Fayetteville State University  
College of Arts and Sciences  
Department of Mathematics and Computer Science  

Course Outline and Syllabus  

Spring 2003

I. LOCATOR INFORMATION:

1. COURSE NAME: Complex Variables
2. COURSE NUMBER: MATH 492
3. TIME CLASS MEETS: 2:00 – 3:20 p.m.
4. DAYS CLASS MEETS: T & R
5. ROOM/BLDG., WHERE CLASS MEETS: SBE 114
6. INSTRUCTOR: Dr. Guanghua Zhao
7. OFFICE LOCATION: SBE 347
   OFFICE HOURS: MWF 12:20-1:00; TR 3:30-6:30
8. INSTRUCTOR TELEPHONE: (910) 672-1500
9. E-MAIL AND WEB: gzha@uncfsu.edu http://faculty.uncfsu.edu/gzhao
10. FINAL EXAMINATION:

II. COURSE DESCRIPTION:

A rigorous study of elementary functions, differentiation and integration of analytic functions, Taylor and McLaurin series, Residue Theorem, and contour integration. Prerequisites: MATH 412 or MATH461.

III. TEXTBOOK:


IV COURSE OBJECTIVES:

The main objective of this course is to develop in a rigorous and self-contained manner those parts of theory which are prominent in the applications of the subject. These topics will enable the students to take further courses in complex analysis.

V COURSE COMPETENCIES:

Demonstrate a thorough mastery of algebraic properties of the complex numbers including the polar representative of complex numbers (5.3). Know the symbolism of mathematical logic (8.1). Demonstrate a thorough knowledge of the concepts of equivalence and implication(8.2). Negate a logical statement that employs quantifiers (8.3). Possess a thorough knowledge of the role of proof in the study and development of mathematics (8.5). Create original proofs in the various branches of mathematics including direct proofs, indirect proofs, and proofs using mathematical induction (8.6). Know the relationship between the logical
operations and the set of theoretic operations (9.2). Demonstrate a thorough knowledge of the concept of a set theoretic relation (9.3).

VI EVALUATION CRITERIA/GRADING SCALE:

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
<th>Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
<td>A 92 – 100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
<td>B 83 – 91</td>
</tr>
<tr>
<td>Instructor’s Option</td>
<td>10%</td>
<td>C 73 – 82</td>
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<td>D 64 – 72</td>
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<td>F Below 64</td>
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</table>

VII CONDUCT OF COURSE/CLASS DECORUM:

1. Students must refrain from smoking, eating, and drinking in the classroom. The rights of others must be respected.

2. Students are encouraged to ask questions of the instructor in class and to respond to those posed by the instructor. They should not discourage others from raising or answering questions. Often, other students have the same questions which they wish to ask, but are hesitant to do so.

3. Students are expected to attend all classes (Attendance is Very Important!!!!!), to complete all class assignments, and to spend adequate time on their classwork to ensure that the course outcomes are met.

4. Talking in class between students is strictly unacceptable. Discussions should be directed to the instructor.

5. Make-up exams will be a lot harder.

6. Late homework will no longer be accepted after it has been graded and returned to class.

VIII COURSE OUTLINE:

<table>
<thead>
<tr>
<th>LECTURE</th>
<th>TOPIC FOR DISCUSSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chapter 1—Complex Numbers</td>
</tr>
<tr>
<td></td>
<td>Sums and Products, Algebraic Properties</td>
</tr>
<tr>
<td>2</td>
<td>Moduli and Conjugates</td>
</tr>
<tr>
<td>3</td>
<td>Dr. Martin Luther King’s Birthday—NO CLASS</td>
</tr>
<tr>
<td>4</td>
<td>Triangle Inequality, Polar Coordinates and Euler’s Formula</td>
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<tr>
<td>5</td>
<td>Products and Quotients in Exponential Form</td>
</tr>
<tr>
<td>6</td>
<td>Roots of Complex Numbers</td>
</tr>
<tr>
<td>7</td>
<td>Regions in the Complex Plane</td>
</tr>
<tr>
<td>8</td>
<td>Chapter 2—Analytic Functions</td>
</tr>
</tbody>
</table>
Functions of a Complex Variable

9  Mapping and Limits, Theorems on Limits
10  Limits Involving the Point at Infinity
11  Continuity, Derivatives
12  Derivatives and Differentiation Formulas
13  Cauchy-Riemann Equations
14  Sufficient Conditions for Differentiability
15  Mid-Term Examination

Spring Break

16  Analytic Functions
17  Harmonic Functions
18  Chapter 3—Elementary Functions
   The Exponential Function
19  Trigonometric Functions
20  Hyperbolic Functions
21  The Logarithmic Function and Its Branches
22  Complex Exponents
23  Inverse Trigonometric and Hyperbolic Functions
24  Chapter 4—Integrals
   Complex-Valued Functions w(t)
25  Contours
26  Contour Integrals, Contour integral Examples
27  Antiderivatives, Antiderivatives and Examples
28  Cauchy-Goursat Theorem
29  Cauchy Integral Formula
30  Extended Cauchy Integral Formula

IX  TEACHING STRATEGIES:

Lecture, problem discussion, group presentations


