

## 6<sup>TH</sup> SEMESTER

### DISCIPLINE SPECIFIC ELECTIVE (DSE)

AMM616D: APPLIED MATHEMATICS: METHODS OF APPLIED MATHEMATICS-II

**CREDITS: 6**

#### Unit-I Matrix Theory-I

Types of matrices, Inverse of a square matrix, reversal law and its generalization, trace of a matrix, matrix polynomials, characteristic equation, matrix polynomials, Cayley-Hamilton Theorem, rank of a matrix, invariance of rank matrix under elementary row and column transformations. Reduction of matrix to normal form, elementary matrices, equivalence of matrices, linear dependence and linear independence of row(column) vectors, conditions for columns of a matrix to be linearly dependent, matrix A has rank r iff it has r linearly independent columns, analogous results for rows.

#### Unit-II Matrix Theory-II

Linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four. Linear product of two vectors, orthogonal and unitary matrices, determination of orthogonal matrices, eigen values and eigen vectors and their determination.

#### Unit-III Vector Calculus

Parametric representation of curves and surfaces; limit, continuity and differentiability of vector functions, derivative of sum, dot product and cross product of two vectors, gradient of a scalar field and directional derivative, geometrical representation. Divergence of vector field, curl of vector field, physical interpretation of divergence and curl, line integrals and Green's Theorem, surface area and surface integrals, Divergence Theorem of Gauss, Stoke's Theorem.

#### Unit-IV Numerical Methods

Introduction to numerical methods, Bisection method, False position method, Fixed point iteration method, Newton's method, Secant method, LU decomposition, Gauss-Jacobi, Gauss-Seidel and SOR iterative methods. Algorithms and Convergence of solution. Lagrange and Newton interpolation, linear and higher order, finite difference operators, numerical differentiation, Forward difference, backward difference and central difference. Integration: trapezoidal rule, Simpson's rule, Euler's method.

#### Text Books Recommended:

1. A.Aziz, N.A.Rather & B.A.Zargar, A Text Book of Matrices, KBD.
2. Shanti Narayan, A Text Book of Matrices.
3. B. Bradie, *A Friendly Introduction to Numerical Analysis*, Pearson Education, India, 2007.
4. Ivl.KJaln, S.R.K, Lyengar and R.K.Jain, *Numerical Methods for Scientific and Engineering Computation*, S<sup>II</sup> Ed., New age International Publisher, India, 2007.
5. G. B. Thomas and R.L. Finney, *calculus*, S<sup>II</sup> Ed., Pearson Education, Delhi, 2005.
6. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) P. Ltd.
7. P.C. Matheew's, *Vector Calculus*, Springer Verlag London Limited, 1998.