Semester: I (Major Core-1)
Subject Title: Matrix Algebra and ODE (Theory)
Course Code: MT-1501
No. of Credits: 04
Learning Hours: 4 Hours/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 of 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 Caley 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.

Unit 3: (a) Introduction to ordinary differential equations, order and degree of ODE, Construction of ode, Methods of solving differential equations of first order and degree one: Variable separable, Homogeneous and non- homogeneous differential equations, Exact differential equations, Integrating factors, linear differential equation, Bernoulli's differential . (b) Method of solving differential equations of first order and higher degree: Solvable for y, solvable for x, solvable for p where $p = dy/dx$, Clairaut's differential equation and doe reducible to Clairaut's equation, Lagrange's differential equation.

Unit 4: Linear differential equations of higher order and degree one: Differential operators. Linear differential equations of higher order and degree one with constant coefficients, Auxiliary equation, Complementary function, particular integrals, complete solution, Integral operator (Inverse operator), Derivation of particular integral formulae for some standard functions, Euler form of homogeneous linear differential equations with variable coefficients and method of solving it.

Reference Books:
1. H. Anton, Elementary linear algebra with applications (8th Edition),John Wiley (1995).
2. Linear Algebra Theory and Applications – Ward Cheney, David Kincaid. Jones and Bartlet India Pvt. Ltd.
3. Gilbert Strang, Linear Algebra and its Applications (English) 4th edition, Academic press, Indian edition.
4. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
5. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.
6. Elementary Differential Equations, Rainville and Bedient, Macmillan Publication.
7. Ordinary and Partial Differential Equations, M. D. Raisingania, S. Chand and Company, 2009.
8. Differential Equations- D.A. Murray, Tata McGraw Hills.
9. Ordinary Differential Equations and Partial Differential Equations, Nita shah, PHI Ltd.
10. Theory and problems on Differential Equations- Frank Ayres, McGraw Hill Book Co., New York.

Semester: I (Major Core-2)
Subject Title: Mathematics Practical-1(Practical)
Course Code: MT-1502L
No. of Credits: 04
Learning Hours: 8 Hours/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-I
(12) Problems on methods of integration-II
(13) Problems on Reduction formulae for definite integral
(14) Applications of integration to find area.
(15) Applications of integration to find volume.
(16) Applications of integration to find arc length.
(17) Applications of integration to find surface area.
(18) Problems on solution of ODE of order 1 and degree 1
(19) Problems on solution of ODE of order 1 and degree n
(20) Solution of higher order ODE with constant coefficients
(21) Solution of higher order ODE with variable coefficients
(22) Solution of system of simultaneous differential equations of order 1 and degree 1.
(23) Method of undetermined coefficients and method of variation of parameters.
(24) Mathematical Modelling using first order and degree one differential equations.
(25) Problems on different types of errors in numerical computations.
(26) Problems based on relation between roots and coefficients of a polynomial equations and problems of finding equations from given conditions.
(27) AM-GM-HM inequality and its applications
(28) Elementary properties of binary relation.

Reference Books:
1. H. Anton, Elementary linear algebra with applications (8th Edition),John Wiley (1995).
2. Gilbert Strang, Linear Algebra and its Applications (English) 4th 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.
5. Elementary Differential Equations, Rainville and Bedient, Macmillan Publication.
6. Differential Equations- D.A. Murray, Tata McGraw Hills.
7. Higher Algebra- Bernard and Child.
8. Integral Calculus- Shantinaryan