SEMESTER -V

MJC-08: Ring Theory and Linear Algebra-I

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The fundamental concept of Rings, Fields, subrings, integral domains, ring homomorphisms and their properties.

CO2: The concept of linear independence of vectors over a field, the idea of a finite dimensional vector space, basis of a vector space and the dimension of a vector space.

CO3: Basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation, algebra of transformations and the change of basis.

MJC-08 : Ring Theory and Linear Algebra-I (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of rings, Properties of rings, Definition and examples of Subrings, Zero divisors, Integral domains and its examples, Properties of integral domains, Division rings, fields, Characteristic of a ring, Ideals and its properties, Quotient rings.	14
2	Ring homomorphisms, Kernel of Ring homomorphisms, Properties of ring homomorphisms, Isomorphism theorems for Rings.	10
3	Vector spaces, Subspaces, Algebra of subspaces, Linear combination of vectors, Linear span, Linear independence, Basis and dimension, Dimension of subspaces, Quotient spaces.	14
4	Linear transformations, Null Spaces and Ranges, Matrix representation of a linear transformation, Rank-Nullity theorem, Algebra of linear transformation, Eigenvalues and Eigenvectors, Characteristic equation of a matrix and Cayley-Hamilton theorem.	14
5	Isomorphisms for vector spaces, Isomorphism theorems for vector spaces, Invertibility and Isomorphisms.	8
	TOTAL	60

Book References:

1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited. Delhi. Fourth impression, 2015.
2. Herstein, I. N. (2006). Topics in Algebra (2nd ed.). Wiley Student Edition. India.
3. Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2003). Linear Algebra (4th ed.). Prentice-Hall of India Pvt. Ltd. New Delhi.
4. Kumaresan, S. (2000). Linear Algebra: A Geometric Approach, Prentice Hall India Learning Private Limited, New title Edition.
5. Hoffman, Kenneth & Kunze, Ray Alden (1978). Linear Algebra (2nd ed.). Prentice-Hall of India Pvt. Limited. Delhi. Pearson Education India Reprint, 2015.