

## **ST1 C02: ANALYTICAL TOOLS FOR STATISTICS**

### **UNIT I**

Vector spaces, subspaces, linear independence of vectors, basis and dimension of a vector space, inner product and orthogonal vectors, Gram-Schmidt orthogonalization process, orthonormal basis, rank of a matrix, null space, partitioned matrices.

### **UNIT II**

Linear equations, rank nullity theorem, characteristic roots and vectors, Cayley-Hamilton theorem, characteristic subspaces of a matrix, nature of characteristic roots of some special types of matrices, algebraic and geometric multiplicity of a characteristic root, generalized inverse, properties of g-inverse, Moore-Penrose inverse and its computations.

### **UNIT III**

Quadratic forms, congruent transformations, congruence of symmetric matrices, canonical reduction and orthogonal reduction of real quadratic forms, nature of quadratic forms, simultaneous reduction of quadratic forms, similarity and spectral decomposition.

### **UNIT IV**

Linear programming:- convex sets and associated theorems, introduction to linear programming problems (LPP), graphical solution, feasible, basic feasible and optimal basic feasible solutions to an LPP, theoretical development of simplex method, big-M method, two-phase simplex method, dual of linear programming, theorems of duality, dual-simplex method.

#### **Text Books:**

1. Shanti Narayan (1991) A text of book of matrices, S. Chand & Company, New Delhi
2. Graybill F. A. (1983) Matrices with applications in statistics, 2nd Ed. Wadsworth.
3. Biswas S. (1997) A text book of linear algebra, New age international.
4. Kanti Swaroop, Gupta P.K., et al, (1985) Operations Research, Sultan Chand & Sons.

#### **Reference Books:**

1. Rao C.R. (2002) Linear statistical inference and its applications, Second edition, Wiley Eastern.
2. Rao A.R. and Bhimasankaram P (1992) Linear Algebra, Tata McGraw Hill Publishing Company Ltd.
3. Sharma J.K. (2001) Operations Research: Theory and Applications, McMillan, New Delhi.