21HS112 ENGINEERING MATHEMATICS - II (F)

LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

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COURSE DESCRIPTION AND OBJECTIVES:

To provide students with solid foundation in Mathematical fundamentals such as matrices, ordinary differential equations, numerical methods required for engineering applications.

COURSE OUTCOMES:

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

COs	Course Outcomes
1	Evaluate the rank, eigenvalues and eigenvectors of a matrix and solution of a system of linear equations.
2	Appreciate the use of Cayley-Hamilton theorem.
3	Demonstrate the concept of analytical methods to solve differential equations.
4	Demonstrate the concept of numerical methods to solve differential equations.
5	Use software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Finding the rank of a matrix using various methods.*
- ✓ *Solve the system of linear equations with the appropriate methods.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Solving a differential equation using suitable method.*
- ✓ *Compute numerical solutions of a differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solving the system of linear equations and compare the results with solutions obtained using soft ware*
- *Compute numerical solutions to differential equation and compare the results with solutions obtained using soft ware*

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-Siedal 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, Variables 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 FOR DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

TEXT BOOKS:

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