Complex Analysis Syllabus

Math 421, Kowalski

Essentials

- Math 421, Complex Analysis
  SDSMT, Spring 2000, 3 credits
- Section 1 meets Monday, Wednesday, and Friday from 2:00–2:50 PM in McLaury 304.
- The course text is *Fundamentals of Complex Analysis with Applications to Engineering, Science, and Mathematics* (seventh edition), by Saff and Snider. We will cover Chapters 1–7.

Instructor information

- Dr. Travis Kowalski (either “Travis” or “Dr. K” is fine)
- Office: McLaury 314D
  Phone: (605) 394-6146
  Email: travis.kowalski@sdsmt.edu
- Webpage: http://www.mcs.sdsmt.edu/tkowalsk/
- Office hours: Official hours are available at the website above. I have an open-door policy, however: if my door is open, you may come in and ask me anything. You can also always make an appointment with me individually; just contact me by email or after class.

Course objective and description. Complex analysis is the study of calculus with the imaginary number included. Topics include the algebra of complex numbers, complex functions, contour integration and Cauchy integral theorems, Taylor and Laurent series and the residue theorem, the evaluation of real definite integrals, elementary mapping problems.

Prerequisites. Math 225 (Calculus III) completed with a C or better.

Technology. Given the underlying multi-variable nature of the material, technology can give us an appreciation of complex analysis’ aesthetic beauty and its uses in engineering and science disciplines. To this end, all students have access to a powerful “computer algebra system” called Maple, which can be accessed from any campus computer, and I will illustrate its use daily in class and through occasional computer labs.

A graphing calculator, while not required, is certainly useful for homework. Virtually any kind of graphing calculator should be suitable for this course, though Texas Instruments are typically the easiest to use. The “unofficial” Math department recommendation is the TI-89, although the TI-83 and TI-84 are also good choices.

Grading. The grading is based on the following:

Assignments: 40%
Projects: 10%
3 Exams: 50% (total)

The third and final exam is on Tuesday, May 5, 1:00-2:50 PM. This is non-negotiable. Letter grades will be assigned according to the following scale:

- A: 90–100%
- B: 80–89%
- C: 70–79%
- D: 60–69% points
- F: less than 60%

Plus or minus grades are not allowed (Board of Regents policy, Fall 2003). I reserve the right to lower these values as I see fit.

Instruction and attendance. Class will mostly take the form of lecture and discussion. However, we may occasionally have group activities, computer labs, or other meetings as need be. Hence, daily attendance is expected, although I will not police it. You should bring your book to every class period and be prepared by reading the corresponding text material before the coverage of the material in class (and it is likely you will need to read the same material after class). It is expected that you should spend at least 2 hours of study for every hour in class.
Course outcomes. Upon completing this course you should, at a minimum, be able to:

1. Perform basic arithmetic with complex numbers
2. Use CR equations to test for analyticity and compute a derivative
3. Work with standard complex functions (mapping properties, derivatives, differences from real analogs)
4. Compute contour integrals using definition and Cauchy integral theorems
5. Compute Taylor and Laurent series expansions of functions
6. Apply the Residue Theorem, particularly in the evaluation of real definite integrals

Homework. The only way to learn mathematics is to do mathematics, so there will be homework assigned. Each lecture I will assign some homework problems from the day’s material. These assignments will be collected about once a week in class. Feel free to discuss problems with your peers, but make sure that the individual write-up is your own. All such assignments will be announced in class and/or on the webpage. Late homework will be accepted, with a 50% reduction of points for each day it is late.

Projects. Complex analysis has a number of remarkable uses, beautiful results, and mystifying consequences. As a result, I will have you explore some of these in detail as projects beyond the book’s material. We will be assembling a “function field guide” that explores common elementary complex functions; we will also be looking into contrasts between the real world and the complex one; we will be investigating applications in the real world. More about projects during the semester.

Examinations. There will be three hour-long examinations over the semester – two mid-term and one during finals week – that will test your mastery of the course material. These will not be comprehensive, and will test your ability to use your calculus tools in novel ways; the extended problems will be good practice for these. Exams will be announced at least one week ahead of time.

Make-up exams. For any conflict with a scheduled exam time that is known in advance, the student is obligated to notify the instructor in advance; I will most likely be happy to give you a make-up exam. Exams that are missed with no prior notification or for unexcused reasons will earn a score of 0 and no make-up will be allowed. Notification may be made via email or phoning me. Also, make sure you know when your final is. By decree of the Math Department, under no circumstances will an early final exam be administered!

Special needs. Students with special needs or requiring special accommodations should contact the instructor and/or the campus ADA coordinator, Dr. Jolie McCoy, at 394-1924 at the earliest opportunity.

Classroom behavior. The Student Handbook prohibits the disruption or obstruction of teaching. Activities that are disruptive and/or obstructive to teaching will include, but are not limited to, the following: showing up late to class, eating in class, or the use of electronic noisemakers like cell phones or pagers. If an electronic device disrupts class then the owner will sacrifice their highest homework score for each offense, or pay The Fine. The Fine for electronic device disruption is the purchase of cookies and/or donuts for the entire class. This happens to be similar to a policy used at the state legislature.

Academic dishonesty. If you cheat on a test or assignment, you may fail the course. At the very least, you will get a negative score on that test or assignment since cheating is worse than doing nothing. Discussing a problem with other students is a valuable learning tool; copying someone else’s work is not. All students will be held to the institutional standard for academic honesty and integrity. The following are the relevant sections taken from the student handbook (SD BOR policy), which states that acts of academic dishonesty will include, but are not limited to, the following: Cheating, plagiarism, dishonesty, furnishing false information, or forgery.

State Policy on “Freedom in Learning.” Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should contact the dean of the college which offers the class to initiate a review of the evaluation.

Official policies. You can read the official Board of Regents student policies at