MAT 573 Complex Analysis II
Course Announcement

Professor: John Quigg **Semester:** Spring 2019

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Classes: Monday and Wednesday 3:05–4:20 in DISCVRY 113

Prerequisite: MAT 572 Complex Analysis I, or approval of instructor

Topics:

The course will cover topics chosen from the following list:

- **Harmonic functions**, which are the real (equivalently, imaginary) parts of holomorphic functions, and which have a theory all their own, culminating in the solution of the Dirichlet problem to find harmonic functions with prescribed boundary values.
- **Weierstrass' Product Theorem**, describing how entire functions with prescribed zeros can be constructed using infinite products, generalizing from polynomials
- **Runge's Theorem**, showing how holomorphic functions on compact sets can be uniformly approximated by rational functions
- **Mittag-Leffler Theorem**, showing how meromorphic functions with prescribed poles and principal parts can be constructed using infinite series, generalizing from rational functions.
- **Riemann Mapping Theorem**, showing how simply connected open sets can be mapped bijectively and holomorphically onto the unit disk.
- **Riemann Surfaces**, showing how "multiple-valued functions" such as $\log z$ and $z^{1/n}$ can be treated "all at once" in a rigorous way, as connected components of sheaves of germs of holomorphic functions.

Textbook: There is no required text — instead, I will post lecture notes. But suggested references include:

- L. V. Ahlfors, "Complex Analysis", 3rd ed., McGraw-Hill, 1978.
- J. B. Conway, "Functions of One Complex Variable", 2nd ed., Springer-Verlag, 1978.
- S. Lang, "Complex Analysis", 2nd ed., Springer-Verlag, 1965.
- W. Rudin, "Real and Complex Analysis", McGraw-Hill, 1987.