

**Learning Outcomes:**

After successful completion of the course, student will be able to

- Express physical phenomenon in mathematical formulation
- Understand and solve differential equations
- Basic knowledge of widely used Fourier transform techniques and their applications in computer and IT Engineering

**SYLLABUS**

<b>Unit No.</b>	<b>Topics</b>	<b>Lectures (Hours)</b>
<b>1</b>	<b>LAPLACE TRANSFORMS:</b>  Definition, Laplace transform of elementary functions. Formulas of Laplace transform, Inverse Laplace transforms. Laplace transform of derivatives, Laplace transform of integration. Multiplication by $t^n$ , Division by $t$ , Convolution theorem. Unit step and Heaviside's unit function, Dirac-delta function. Periodic functions Solution of ordinary linear differential equations, simultaneous equation with constant co-efficient applied to electrical circuits	<b>9</b>
<b>2</b>	<b>FOURIER SERIES:</b>  Definition of periodic function, Euler's formula, Functions having points of discontinuity, Change of intervals, Odd and Even functions, Expansion of odd or even periodic functions, Half range sine and cosine series, Elements of harmonic analysis.	<b>9</b>
<b>3</b>	<b>FOURIER TRANSFORMS:</b>  Definition, Fourier integral, Fourier sine and cosine integration, complex form of Fourier integral, Fourier sine transform, Fourier cosine transform, Inverse Fourier transforms.	<b>6</b>
<b>4</b>	<b>THEORY OF COMPLEX VARIABLES:</b>  Limits of Functions, Continuity, Differentiability, Analytic functions, Cauchy-Riemann Equations, Necessary and Sufficient condition for analyticity, Properties of Analytic Functions, Laplace Equation, Harmonic Functions, Finding Harmonic Conjugate functions Exponential, Trigonometric, Hyperbolic functions and its properties. Multiple valued function and its branches: Logarithmic function and Complex Exponent function.	<b>9</b>
<b>5</b>	<b>COMPLEX INTEGRATION:</b>  Curves, Line Integrals (contour integral) and its properties, Line integrals of single valued functions, Line integrals of multiple valued functions (by choosing suitable branches). Cauchy-Goursat Theorem, Cauchy Integral Formula, Liouville Theorem, Fundamental Theorem of Algebra, Maximum	<b>8</b>

**6 NUMERICAL METHODS:**

**7**

Roots of algebraic equations, Solution of linear simultaneous equations, Numerical differentiation and Numerical integration. Numerical methods to solve first order, first degree ordinary differential equations.

**Text Books:**

1. Higher engineering mathematics. By B.S.Grewal.
2. Theory of functions of complex variables. By: Shanti Narayan.

**Reference Books:**

1. Engineering mathematics. By Srivastava.
2. Textbook of engineering mathematics By A.B.Mathur and V.P.Jaggi.
3. Introductory Methods of Numerical Analysis By S.S.Sastry.