MATH 3364: Introduction to Complex Analysis

Prerequisites: MATH 3331.

Text: Fundamentals of Complex Analysis with Applications to Engineering and Science, 3rd Edition, by E.B. Saff and A.D. Snider, Prentice-Hall, 2003.

Chapter 1: Complex Numbers

- 1.1 The Algebra of Complex Numbers
- 1.2 Point Representation of Complex Numbers
- 1.3 Vectors and Polar Forms
- 1.4 The Complex Exponential
- 1.5 Powers and Roots
- 1.6 Planar Sets
- 1.7 The Riemann Sphere and Stereographic Projection

Chapter 2: Analytic Functions

- 2.1 Functions of a Complex Variable
- 2.2 Limits and Continuity
- 2.3 Analyticity
- 2.4 The Cauchy-Riemann Equations
- 2.5 Harmonic Functions

Chapter 3: Elementary Functions

- 3.1 Polynomials and Rational Functions
- 3.2 The Exponential, Trigonometric and Hyperbolic Functions
- 3.3 The Logarithmic Function
- 3.4 Washers, Wedges, and Walls
- 3.5 Complex Powers and Inverse Trigonometric Functions

Chapter 4: Complex Integration

- 4.1 Contours
- 4.2 Contour Integrals
- 4.3 Independence of Path
- 4.4 Cauchy's Integral Theorem
- 4.5 Cauchy's Integral Formula and Its Consequences
- 4.6 Bounds for Analytic Functions

Chapter 5: Series Representations for Analytic Functions

- 5.1 Sequences and Series
- 5.2 Taylor Series
- 5.3 Power Series
- 5.4 Mathematical Theory of Convergence
- 5.5 Laurent Series
- 5.6 Zeros and Singularities
- 5.7 The Point at Infinity

Chapter 6: Residue Theory

- 6.1 The Residue Theorem
- 6.2 Trigonometric Integrals
- 6.3 Improper Integrals of Certain Functions
- 6.4 Improper Integrals Involving Trigonometric Functions
- 6.5 Indented Contours
- 6.6 Integrals Involving Multiple-Value Functions
- 6.7 The Argument Principle and Rouche's Theorem

At the instructor's discretion, other topics as time permits.