

**ADIKAVI NANNAYA UNIVERSITY**  
B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS  
**SEMESTER – V, PAPER -5**  
**RING THEORY & VECTOR CALCULUS**

**60 Hrs**

**UNIT – 1 (12 hrs) RINGS-I :-**

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

**UNIT – 2 (12 hrs) RINGS-II :-**

Definition of Homomorphism – Homomorphic Image – Elementary Properties of Homomorphism – Kernel of a Homomorphism – Fundamental theorem of Homomorphism – Maximal Ideals – Prime Ideals.

**UNIT – 3 (12 hrs) VECTOR DIFFERENTIATION :-**

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators.

**UNIT – 4 (12 hrs) VECTOR INTEGRATION :-**

Line Integral, Surface Integral, Volume integral with examples.

**UNIT – 5 (12 hrs) VECTOR INTEGRATION APPLICATIONS :-**

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

**Reference Books :-**

1. Abstract Algebra by J. Fraleigh, Published by Narosa Publishing house.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publications.
6. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

**Suggested Activities:**

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

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**SEMESTER – V, PAPER -6**  
**LINEAR ALGEBRA**

**60 Hrs**

**UNIT – I (12 hrs) : Vector Spaces-I :**

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

**UNIT –II (12 hrs) : Vector Spaces-II :**

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotientspace.

**UNIT –III (12 hrs) : Linear Transformations :**

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

**UNIT –IV (12 hrs) : Matrix :**

Linear Equations, Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley – Hamilton Theorem.

**UNIT –V (12 hrs) : Inner product space :**

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel’s inequality and Parseval’s Identity.

**Reference Books :**

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut-250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4<sup>th</sup> Edition 2007.

**Suggested Activities:**

Seminar/ Quiz/ Assignments/ Project on “Applications of Linear algebra Through Computer Sciences”