

## SEMESTER-V

### COURSE 5: LINEAR ALGEBRA

Theory

Credits: 4

5 hrs/week

#### Course Outcomes

After successful completion of this course, the student will be able to

1. understand the concepts of vector spaces, subspaces
2. understand the concepts of basis, dimension and their properties
3. understand the concept of linear transformation and its properties
4. apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
5. learn the properties of inner product spaces and determine orthogonality in inner product spaces.

#### Course Content

##### UNIT – I

##### 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

##### 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 Quotient space.

##### UNIT –III

##### Linear Transformations

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

##### UNIT –IV

##### Matrices

Characteristic equation - Characteristic Values - Characteristic vectors of a square matrix - Cayley Hamilton Theorem – problems on Cayley Hamilton Theorem.

##### UNIT –V

##### Inner product space

Inner product spaces- Euclidean and unitary spaces- Norm or length of a Vector- Schwartz inequality- Triangle Inequality- Parallelogram law- Orthogonality- Orthonormal set- Problems on Gram– Schmidt orthogonalisation process - Bessel's inequality.

#### Activities :

Seminar/ Quiz/ Assignments/Applications of Linear Algebra in real life problems\ Problem Solving.

#### Text Books

- 1.Linear Algebra by J.N. Sharma and A.R. Vasishtha, published by Krishna Prakashan Media (P) Ltd.
- 2.Matrices by A.R.Vasishtha and A.K.Vasishtha published by Krishna Prakashan Media (P) Ltd.

**Reference Books**

1. Linear Algebra by Stephen H. Friedberg et. al. published by Prentice Hall of India Pvt. Ltd. 4<sup>th</sup> Edition, 2007
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson education low priced edition), New Delhi.
3. Matrices by Shanti Narayana, published by S.Chand Publications

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