

## Engineering Mathematics IV (3-2-0)

### Evaluation:

	Theory	Practical	Total
Internal	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objectives:

After completion of this course students will be able to

- to explain and apply theorems of complex variables in their required applied problems.
- to apply concepts of Fourier and Z-transform in the signal processing.
- to study wave and diffusion equations in Cartesian, cylindrical, and polar coordinates.

### Course Contents:

#### Unit I: Complex variable

12 hrs

- 1.1 Review of complex numbers with their properties
- 1.2 De Moirves Theorem
- 1.3 Function of complex variables,
- 1.4 Conformal mappings
- 1.5 Analyticity , necessary condition of analyticity
- 1.6 Cauchy integral theorem, Cauchy integral formula, Extension form of Cauchy integral formula,
- 1.7 Taylor and Laurent series
- 1.8 Singularities, zeros, poles, complex integration, residue theorem

#### Unit II: Z-transform

9 hrs

- 2.1 Definition, one sided and two sided z transform
- 2.2 Linear Time invariant system, Unit impulse function
- 2.3 Properties of z transform, region of convergence
- 2.4 Inverse Z transform by residue and partial fraction
- 2.5 Parseval theorem, convolution
- 2.6 Application (Solution of difference equation)

#### Unit III: Fourier Integral and Fourier Transform

7 hrs

- 3.1 Fourier series in complex form
- 3.2 Fourier integral, Sine integral and cosine integral
- 3.3 Fourier transform, cosine transform, sine transform
- 3.4 Inverse Fourier transform, Parseval identity
- 3.5 Convolution theorem and its applications

#### Unit IV: Partial Differential Equation

14 hrs

- 4.1 Definition with examples
- 4.2 Method of separation of variables



- 4.3 Derivation and solutions of Wave equations (one and two dimensional) and their applications.
- 4.4 Wave equation by D Alembert's method
- 4.5 Derivation and solution of heat equation (one and two dimensional) and their application
- 4.6 Laplacian equation [Cartesian, polar, cylindrical, spherical form(statement only)], their solutions.
- 4.7 Engineering applications of partial differential equation.

#### Unit V: Curve in space

3 hrs

- 5.1 Ellipsoid, hyperboloid, Paraboloid, cylinder, cone (Standard equations, their sketch)
- 5.2 Tangent line and tangent plane on the space curve

#### Text books:

- 1. E. Kreyszig, *Advanced Engineering Mathematics*, 8th edition Wiley-Easter Publication, New Delhi
- 2. H. K. Dass & R. Verma, *Higher Engineering Mathematics*, First edition, S. Chand & Company Limited, New Delhi

#### Reference Books:

- 1. Digital Signal Processing: J. G. Proakis, Prentice Hall of India.
- 2. V Sundaran, R Bala Subramanayam, K. L . Laxminarayanam, *Engineering Mathematics* , Volume II
- 3. A. V. Oppenheim, *Discrete-Time Signal Processing*, Prentice Hall, India Limited, 1990.
- 4. K. Ogata, *Discrete-Time Control System*, Prentice Hall, India Limited, 1993.

