



Math 513 – Complex Variables I Course Syllabus

Course description: Complex arithmetic, power series representations and their properties, behavior of elementary functions, and properties of analyticity.

Credit hours: 3

Course Prerequisites and Corequisites: MTH 439

Course Outline: This is the first part of the two part introductory course in Complex Analysis. In this course we cover the following topics:

	<u>Approximate time spent</u>
• Basic properties of complex numbers	30%
○ Complex field and representation	
○ Geometric representation and interpretation	
○ Modulus and conjugation	
○ Stereographic projection	
○ The Riemann metric	
• Power series representations and their properties	25%
○ Convergence of sequences and series	
○ Uniform convergence	
○ Radius of convergence	
○ Differentiation of power series	
• Elementary functions	25%
○ Exponential function	
○ Trigonometric functions (regular and hyperbolic)	
○ General power functions	
• Analytic functions	20%
○ Maximum and Minimum Modulus principles	
○ Cauchy-Riemann equations	
○ Harmonic functions	
○ Linear fractional transformations (as time allows)	

Student Learning Outcomes (SLO): At the end of MTH 513, a student who has studied and learned the material should be able to:

1. Demonstrate use of the different representations of complex numbers and use them appropriately. [PLO: 2,3,4]
2. Apply basics principles of convergence to complex power series and analyze the analyticity of complex functions. [PLO: 2,3,4]
3. Demonstrate use of the significance of the Cauchy-Riemann equations in the context of harmonic functions. [PLO: 2,3,4]

Program Learning Outcomes (PLO):

Students graduating from SFASU with a M.S. degree and a major in mathematics will:

2. **[Skills]** Execute advanced mathematical procedures and build upon these standard procedures. (learning of new skills, applying or extending skills in new situations)
3. **[Concepts]** Demonstrate knowledge of core mathematical concepts. (definitions and theorems in analysis, definitions and theorems in linear or abstract algebra, definitions and theorems in theoretical statistics)
4. **[Problem Solving]** Demonstrate initiative in using various mathematical tools, including technology, to formulate, represent, and solve problems. (implement algorithms or definitions, discuss algorithmic proficiency, find numerical approximations)