

**Mathematics 3160**  
Applied Complex Variables  
Fall 2006 (MW 9:40-10:30am, AEB 110)

**Instructor:** Grady Wright                      **Phone:** 581-8649  
**Office:** JWB 126                                      **E-mail:**  
**Office Hours:** MTW 10:35-11:45am, or by appointment, or whenever I'm free

**Text:** J. Brown and R. Churchill, *Complex Variables with Applications*, 7<sup>th</sup> edition, McGraw Hill, 2004

**Course webpage:** <http://www.math.utah.edu/~wright/courses/3160>

**Course description:** We discuss the algebra of complex numbers, elementary functions of complex arguments, the theory of analytic functions, the Taylor and Laurent expansion of a function, integration in the complex plane, and conformal mappings with applications to electrostatics, heat, and fluid flow.

**Prerequisites:** No previous experience in complex variables is necessary. However, knowledge of the following topics is required:

- Single and multivariable calculus
- Ordinary differential equations and linear algebra (MATH 2250 or 2280)

**Homework:** Homework is assigned on a weekly basis and is posted on the [course webpage](#) on Wednesdays or Thursdays and due the following Wednesday **at the end of class**. Late homework is accepted up to 5 days after the due date for half the credit. Your submitted homework should show all necessary work you used to solve the problems; mathematical statements should be complete (or nearly complete) sentences; and the reasoning and logic underlying all arguments should be clearly spelled out. Please see the attached sheet "How to Present your Work" for tips on meeting these requirements (this sheet may also be downloaded from the course website). **Failure to adhere to the above requirements may result in a loss of points.**

**Collaboration:** Collaboration is part of the real world and therefore permitted for all homework assignments, BUT NOT EXAMS. However, **each student is responsible for turning in their own written solutions to the problems**. Straight copying of another student's work will result in a zero on that assignment for all parties involved.

**Technology:** A calculator is not required for the course, although it may be useful for some of the homework problems. You may also use software such as *Maple* and *Mathematica* for the homework problems. This software is available for your use in the Undergraduate Mathematics Computer Lab and available for purchase from the bookstore. Calculators will be allowed for the exams. However, the use of notebook computers (and thus *Maple* and *Mathematica*) and wireless devices is prohibited during exams.

**Grading policy:** The final grade for the course is based on homework assignments, two midterm exams, and a cumulative final exam. The breakdown for the course grade is as follows:

- Homework: 30%
- Midterm 1 (Wednesday, Oct. 4, 2006): 20%
- Midterm 2 (Wednesday, Nov. 16, 2006): 20%

- Final (Monday, Dec. 11, 2006 8:00-10:00am): 30%

**Students with disabilities:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. Reasonable accommodations will be provided for students with physical, sensory, cognitive, systemic, learning and psychiatric disabilities. If you need accommodations in this class, please contact me at the beginning of the semester.

**Tutoring:** Free “drop-in” tutoring is available for this course in room 155 of the T. Benny Rushing Mathematics Center (adjacent to the LCB and JWB buildings). For more information about the tutoring center see <http://www.math.utah.edu/ugrad/tutoring.html>.

**Important Dates:**

- **Sept. 1** – Last day to drop term and first session classes.
- **Sept. 4** – Labor Day: **No Class**
- **Sept. 5** – Last day to add classes and to elect CR/NC or audit.
- **Oct. 5-6** – Fall break: **No class**
- **Oct. 20** – Last day to withdraw from term length classes
- **Nov. 23-24** – Thanksgiving break: **No Class**
- **Dec. 1** – Last day to reverse CR/NC for term and second session
- **Dec. 7** – Classes end
- **Dec. 11** – Final exam, 8:00-10:00am

**Course outline:** We will try and cover the following material (in roughly this order):

Section	Topic
1—3	Complex numbers
4—7	Geometric properties
8—9	Roots
10	Regions
11—13	Mappings
14—16	Limits
17—19	Derivatives
20—27	Cauchy-Riemann equations
29—32	Logarithms
28, 33—35	Exponential/trigonometric functions
36—41	Contour integrals
42—43	Antiderivatives
44—46	Cauchy-Goursat theorem
47—48	Cauchy integral formula
49—50	Liouville's theorem
51—54	Algebra and series

Section	Topic
55—61	Laurent series
62—64	Residues
65—70	Poles
71—74,78	Evaluating integrals
75—77	Indented paths
79—80	Argument principle
81—82	Inverse Laplace transform
83—88	Linear fractional transform
89—93	Mapping by logarithms, roots, etc.
94—97	Conformal mappings
98—99	Harmonic functions
100—103	Steady temperatures
104—105	Electrostatics
106—108	Fluid flow

**Other good reading:**

- Ablowitz & Fokas, *Complex Variables, Introduction and Applications* (Cambridge University Press)

*The complexity of complex variables is more imaginary than real.* –An encouraging observation

*The number you have dialed is imaginary. Please rotate your phone 90 degrees and try again.* –A math joke

*The shortest path between two truths in the real domain passes through the complex domain.* –Jacques Hadamard