# Math 514 – Complex Variables II
# Course Syllabus

**Course description:** Line and contour integrals: evaluation, properties and applications, singularities and residues.

**Credit hours:** 3

**Course Prerequisites and Corequisites:** MTH 513

**Course Outline:** This is the second part of the two part introductory course in Complex Analysis. In this course we cover the following topics: Approximate time spent
- **Analytic functions** 5%
  - Any topics not completed in Math 513
- **Curves and the topology of the complex plane** 10%
  - Jordan Curve Theorem
  - Curves in the complex plane
- **Complex integration and Cauchy's Theorem** 40%
  - Line integrals
  - Cauchy-Goursat Theorem
  - Cauchy Integral formula
  - Morera's Theorem
- **Singularities and Residues** 40%
  - Singularities
  - Laurent Series
  - Residues
  - Evaluation of real integrals via the Residue Theorem
- **Other topics** (as time allows) 5%

**Student Learning Outcomes (SLO):** At the end of MTH 514, a student who has studied and learned the material should be able to:
1. Interpret, apply, and use the various Cauchy's Theorems in applied settings and proof. [PLO: 1,2,3,4]
2. Find the Laurent series representations of functions with isolated singularities and use them to calculate residues. [PLO: 2,3]
3. Evaluate complex and real integrals using complex path integration and residues. [PLO: 1,2,3,4]

**Program Learning Outcomes (PLO):**

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

1. **[*Critical Reasoning*]** Independently apply the principles of logic in mathematics to develop and analyze conjectures and proofs. (understanding of abstract structures, development of definitions, development and proof of conjectures)
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)

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