# Math 623 Complex Analysis

**Instructor:** Professor Eric Key

**When:** Monday and Wednesday, 5:00 to 6:15 PM.

**Where:** Engineering and Mathematical Sciences Room E206

**Course number:** 39906

**Textbook:** *Complex Variables* by Norman Levinson and Raymond M. Redheffer (Holden-Day). This book is currently out of print, but should be available through the bookstore by permission from the publishers. The library has two copies and one will be put on reserve. The call number is QA331 L47 if you want to look at one before registering. There are also copies available through used book dealers on line.

I propose the following course of study:

1. Complex numbers and functions
   (a) Complex numbers
   (b) Absolute values
   (c) Multiplication and the complex plane
   (d) Regions and functions
   (e) Limits and continuity
   (f) Complex numbers as ordered pairs
2. The complex derivative
   (a) Analytic functions
   (b) Exponential and trigonometric functions
   (c) The logarithm and power functions
   (d) The Riemann surface for log(z)
   (e) Harmonic functions
3. Complex integration
   (a) Integration on a contour
   (b) The Cauchy integral theorem
   (c) The Cauchy-Goursat theorem
   (d) Consequences of the Cauchy integral theorem
   (e) Taylor series
   (f) The maximum principle
   (g) Isolated singularities
   (h) Laurent series
   (i) Analyticity
4. Residue Theory
   (a) Simply connected domains
   (b) The residue theorem
   (c) Integrals over the real axis
   (d) Rouche's theorem
   (e) Other forms of the residue theorem
5. Conformal Mapping

(a) Conformal mapping and bilinear transformations

(b) Harmonic functions and mappings

(c) The Schwarz-Christoffel transformation

6. Uniform Convergence

(a) Convergence of sequences and series

(b) Power series

(c) Functions defined by integrals

(d) Formulae of Parseval, Schwarz and Poisson

Grades will be based on 6 homework assignments and a comprehensive in class final examination.