Mei-Chi Shaw

Spring 2018, MWF 3:00-3:50 pm

Math. 60380 Basic Complex Analysis II

The main topics of the course will be on the theory of Riemann surfaces using modern approach. We will cover the classical results in Riemann surfaces, including function theory on Riemann surfaces, Picard's theorem, uniformization theorem, Riemann Roch theorem. Harmonic functions and the Dirichlet problem by both classical and modern approach will be discussed systematically. We will also emphasize the interplay between complex analysis, Riemannian geometry, topology and differential manifolds. The method is to use the Cauchy-Riemann equations and the Hodge theorem. This potential theoretic approach will yield the classical results directly and streamline the classical topics.

Textbook:

We will continue to use the manuscript coauthored with Dr. Charles Stanton. The manuscript is based on lecture notes that I taught over the years.We will cover the following chapters:

Chapter 5: The Cauchy-Riemann equation and Poisoon kernel.

Chapter 6: The Dirichlet Problem and Riemann mapping theorem.

Chapter 7: Hilbert space approach to the Dirichlet problem.

Chapter 8: Compact Riemann surfaces.

Chapter 9: Uniformization of Riemann Surfaces.

Chapter 10: Introduction to several complex variables.

Grades:

Homework: 40%

MIdterm Exam: 40%

Project 20%: Each student will do an individual course project of a topic of your choice. A preliminary report of the topic should be submitted before the end of the semester. Each student will submit a paper on the topic and make a presentation in front of the class at the end of the semester.

Office Hours: There will be regular office hours every Wednesday, 12:00-2:00 PM at my office (Hayes-Healy 244) or by appointments.

Other References:

1. Ahlfors, L. V., Complex Analysis, 3rd edition, New York, Mcgraw-Hill, 1979.
2. Donaldson, S. Riemann Surfaces, Oxford University Press, 2011.
3. Forster, O. Lectures on Riemann Surfaces. Springer-Verlag, 1993
4. Krantz, S., Complex Analysis from the Geometric point of view. Cirus Vance.
5. Narasimhan, R. Complex Analysis in one variable, Birkhäser,

Prerequisite: Math 60370 or some basic knowledge of one complex variable.