24MA202 Complex Analysis, Transform Techniques & Statistics

(ECE/EEE / EIE)

Category: Basic Sciences (BS) 4L 0T 0P 4C

Pre-requisite: 10+2 Mathematics

Course Description:

An overview of limit, continuity, differentiability, and analyticity of complex variable functions, construction of analytic functions and expansion of functions, theorems to solve contour integration with their applications in engineering problems. Familiarize the concepts of distinct transformation techniques

Course Aims and Objectives:

- Teach methods to construct analytic/complex potential functions
- Impart the concept of singularities, expansions of complex variable functions about the singular point, and contour integration
- Introducing various transform techniques to analyze continuous and discrete systems in engineering applications

Course Outcomes:

At the end of the course, the student will be able to…

CO 1: Employ methods to construct analytic functions [K3]

CO 2: Determine the series expansions of complex variable function and evaluate contour integration [K3]

CO 3: Apply Laplace transform techniques to convolute functions [K3]

CO 4: Use Fourier series and Fourier transforms to solve periodic and non-periodic functions [K3]

CO 5: Find line and parabola of best fit, correlation coefficient and regression lines [K3]

Course Structure:

Unit 1: Analytic Functions

Contents

Analytic Functions: Limit of a complex function, derivative of f(z), Cauchy-Riemann equations in cartesian and polar coordinates, analytic functions, harmonic functions, orthogonal systems.

Unit 2: Complex Integration

Contents

Complex integration: Complex integration(Definition only),Cauchy's integral theorem(without proof) series of complex terms-Taylor and Laurent Series (without proofs), zeros and singularities of analytic function, residues, calculation of residues, residue theorem(without proof), bilinear transformation.

Unit 3: Laplace Transforms

Contents

Introduction, definition, condition for existence, transform of elementary functions properties of Laplace transforms, transforms of periodic functions, integrals, multiplication by t^n and division by t, evaluation of integrals by Laplace transforms, inverse transforms, method of partial fractions, convolution theorem.

Unit 4: Fourier series and Transforms

Contents

Fourier series: Euler's formulae, conditions for a Fourier expansion, functions having point of discontinuity, change of interval, even and odd functions.

Fourier transforms: Fourier integral theorem (without proof & No problems), Fourier sine and cosine integrals (without proof & No problems), Fourier transforms, Fourier sine and cosine transforms.

Unit 5: Statistics

Contents

Curve fitting, method of least squares, working procedure to fit straight line and parabola, correlation, coefficient of correlation, lines of regression.

Textbook(s) / Reference(s)

Textbook:

[1]. Grewal B. S,"***Higher Engineering Mathematics***", 44th edition, 2017, Khanna Publishers.

References:

[1]. Kreyszig Erwin. "***Advanced Engineering Mathematics***", 9th edition, 2013, Wiley Publishers.

[2]. Jain R.K. &Iyengar S.R.K,"***Advanced Engineering Mathematics***" 5thedition, 2021, Alpha Science International Ltd.

[3]. Ramana B V, "***Higher Engineering Mathematics***", 1st edition, 2007, Tata MC Graw Hill.