

Complex Variables and Transforms

Code	Credit Hours
MATH-232	3-0

Course Description:

This course provides sound knowledge of calculus in the complex domain with a detailed discussion on complex algebra, complex functions, analyticity and contour integration. It also covers Fourier Series, Fourier Integrals and Fourier Transforms to provide students strong mathematical tools to solve Engineering/Technology problems.

Text Book:

1. Advanced Engineering Mathematics (9th Edition) by Ervin Kreyszig.
2. Applied Complex Variables for Scientists and Engineers by Yue Kuen Kwok.
3. A first course in complex analysis with applications by Dennis G. Zill.

Reference Book:

1. Real and Complex Analysis by Walter Rudin.
2. Complex Variables & Applications by James Ward Brown, Ruel V. Churchill.
3. Advanced Engineering Mathematics by Peter V. O'Neil.
4. Advanced Modern Engineering Mathematics by Glyn James.
5. Complex Analysis with applications in Science and Engineering by Harold Cohen.

Prerequisites:

NA

ASSESSMENT SYSTEM

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	50%

Teaching Plan:

Week No	Topics	Learning Outcomes
1	Introduction	Course Outline, objectives, teaching plan, assessment method, Review of complex numbers and complex algebra.
2-3	Complex Functions and Derivatives	Introduction to Complex functions, Real and imaginary components of a function of a complex variable function, Limit and continuity. Derivative, Cauchy Riemann Equations, Properties of UV-function, Analytic Functions, Harmonic functions. Complex logarithms. Derivatives of analytic functions. Dirichlet Problem.
4-5	Complex Integrals	Introduction to Line integral in complex plane. Cauchy Integral theorem, Cauchy Integral formula
6-8	Complex Sequences and Series	Sequences and Series, Power series, Taylor series. Laurent series. Singularities and Zeros. Residue integration method, Evaluation of real integrals
9	Mid Semester Exam	
10-11	Conformal Mapping	Concept of mapping, Complex mapping functions, Conformal mapping and its applications.
12-14	Fourier Series and Fourier Integral	Periodic functions, Trigonometric series, Fourier series. Fourier series for functions of any period. Even and Odd functions, Half range expansions. Complex Fourier series. Amplitude phase form of Fourier Series. Applications. Fourier integral. Introduction to Fourier Transform.
15-17	Fourier Transform and Z-Transform	Properties of Fourier Transform. Inverse Fourier Transform. Applications of Fourier Transform. Introduction, Definition, examples and properties of Z-transform. Inverse of Z-transform. Solution of Difference equation
18	End Semester Exam	