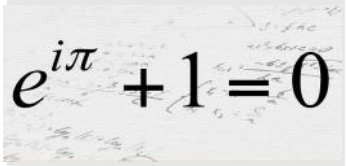

Source: www.google.co.in

19HS108 ENGINEERING MATHEMATICS II (B)

MATRICES & ORDINARY DIFFERENTIAL EQUATIONS

Hours Per Week :

L	T	P	C
3	0	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
25	50	-	5	-	5

COURSE DESCRIPTION AND OBJECTIVES :

To provide students with solid foundation in mathematical fundamentals such as matrices, ordinary differential equations and their applications required for Engineering applications.

COURSE OUTCOMES:

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

COs	Course Outcomes	POs
1	Demonstrate the concept of analytical and numerical methods to solve differential equations.	1, 2
2	Finding inverse of a matrix and powers of a matrix.	1, 2
3	Appreciate applications of first order differential equations.	1, 2
4	Determine rank, eigen values and eigen vectors of a matrix and solution of a system of linear equations.	1, 2
5	Use software tools to obtain and verify the solutions.	5

SKILLS:

- ✓ *Test the consistency of system of linear equations and solve them using Matrix algebra methods.*
- ✓ *Solve first and higher order linear differential equations analytically and numerically through appropriate methods.*
- ✓ *Study some real life problems through differential equations.*

UNIT – I **L-9**

MATRICES : Definition, Types, Matrix Algebra, Elementary row and column operations; Inverse of a matrix; Rank of a matrix, Triangular form, Echelon form, Normal form.

Consistency of system of linear equations, Cramer's rule, Matrix Inversion method, Gauss elimination method.

UNIT – II **L-9**

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

UNIT – III **L-9**

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

UNIT – IV **L-9**

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

UNIT – V **L-9**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS : Newton's law of cooling, Law of natural growth and decay. Orthogonal trajectories.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS : Euler's and Runge-Kutta methods.

ACTIVITIES:

- *Testing given system of simultaneous linear equations for consistency.*
- *Computing powers of a matrix using Cayley-Hamilton theorem and diagonalisation.*
- *Solve D.E of first and higher order through appropriate analytical and numerical methods.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS:30**

1. Basic rules of Matrix algebra.
2. To find Rank of a Matrix.
3. Solving system of equations using Cramer's rule.
4. Solving system of equations using Matrix inversion method.
5. Solving system of equations using Gauss-Jordan method.
6. Eigenvalues and Eigenvectors for given Matrix.
7. Cayley Hamilton theorem and its applications to square matrices.
8. Solving differential equations of first order.
9. Euler's method to solve first order ODE.
10. Runge-Kutta method to solve first order ODE.

TEXT BOOKS:

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

REFERENCE BOOK:

1. John Bird, "Higher Engineering Mathematics", Routledge (Taylor & Francis Group), 2018.