

16HS106 BASIC MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

This course offers basic concepts on matrices, system of equations, differential equations of first and higher order. Further, numerical methods to solve differential equations are introduced.

The objective of the course is to provide the knowledge on the properties of matrices and solving system of equations using matrices. It is also aimed to offer various methods (analytical as well as numerical) to solve first and second order ordinary differential equations.

Course Outcomes:

Upon completion of the course, the student will be able to

- CO1: Understanding the algebra of matrices, rank of matrix.
- CO2: Apply various methods to solve system of linear equations.
- CO3: Solve ordinary differential equations of first and second order.
- CO4: Apply numerical methods to solve integrals and ordinary differential equations.
- CO5: Use software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Compare the inverse of matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Solve given differential equations.*

UNIT - 1 L-9, T-3

MATRICES: Definition, types of matrices, algebra of matrices, determinant, minor, cofactor, adjoint, and inverse of a matrix; Elementary row operations, inverse by row operations, rank, determination of rank using Echelon form and normal form.

UNIT - 2 L-9, T-3

SYSTEM OF EQUATIONS: System of linear equations, consistency of system of equations, solution by Cramer's rule, matrix inversion method, Gauss-Jordan method and Gauss elimination method.

UNIT - 3 L-9, T-3

FIRST ORDER ORDINARY DIFFERENTIAL: Introduction, variable separable, linear equations, Bernoulli equation, homogenous equations and non-homogenous equations.

UNIT - 4 L-9, T-3

SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations of second order with constant coefficients with RHS of type $S^{\lambda} \cos px$ & $S^{\lambda} \sin px$

UNIT - 5 L-9, T-3

NUMERICAL METHODS - II: Numerical integration by trapezoidal rule and Simpson's rules; Numerical solutions to Differential equations - Euler's method and Runge-Kutte method.

ACTIVITIES:

- Compute the inverse of matrix and compare with MATLAB output.
- Solve given system of linear equations and compare with MATLAB output.
- Solve given differential equations and compare with MATLAB output.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Matrix algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's rule).
5. System of equations (Matrix inversion method).
6. Solutions of first order ODE.
7. Trapezoidal rule.
8. Simpson's one-third rule.
9. Simpson's three-eight rule.
10. Euler's method.
11. RK Method.

Text BOOKS :

1. H. K. Dass and Er. R. Verma, "Higher Engineering Mathematics", S. Chand and Co., 3rd edition, 2014.
2. B. S. Grawel, "Engineering Mathematics", Khanna Publishers, 44th edition, 2014.

Reference BookS :

1. K. S. Rao, "Numerical Methods", 3rd edition, PHI Publishers, 2007.
2. R. Pratap, "Getting started with MatLab", Oxford University Publication, 2009.