

19HS103

ENGINEERING MATHEMATICS I (C)

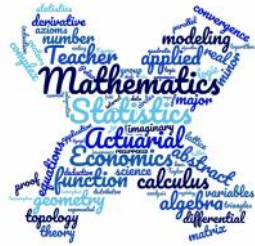
LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS

Hours Per Week :

L	T	P	C
3	0	2	4

Total Hours :

L	T	P	W/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	45	-	10	-	5



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COURSE DESCRIPTION AND OBJECTIVES:

To acquaint students with principles of Mathematics through matrices, differential equations and numerical methods that serves as an essential tool in several Engineering applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Determine rank, eigenvalues and eigenvectors of a matrix and solution of a system of linear equations.	1, 2
2	Finding inverse of a matrix and powers of a matrix.	1, 2
3	Solving differential equations using analytical methods.	1, 2
4	Solving differential equations using numerical methods.	1, 2
5	Use software tools to obtain and verify the solutions.	5

SKILLS:

- ✓ Find rank of a matrix using different methods.
- ✓ Compute the eigen values and eigen vectors of a matrix.
- ✓ Find numerical solution of a differential equation using appropriate method.

ACTIVITIES:

- o Differentiate the method to find rank of a matrix.
- o Differentiate the method to solve given differential equation.
- o Compute numerical solution to D.E and compare with the output obtained by softwares.

UNIT – I**L-9**

MATRICES : Rank of a matrix, Normal form, Triangular form, Echelon form; Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Seidel method.

UNIT – II**L-9**

EIGEN VALUES AND EIGEN VECTORS : Eigen values, Eigen vectors, Properties (without proofs); Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT – III**L-9**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS : Basic Definitions, Variable separable, homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT – IV**L-9**

HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : e^{ax} , $\sin ax$, $\cos ax$ and x^n .

UNIT – V**L-9**

NUMERICAL METHODS TO SOLVE ORDINARY DIFFERENTIAL EQUATIONS : Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS****TOTAL HOURS: 30**

1. Mathematical Preliminaries in WX maxima.
2. Basics of Matrix Algebra.
3. Determine the Rank of a matrix.
4. Reduce into Triangular & Echelon form of a matrix.
5. Solve system of equations using Direct method.
6. Solve system of equations using Cramer's rule.
7. Solve system of equations using Matrix inversion method.
8. Solving system of equations using Gauss-Jordan method, Gauss elimination method.
9. Calculate the Eigen values and Eigen vectors of a given matrix.
10. Cayley-Hamilton theorem applications for square matrixes.
11. Modal Matrix, Diagonalization of matrix.

TEXT BOOKS :

1. H. K. Dass and Er. RajanishVerma, "Higher Engineering Mathematics", S. Chand & Co., 3rd edition, 2015.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2018.

REFERENCE BOOKS :

1. John Bird, "Higher Engineering Mathematics", Routledge (Taylor & Francis Group), 2018.
2. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2008.
4. N. P. Bali and K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, 2018.
5. T. K.V. Iyengar et al., "Engineering Mathematics, I, II, III", S. Chand & Co., 2018.