

MATH 417, SUMMER 2019

- Meeting time: MWF 10-11:40 in GH 204
- Professor: Kevin Whyte, SEO 515 12-1 MF and by appointment (email : kwhyteuic.edu)
- TA: Jake Herndon, MSLC Th 10-1
- Course web page : <http://homepages.math.uic.edu/kwhyte/math417.html>

This class is an introduction to analytic functions of one complex variable. Our major topics will be : Cauchy's Integral Formula, Power Series, Residues and Poles, and Conformal mappings. Complex analysis has surprising applications in a number of areas of mathematics - geometry (Riemann surfaces and the Riemann mapping theorem), number theory (the fundamental theorem of algebra and the prime number theorem), as well as physics, fluid dynamics, and many other fields. The only formal prerequisite is multivariable calculus, but we will be focused on a rigorous mathematical treatment of the subject and so the reading, discovering, and writing of proofs will be central. We do not have a required textbook; the recommended text is **Complex Analysis** by Bak and Newman, but the book **Complex Variables and Applications** by Brown and Churchill (as ordered by the bookstore) is also acceptable.

HOMEWORK

Working through many exercises is essential to learning the material. We will spend the first half of each Monday's class going over problems and questions. A handful of problems will also be collected each week : one or two of these will be assigned in each lecture to be handed in on Mondays.

EXAMS

We will have one midterm (on July 12th) and a final exam (on Aug 9th), both at the usual class time and room.

GRADING

The course grade will be determined by :

- Homework 25%
- Midterm 35%
- Final Exam 40%

ATTENDANCE

Given that the summer session is only 8 weeks, it is especially important to keep up with the syllabus. If you have a conflict and must miss a lecture, please contact me as soon as possible to catch up on what was missed. If you have a conflict with either of the exam dates please make arrangements as far in advance as possible.

SCHEDULE OF TOPICS

- Week 1 : Review of complex numbers. Definitions of derivatives, analytic functions, and the Cauchy-Riemann equations. Convergence of series of complex numbers and power series. Elementary functions.
- Week 2 : Path integrals and Cauchy's integral formula. Liouville's theorem. Application: Fundamental theorem of Algebra.
- Week 3: Properties of analytic functions: power series representation, mean value theorem, open mapping theorem.
- Week 4: Simply connected domains and the general Cauchy integral formula. The Logarithm function. Review for exam.
- Week 5: Isolated singularities. Laurent Expansions. The Casorati-Weierstrass Theorem.
- Week 6: Winding numbers and Residues. Contour integrals.
- Week 7: Conformal mappings and the Riemann Mapping theorem.
- Week 8: Applications to number theory: the prime number theorem. Review for Final exam.

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