17HS048 LAPLACE TRANSFORMS

Course Description and Objectives:
To introduce fundamentals and use of integral transforms, integral equations and variational calculus. Understand the methods to analyse the system behaviour for linear and nonlinear, homogeneous and nonhomogeneous cases. Solve the simple problems using Fourier transform and Complex Integration.

Course Outcomes:

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

COs	Course Outcomes
1	Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties.
2	Solve ordinary differential equations using Laplace transforms.
3	Familiarise with Fourier transforms of functions belonging to L1() class, relation between Laplace and Fourier transforms.
4	Explain Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems.
5	Learn Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series.

Skills:

1. Check the analyticity of a function.
2. Decide the nature of singularity.
3. Find the Laplace transforms of a given function.

UNIT – 1 (12 hrs) Laplace Transform I

Definition of - Integral Transform – Laplace Transform Linearity, Property, Piecewise continuous Functions, Existence of Laplace Transform, Functions of Exponential order, and of Class A.

UNIT – 2 (12 hrs) Laplace Transform II

First Shifting Theorem, Second Shifting Theorem, Change of Scale Property, Laplace Transform of the derivative of f(t), Initial Value theorem and Final Value theorem.

UNIT – 3 (12 hrs) Laplace Transform III

Laplace Transform of Integrals – Multiplication by t, Multiplication by t^n – Division by t. Laplace transform of Bessel Function, Laplace Transform of Error Function, Laplace Transform of Sine and cosine integrals.

UNIT –4 (12 hrs) Inverse Laplace Transform I

Definition of Inverse Laplace Transform. Linearity, Property, First Shifting Theorem, Second Shifting Theorem, Change of Scale property, use of partial fractions, Examples.

UNIT –5 (12 hrs) Inverse Laplace Transform II

Inverse Laplace transforms of Derivatives–Inverse Laplace Transforms of Integrals – Multiplication by Powers of 'P'– Division by powers of 'P'– Convolution Definition – Convolution Theorem – proof and Applications – Heaviside's Expansion theorem and its Applications.

Reference Books

1. Laplace Transforms by A.R. Vasistha and Dr. R.K. Gupta, Krishna Prakashan Media Pvt. Ltd. Meerut.
2. Fourier Series and Integral Transforms by Dr. S. Sreenadh, S.Chand and Co., Pvt. Ltd., New Delhi.
3. Laplace and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Pragathi Prakashan, Meerut.
4. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass S. Chand and Co., New Delhi.

Suggested Activities:
Seminar/ Quiz/ Assignments