

15 MMCC 204 Linear Algebra (3-0-0)

Module-I (10-hours)

Geometric interpretation of solution of system of equations in two and three variables; matrix notation; solution by elimination and back substitution; interpretation in terms of matrices, elimination using matrices; elementary matrices, properties of operations on matrices. Definition and uniqueness; non-existence in general: singular matrices; calculation of inverse using Gauss-Jordan elimination; existence of one sided inverse implies invertibility ; decomposition of a matrix as product of upper and lower triangular matrices. Vector spaces and Subspaces, Solving $Ax=0$ and $Ax=b$, Linear Independence, Basis and Dimension, The four fundamental Subspaces, graph and networks, Linear Transformations.

Module-II (10-hours)

Orthogonal Vectors and Subspaces, Cosines and Projections onto Lines, Projections and Least Squares, orthogonal Bases and Gram-Schmidt, The Faster Fourier Transform, Properties of the determinant, formulas for the determinant, Expansion of determinant of a matrix in Cofactors, Applications of Determinants.

Module-III (10-hours)

Eigen values and eigenvectors, Diagonalisation of a Matrix, Difference equations and powers A^k , Markov Matrices, Differential equations and e^{At} , stability of differential equation, complex Matrices, unitary Matrices, similarity transformations, Jordan Form, minima , maxima and saddle points, tests for positive definiteness, Test for positive definiteness, singular value decomposition, minimum principles.

Text Book:

1. Strang, Introduction to Linear Algebra, 4th ed., Wellesley Cambridge Press. Chapters-1-5, 6.1,6.2,6.3,6.4.

Reference

1. An introduction to Linear Algebra by V. Krishnamurthy, V. P. Mainra and J. L. Arora, East West Publication
2. M. Artin, Algebra, Prentice-Hall of India.
3. Hoffman and Kunze, Linear Algebra, 2nd ed., PHI.
4. S. Kumaresan, Linear Algebra, a geometric approach, PHI.