Subject Code : RNENS1

FIRST YEAR - PAPER – I : ALGEBRA

Unit I

Another counting principle – Sylow's theorems – Direct products – Finite abelian groups, Polynomial rings – Polynomials over the rational field – Polynomial rings over commutative rings.

Unit II

Extension fields – roots of polynomials – More about roots – The element of Galois theory – Finite fields – Wedderburn's theorem on finite division rings – A theorem of Frobenius.

Unit III

The algebra of linear transformations – Isomorphism of vector spaces – Representations of linear transformations by matrices – Linear functionals- the double dual – the transpose of a linear transformation.

Unit IV

The algebra of polynomials – Lagrange Interpolation – Polynomial ideals – the prime factorization of a polynomial – Commutative rings – Determinant functions- Permutations and the uniqueness of determinant – classical adjoint of a matrix – Inverse of an invertible matrix using determinats.

Unit V

Characteristic values – Annihilating polynomial – Invariant subspaces – Simultaneous triangulation – Simultaneous diagonalization – Direct sum decompositions.

Text books:

1. I.N. Herstein, "Topics in Algebra" Second Edition, Vikas Publishing House Pvt. Ltd., New Delhi.
   Unit I: Chapter 2 (2.11, 2.12, 2.13, 2.14) Chapter 3 (3.9, 3.10, 3.11)
   Unit II: Chapter 5 (5.1, 5.3, 5.5, 5.6) Chapter 7 (7.1, 7.2, 7.3)
2. K. Hoffman and R. Kunze, "Linear Algebra", Second Edition, Prentice – Hall of India Pvt. Ltd.
   Unit III: Chapter 3 (all sections)
   Unit IV Chapter 4 (all sections) Chapter 5 (5.1 to 5.4)
   Unit V: Chapter 6 (6.1 to 6.6)

Books for References:

1. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul "Basic Abstract Algebra", Cambridge University Press, Second Edition, 1995.
2. J.b. Fraleigh, "A First Course in Abstract Algebra", Narosa Publishing House, New Delhi
3. N. Jacohson, Basic Algebra, Volume I and II, Freeman 1980.