jordan method.

UNIT-III: Discrete Mathematics-The Foundations: Logic and Proofs(12Hrs)

Introduction, Propositional Logic, Propositional equivalences, Predicates and Quantifiers, Rules of inference, Introductions to proofs. Normal forms-PDNF, PCNF.

Examples/Applications/Case Studies:

- Logical circuits using Boolean algebra
- Automated reasoning systems and artificial intelligence
- Predicate logic in database query languages (SQL)

UNIT-IV: Basic Counting Techniques:(12Hrs)

Basics of counting- Sum rule, Product rule, Pigeonhole principle, Permutations and combinations, Enumeration of combinations and permutations- with repetitions and constrained repetitions

UNIT-V: Advanced Counting Techniques: (12Hrs)

Recurrence Relations- Solving Linear Recurrence Relations-Solving homogeneous recurrence relations with constant Coefficients-Solving Non homogeneous recurrence relations with constant coefficient.

Text Books:

- 1) Grewal B. S. (2017). *Higher Engineering Mathematics*. (44th Edition). Khanna Publishers.
- 2) J.L Mott and A.Kandel, *Discrete Mathematics for Computer scientists and Mathematicians*, 2nd edition, PHI

References Books:

1. Kreyszig Erwin. (2013). *Advanced Engineering Mathematics*. (9th Edition). Wiley Publishers.
2. Weir Maurice D., Hass Joel & Giodano Frank R. (2013). *Thomas' Calculus*. (11th Edition). Pearson Education,inc..
3. Kenneth H Rosen, *Discrete Mathematics and Applications*, 6th edition, McGrahill
4. N.Chandra Shekharan and M. Umaparvathi , *Discrete Mathematics* ,PHI 2010