

**Semester: I (Minor)**  
**Matrix Algebra (Theory and Practical)**  
**Course Code: MT-1101**  
**No. of Credits: 04(2+2)**  
**Learning Hours: 6 Hours/Week**

**Part-I: Theory (credits -2 , 2 hrs/week)**

**Unit 1:** Introduction to matrices, different types of matrices, operations on matrices, theorems on matrices, matrix operations, symmetric and skew-symmetric matrices, Hermitian and skew-Hermitian matrices, orthogonal matrices, unitary matrices, normal matrices. Non-singular matrix, Matrix inversion using adjoint method, Linearly independent and dependent row(column) vectors of a matrix, row rank, column rank and rank of a matrix, row echelon (RE) and row reduced echelon (RRE) form of a matrix, matrix inversion using row reduced echelon (RRE) form.

**Unit 2:** Eigen values and eigen vector of a square matrix. the characteristic equation of a matrix. Cayley-Hamilton theorem. Application of Cayley Hamilton theorem to find the inverse of a matrix, theorems on consistency of a system of simultaneous linear equations, Application of matrices in solving a system of simultaneous linear equations, Cramer's rule.

**Reference Books:**

1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley (1995).
2. Gilbert Strang, Linear Algebra and its Applications (English) 4<sup>th</sup> edition, Academic press, Indian edition.
3. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
4. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.

**Part-II: Practical (credits -2 , 4 hrs/week)**

**List of practical to be performed:**

- (1) Matrix algebra
- (2) RE and RRE form
- (3) Rank of a matrix
- (4) Linearly independent and dependent vectors.
- (5) Inverse of square matrix
- (6) Eigen values, eigen vectors
- (7) Cayley Hamilton theorem and its applications
- (8) Graphs of standard curves in Cartesian form
- (9) Graphs of standard curves in parametric forms
- (10) Graphs of standard curves in polar forms
- (11) Problems on methods of integration
- (12) Problems on Reduction formulae for definite integral
- (13) Applications of integration to find area.
- (14) Applications of integration to find volume.
- (15) Applications of integration to find arc length.
- (16) Applications of integration to find surface area.

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3. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
4. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.
5. Elementary Differential Equations, Rainville and Bedient, Macmillan Publication.
6. Differential Equations- D.A. Murray, Tata McGraw Hills.
7. Integral Calculus- Shantinarian