C4.3 Ring Theory-I and Linear Algebra-II

Theory Paper, Full Marks: 100, Total Credit:6=5+1(Th+Tutorial), No. of classes per week:6(=5+1)
Paper Code: HMTCR4101T

Module-I : Ring Theory-I (39 classes)

Course Objective: Introduction to rings and basic properties of rings and their homomorphisms and ideals.

Rings, Integral Domains, Division Rings **(2)**, Fields, Sub-rings and Subfields **(2)**, Basic Theorems(with proof) on Rings, Units in Ring, units in the ring of integer modulo n, Wilson's theorem. Integral Domains and Fields **(4)**, Characteristic of a Ring **(2)** .

Ideals, Ideals generated by a set, Properties of Ideals (4) Principal Ideals, Quotient Rings, Prime Ideals and Maximal Ideals and their properties **(10)**. Ring Homomorphisms, Isomorphism Theorems , Ideals of a quotient ring and correspondence theorem **(10)**, Chinese Remainder Theorem and its applications (**3)**
Embedding of an Integral Domain in a field **(2)**.

References:

(1) First Course in Abstract Algebra— J. B. Fraleigh
(2) Abstract Algebra—D.S. Dummit and R. M. Foote
(3) Algebra—M. Artin
(4) Topics in Algebra—I. N. Herstein
(5) Topics in Abstract Algebra—M. K. Sen, S. Ghosh, P. Mukhopadhyay
(6) Elementary Linear Algebra—Howard Anton, Chris Rorres

Module-II: Linear Algebra-II (39 classes)

Course Objective: To learn the diagonalizability of matrices and linear transformations, geometry of inner product spaces and the properties of linear transformations on inner product spaces.

Dual spaces, dual basis, double dual **(3)**, transpose of a linear transformation and its matrix in the dual basis, annihilators **(4)**. Eigen spaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem **(8)**, the minimal polynomial for a linear operator, diagonalizability in connection with minimal polynomial, canonical forms **(6)**

Inner product spaces and norms- Examples, Cauchy- Schwarz Inequality **(3)**, Orthogonal and ortho-normal basis, Gram-Schmidt orthogonalisation process **(4)**, orthogonal complements, Bessel's inequality. **(3)**
The adjoint of a linear operator. Normal and self-adjoint operators and their diagonalizability (8).

References:

1. Linear Algebra-K. Hoffman and R. Kunze
2. Linear Algebra: Insel, Friedberg, Spance.
3. Elementary Linear Algebra—Howard Anton, Chris Rorres

4. Introduction to Linear Algebra: Gilbert Strang
5. Linear Algebra — S. K. Mapa
6. Linear Algebra- K. B. Datta