MATHEMATICAL TRANSFORM TECHNIQUES

II Semester: AE / ECE / EEE / ME / CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHSB11	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

I. COURSE OVERVIEW:

This course focuses on transformations from theoretical based mathematical laws to its practical appli-cations in the domain of various branches of engineering field. The course includes the transformations such as Laplace, Fourier, applications of scalar and vector field over surface, volume and multiple in- tegrals. The course is designed to extract the mathematical developments, skills, from basic concepts to advance level of engineering problems to meet the technological challenges.

II. OBJECTIVES:

The course should enable the students to:

I	Enrich the knowledge of solving algebraic, transcendental and differential equationby numerical methods
II	The operation of non-periodic functions by Fourier transforms.
III	The transformation of ordinary differential equations in Laplace field and itsapplications
IV	The partial differential equation for solving non-linear equations

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Solve** algebraic and transcendental equations using Bisection method, Regula-falsi method and Newton-Raphson method	Apply
CO 2	**Apply** numerical methods in interpolating the equal and unequalspace data	Apply
CO 3	**Make use of** method of least squares to fit polynomial curves and differential equation by numerical methods	Apply
CO 4	**Apply** the Fourier transform as a mathematical function that transforms a signal from the time domain to the frequency domain,non-periodic function up to infinity	Apply
CO 5	**Explain** the properties of Laplace and inverse transform to various functions the integral transforms operations of calculus to algebra inlinear differential equations	Apply
CO 6	**Solve** the linear, nonlinear partial differential equation by the methodof Lagrange's, separable and Char pit to concern engineering field	Apply

IV. SYLLABUS:

Module-I	ROOT FINDING TECHNIQUES AND LAPLACE TRANSFORMS	Classes: 09

ROOT FINDING TECHNIQUES: Root finding techniques: Solving algebraic and transcendental equations by bisection method, method of false position, Newton-Raphson method.

LAPLACE TRANSFORMS: Definition of Laplace transform, linearity property, piecewise continuous function, existence of Laplace transform, function of exponential order, first and second shifting theorems, change of scale property, Laplace transforms of derivatives and integrals, multiplied by t, divided by t, Laplace transform of periodic functions.

Module-II	INTERPOLATION AND INVERSE LAPLACE TRANSFORMS	Classes: 09

INTERPOLATION: Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange's interpolation.

INVERSE LAPLACE TRANSFORMS: Inverse Laplace transform: Definition of Inverse Laplace transform, linearity property, first and second shifting theorems, change of scale property, multiplied by s, divided by s; Convolution theorem and applications.

Module-III	CURVE FITTING AND FOURIER TRANSFORMS	Classes: 09

CURVE FITTING: Fitting a straight line; Second degree curves; Exponential curve, power curve by method of least squares.

FOURIER TRANSFORMS: Fourier integral theorem, Fourier sine and cosine integrals; Fourier transforms; Fourier sine and cosine transform, properties, inverse transforms, finite Fourier transforms.

Module-IV	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	Classes: 09

STEP BY STEP METHOD: Taylor's series method; Euler's method, modified Euler's method for first order differential equations.

MULTI STEP METHOD: Runge-Kutta method for first order differential equations.

Module-V	PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS	Classes: 09

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equation by Lagrange method.

APPLICATIONS: Method of separation of variables; One dimensional heat and wave equations under initial and boundary conditions.

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 36th Edition, 2010.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., "Engineering Mathematics" for first year, Tata McGraw-Hill, New Delhi, 2008.
3. D. Poole, "Linear Algebra A Modern Introduction", 2nd Edition, Brooks/Cole, 2005.
4. Dr. M Anita, "Engineering Mathematics-I", Everest Publishing House, Pune, First Edition, 2016.

Web References:
1. http://www.efunda.com/math/math_home/math.cfm 2. http://www.ocw.mit.edu/resources/#Mathematics 3. http://www.sosmath.com/ 4. http://www.mathworld.wolfram.com/
E-Text Books:
1. http://www.e-booksdirectory.com/details.php?ebook=10166 2. http://www.e-booksdirectory.com/details.php?ebook=7400re