MA 437 Complex Variables

Syllabus*

Course Description Arithmetic of complex numbers; regions in the complex plane; limits, continuity, and derivatives of complex functions; elementary complex functions; mappings by elementary functions; contour integration; power series; Taylor series; Laurent series; calculus of residues; conformal representation; applications. Credit for both MA 437 and MA 537 not allowed.

Prerequisites C or better in MA 238.

Textbook *Complex Variables and Applications*, 8th edition by James Ward Brown and Ruel V. Churchill. Published by McGraw-Hill, Inc. ISBN #0073051942 / 9780073051949

Topics & Time Distribution

Coverage: Chapter 1	all sections	2 weeks
Chapter 2	all sections	2 weeks
Chapter 3	all sections	2 weeks
Chapter 4	all sections	3 weeks
Chapter 5	all sections	2 weeks
Chapter 6	all sections	2 weeks

Chapter 7 sections: Evaluation of Improper Integrals, Improper Integrals from Fourier Analysis, Jordans Lemma 1 week

Note - time allotments are approximate and do not include exams.

MA 437 Complex Variables Learning Objectives

- Understand properties of complex numbers
  - algebraic operations (including powers and roots) with complex numbers; algebraic and exponential forms
  - geometric properties; regions in the complex plane; elementary mappings
- Understand ideas of convergence, continuity and differentiation in the complex plane
  - Complex functions, limits, derivatives, and analytic functions
  - Be able to state and apply the Cauchy-Riemann equations
  - Harmonic functions
- Understand properties of elementary functions including exponential, trigonometric, and logarithmic functions

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- Understand and calculate contour integrals
  - Path integration. Be able to compute complex contour integrals using parameterization
  - Cauchy theorem and Cauchy integral formula
- Understand and compute Taylor and Laurent series expansions for analytic functions
- Residues and isolated singular points
  - Be able to classify of isolated singular points
  - Residues; poles, residues at poles
  - Cauchys residue theorem
  - Understand a connection between zeros and poles of analytic functions
- Be able to apply complex residue theory to integration of real valued functions over the real line.