Math 519 – Complex Analysis

Course Description from Bulletin: Analytic functions, contour integration, singularities, series, conformal mapping, analytic continuation, multivalued functions. (3-0-3)

Enrollment: Elective for AM and other majors.

Textbook(s): L. Ahlfors, *Complex Analysis*, McGraw-Hill (1979), ISBN: 00700006571.
J. Conway, *Functions of One complex Variable*, Springer (1995), ISBN: 0387903283.

Other required material:

Prerequisites:

Objectives:

1. Students will learn to use the basic geometry of the complex plane as a tool for solving analytic problems.
2. Students will be proficient in representing analytic functions in terms of Taylor and Laurent series.
3. Students will be able to identify and classify singularities of analytic functions, including the point at infinity
4. Students will be proficient in evaluating contour integrals by the residue theorem and applying this to evaluate real integrals and series
5. Students will be able to transform regions using conformal mappings and be able to apply this to solve Laplace equations.

Lecture schedule: 3 50 minutes (or 2 75 minutes) lectures per week

Course Outline:	Hours
1. Complex Plane	4
a. Complex numbers	
b. Polar form	
c. Basic regions in complex plane	
d. Stereographic projection	
2. Analytic Functions	8
a. Cauchy-Riemann equations	
b. Harmonic functions	
c. Elementary functions	
d. Analytic functions as mappings	
3. Integration	10
a. Riemann-Stieltjes integrals	
b. Contour integrals	
c. Cauchy's Theorem and consequences	
4. Taylor and Laurent Series	8
a. Singularities	
b. Analytic continuation	
c. Residue theorem and applications	

5. Conformal Mapping 8
    a. Analytic functions
    b. Mobius transformations
    c. Schwarz-Christoffel transformations
    d. Applications
6. Choice of Optional Topics 4
    a. e.g. Laplace transforms, infinite products, gamma functions, Mittag-Leffler Theorem, ….

Assessment:	Homework	20-40%
	Quizzes/Tests	20-50%
	Final Exam	30-50%

Syllabus prepared by: Art Lubin and Xiaofan Li
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