
MA-219 Linear Algebra — (August-December 2003)

Lectures : Monday/Wednesday/Friday 11:00 AM–12:00 Noon

• • Topics

- **1 Vector Spaces** - - - Vector spaces, Subspaces, Linear system of equations, Bases and Dimensions of vector spaces, Affine spaces and affine subspaces.
- **2 Linear Maps** - - - Linear Maps, Space of Linear maps, Linear maps and bases, The rank theorem, Direct sums and projections, Dual spaces. Quotient spaces, Exact sequences, Operations of groups. Affine maps, Projective spaces and maps.
- **3 Matrices** - - - Matrices, Matrix of a Linear map. Rank of matrices, Elementary matrices.
- **4 Determinants** - - - Permutations, Multi-linear maps, Determinant functions, Rules for determinants, The determinant of a linear map, Orientations, Determinants and volume.
- **5 Polynomial algebras** - - - Polynomials in one variable, Polynomials in several variables.
- **6 Linear Operators** - - - Eigenvalues, Characteristic and Minimal polynomials, Triangular and Diagonalizable operators, Decomposition theorems, Jordan canonical form.
- **7 Bilinear and Sesquilinear forms** - - - Bilinear and sesquilinear forms, Symmetric and complex-hermitian forms. Sylvester's law of inertia, Type of hermitian forms.
- **8 Inner Product Spaces** - - - Inner product spaces, Linear and affine isometries.
- **9 Spectral theorems** - - - Spectral theorem for self-adjoint and Normal operators. Principal axis theorem.
- **10 Classical groups** - - - General and Special linear groups. Orthogonal and special orthogonal groups, Unitary and Special unitary groups.

• • Texts/References

- [1] **Artin, M. :** *Algebra*, Prentice-Hall, 1994.
- [2] **Greub, W. :** *Linear Algebra*, Springer-Verlag, Graduate Texts in Mathematics 97, (4-th edition) 1981.
- [3] **Halmos, P. R. :** *Finite-Dimensional Vector Spaces*, Springer-Verlag, 1993.
- [4] **Herstein, I.N. :** *Topics in Algebra*, Wiley Eastern, 1987.
- [5] **Hoffman, K. and Kunze, R. :** *Linear Algebra*, Prentice-Hall, 1972.
- [6] **Jacobson, N. :** *Basic Algebra*, Vols. I & II, Hindustan Pub. Co., 1984.