LINEAR ALGEBRA AND INTEGRAL TRANSFORMS

I B. Tech. - II Semester	L	T	P	C
Course Code: A3HS03	4	1	-	4

COURSE OVERVIEW:
This course focus on basic areas of theory and more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in Engineering and scientific professions. The topics covered include solutions for linear systems, Eigen values and Eigen vectors, linear transformation, Laplace transforms, Application of partial differential equations, Fourier Transforms. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program

PREREQUISITE(S):
- NIL

COURSE OBJECTIVES:
1. Learn concepts of matrix algebra, methods of solving system of linear equations and determine eigen values and eigen vectors of a matrix
2. Understand how the eigen values and eigen vectors of Hermitian, Unitary and Normal matrices differ from those of general matrices.
3. Know the basic properties of standard partial differential equations to solve engineering problems
4. Determine the Fourier Transforms of a given function.
5. Analyze the characteristics and properties of Fourier transforms

COURSE OUTCOMES:
After completing this course, the student will be able to:
1. Use elementary transformations to reduce matrices to echelon form, normal form and hence find their rank.
2. Make use of echelon forms in finding the solution of system of linear equations.
3. Compute eigen values and eigen vectors of square matrices. Reduce the quadratic form to canonical form.
4. Apply Laplace transform to solve differential equations which will be converted to algebraic equation.
5. Determine Fourier transform, Fourier sine and cosine transform of a function
6. Apply partial differential equations to solve engineering problems.

SYLLABUS

UNIT – I **(12 Lectures)**

THEORY OF MATRICES: Real matrices: Symmetric-skew-symmetric and orthogonal matrices –Complex matrices: Hermitian, Skew –Hermitian and Unitary matrices –Elementary row and column transformations –Elementary matrix-Finding rank of a matrix by reducing to Echelon form and Normal form-Finding the inverse of a matrix using elementary row/column transformations (Gauss-Jordan method)-Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix –Solving m X n and n X n linear system of equations by Gauss Elimination-Cayley-Hamilton Theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton Theorem

UNIT – II **(12 Lectures)**

LINEAR TRANSFORMATIONS: Linear dependence and independence of vectors –Linear Transformation, orthogonal transformation-Eigen values and Eigen vectors of a matrix-properties of eigen values and eigen vectors of real and complex matrices- Diagonalization of a matrix. Quadratic forms up to three variables-Rank, Index, Signature and Nature of Quadratic form-Reduction of a Quadratic form to canonical form using linear and orthogonal transformations.

UNIT – III **(8 Lectures)**

SECOND ORDER PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS: Method of separation of variables for second order equations-Applications of Partial differential equations-one dimensional wave equation, Heat equation.

UNIT – IV **(12 Lectures)**

LAPLACE TRANSFORM AND ITS APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS: Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n- Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms- Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT – V **(10 Lectures)**

FOURIER TRANSFOREMS: Fourier integral theorem (statement)-Fourier sine and cosine integrals – Fourier transforms –Fourier sine and cosine transforms-properties- Inverse transforms-Finite Fourier transforms – Parseval's Identity.

TEXT BOOKS:

1. Higher Engineering Mathematics by Dr.B.S.Grewal, Khanna publishers.
2. Engineering Mathematics Vol –I by Gargand Guptha, person publishers
3. Advanced Engineering Mathematics by R K Jain& S R K Iyengar,Narosa Publishers

REFERENCE BOOKS:

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley & Sons Publisher.
2. Engineering Mathematics by N.P.Balil, Lakshmi Publications.
3. Advanced Engineering Mathematics by Michael Greenberg, pearson Education.