

# MATHEMATICS 4200

INTRODUCTION TO COMPLEX VARIABLES  
SUMMER 2008

**Instructor.** Bobby Hanson

**Office.** JWB 314 (easy to remember:  $[100\pi]$ )

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**Office Hours.** I am usually available right after class, or by appointment.

**Class.** Daily 8:45 A.M. — 10:00 A.M., LCB 222.

**Text.** BASIC COMPLEX ANALYSIS by Marsden and Hoffman.

**Course Web Page.** <http://www.math.utah.edu/~bobby/4200>

**Prerequisites.** Math 3210-3220 or equivalent; we will use concepts from analysis including estimation via the triangle inequality, continuity, the derivative matrix and differentiability of multivariable functions, path integrals and Green's Theorem. You will be expected to learn the key theorems in this course, and your homework will include theoretical problems along with computations and applications.

**Course Outline.** The unfortunately-named “imaginary” and “complex” numbers were originally introduced by Geronimo Cardano in the 1500s as an algebraic artifice for factoring polynomials. You probably all first encountered  $i = \sqrt{-1}$  and complex numbers of the form  $a + bi$  when factoring quadratic equations. You may know that complex numbers share the same field axioms for addition and multiplication as the real numbers. You probably also remember Leonhard Euler's beautiful formul from the 1600s,

$$e^{i\theta} = \cos \theta + i \sin \theta,$$

and its applications to differential equations. However, it was not until the 1800s that mathematicians including Karl Friedrich Gauss, Augustin Cauchy, Peter Dirichlet, Karl Weierstrass and Georg Friedrich Bernhard Reimann more fully developed the branch of mathematics known as Complex Analysis. This is a core field of study, and to the present day remains an essential tool in many areas of mathematics and science.

In this course we will systematically develop the theory, the calculus of Complex Analysis. The first 3/4 of the course will be devoted to this, covering Chapters 1 through 5 in the text. The last 1/4 of the course will be aimed at classical applications of Complex Analysis in DEs and PDEs. The big topics for the course will include Differentiability and the Cauchy-Reimann Equations, Complex Integrals, Cauchy's Theorem, Power Series, Residue Calculus, and Conformal Mappings.

**Homework (30%).** Homework will be assigned from each section of the book. Twice a week, on Wednesday and Friday, we will have a presentation day. We will go over the homework problems together on these days. I will ask for volunteers to present several of the problems on the blackboard. I won't ask anyone to present a problem they don't know how to do. Your homework grade will be based on the problems you present during the semester.

**Exams (20% each).** There will be two midterm exams in the class.

**Final Exam (30%).** The Final Exam will be held on Thursday, July 31, from 7:30 A.M. to 9:30 A.M. The exam will be comprehensive. You must take this exam to pass the class.

**Grading.** 90% is an **A**, 80% is a **B**, etc. I will award +/– grades on the fringes of these intervals.

**ADA.** The Americans with Disabilities Act requires reasonable accommodations be provided for students with physical, cognitive, systemic, learning and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations for this course.