

Department: Mathematical Sciences

Course Title and Number: MATH 632 - Complex Analysis

Semester Hours: 3

Course description: A first graduate level course in complex analysis, illustrating the beauty and power of the notion of complex differentiability.

PRQ: MATH 430/530 and 431/531, or equivalent.

Course objectives: The student is expected to acquire a thorough understanding of the theory of complex analysis at the graduate level. In particular, the student will be expected to:

- reason rigorously in mathematical arguments,
- communicate mathematics clearly and efficiently,
- think creatively in abstract situations,
- learn when diagrams can help understanding of a situation, and the difference between a proof and a picture.

Syllabus:

- Construction and properties of complex numbers.
- Topology of the complex plane.
- Complex differentiation, the Cauchy-Riemann equations and analytic functions.
- Power series, elementary functions and their properties.
- Complex integration and Cauchy's theorem, applications of Cauchy's theorem such as Liouville's theorem, Schwarz's lemma and the maximum modulus theorem.
- Laurent series, singularities, residue theory and applications.

Selective Bibliography:

- J. B. Conway, *Functions of one complex variable I*.
- T. Needham, *Visual Complex Analysis*.