Semester* : IV
Course Type : DSC
Course Code** : MAT-DSC-253
Name of the Course : Linear Algebra
Learning level*** : 299
Credits : 4
Contact Hours : 60
Total Marks : 100
End Semester Marks : 70
Internal Marks : 30
Course Objective

- ★ To develop the idea of basic arithmetic operations on vectors and matrices
- ★ To learn the basic terminology of linear algebra in Euclidean spaces including linear dependence and independence, span, basis, dimension, rank, nullity of a linear transformation.
- ★ To learn how to find the eigenvalues, eigenvectors of a matrix or a linear transformation and using them to diagonalize a matrix.
- ★ To know about inner product space and its related theorems and examples.

Unit I

Vector spaces, definition, properties, examples, geometrical interpretation of vector addition. Vector subspaces, examples and properties. Linear combination of vectors, linear span, subspace generated by a set, sum of subspaces, linear dependence and linear independence of vectors.

Unit II

Basis of a vector space, examples and properties, finite dimensional vector space, dimension of a finite dimensional vector space, related examples and properties. Quotient space, examples and properties, dimension of a quotient space.

Unit III

Linear transformations - definition, examples and properties. Linear functional - definition, examples. Matrix of a linear transformation - definition, examples and properties. Kernel and image of a linear transformation, rank-nullity theorem. Isomorphism - definition, examples and properties.

Unit IV

Eigenvalue, eigenvector and eigen space of a linear operator, characteristic polynomial and characteristic equation of a linear operator, Cayley- Hamilton theorem, related problems. diagonalizable operator, matrix of a diagonalizable operator.

Unit V

Inner product spaces - definition, examples and properties. Norm function, Cauchy-Schwarz's inequality, distance in an inner product space, orthogonality, Pythagoras

Theorem, polarization identity, orthonormal set, orthonormal basis, Bessel's inequality, orthogonal complement and its related theorems.

Textbook :

1. S. Kumaresan; Linear Algebra: A geometric approach; Prentice Hall India

Reference Books:

1. Friedberg, Insel, Spence; Linear Algebra; Pearson Education India.
2. Sheldon Axler; Linear Algebra Done Right; Springer.
3. Kenneth Hoffman, Ray Alden Kunze; Linear algebra, 2nd Ed., Prentice-Hall of India Pvt. Ltd.,1971.
4. S. Lipschutz and M. Lipson; Linear Algebra; Schuam's Outlines.
5. A.R Vasistha and J. N. Sharma, Linear Algebra, Krishna Prakashan.

Course Outcome :

After successful completion of this course learners will learn concepts of vector spaces and its related topics, to find the eigen value, eigen vectors and solve the eigen value problems, they can apply the principles of matrix algebra to linear transformation, understand about the inner product space, norms and can apply their knowledge in various disciplines including engineering, physics, computer applications etc.