Complex Variables and Transforms (BH-221)

Pre-Requisite(S)

- Linear Algebra (BH-111)
- Differential Equations (BH-212)

Recommended Book(s)

- Nil

Reference Book(s)

- Erwin Kreyszig, ‘Advanced Engineering Mathematics’, Ninth Edition, 2005,
- International Edition, John Wiley & Sons, ISBN: 0471728977. Thomas Finney, ‘Calculus’, Ninth Edition
- B.P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press, Third Edition
- 4. S.M. Yousuf, ‘Mathematical Methods’ Ilmi Kitab Khana, Lahore

Course Objectives

Introduce the concepts of complex variables, Laplace transform, and Fourier transform, and the use of transforms in the solution of engineering problems.

Course Learning Outcomes (CLO)

CLO-1:	To understand the concepts of complex variables, Laplace transform and Fourier Transform	C2
CLO-2:	To select, apply and critically evaluate the transforms in solution of engineering problems	C3

Course Contents

- Introduction to complex number systems, Argand’s diagram, modulus and argument of a complex number, polar form of a complex number, De Moivre’s theorem and its applications
- Complex functions, analytical functions, harmonic and conjugate, harmonic functions, Cauchy-Riemann equations, line integrals, Green’s theorem, Cauchy’s theorem, Cauchy’s integral formula, singularities Discrete random variables
- Poles, residues, contour integration and applications
- Laplace transform definition, Laplace transforms of elementary functions, properties of Laplace transform, periodic functions and their Laplace transforms and its properties
- Convolution theorem, inverse Laplace transform by integral and partial fraction methods Sum of random variables, central limit theorem
- Fourier transform definition, Fourier transforms of simple functions, magnitude and phase spectra
- Fourier transform theorems, inverse Fourier transform, solutions of differential equations using Fourier transform.
- Introduction to Applications of Transforms

Mapping of CLOs to Assessment Modules

CLOs/PLOs	CLO1	CLO2		
PLO1: Engineering Knowledge	√			
PLO2: Problem Analysis		√		
PLO3: Design and Development of Solution				
PLO4: Investigation				
PLO5: Modern Tool Usage				
PLO6: The Engineer and Society				
PLO7: Environment and Sustainability				
PLO8: Ethics				
PLO9: Individual and Team Work				
PLO10: Communication				
PLO11: Project Management				
PLO12: Life Long Learning				