SYLLABUS – MAT 536
COMPLEX ANALYSIS, SPRING 2025

Tues. and Thurs. 11:00 – 12:20 PM
in 4-130 Math Tower

This is a course in the theory of holomorphic functions in complex dimension one. It is a core course for graduate students. It is expected that all students are well acquainted with differential calculus in several dimensions. This includes Greens' Theorem and Stokes' Theorem, power series, the Implicit Function Theorem, etc.

This is one of the most beautiful subjects in mathematics, and one with importance in many different fields.

INSTRUCTOR: Blaine Lawson

Office: 5-109 Math Tower

E-mail: blaine@math.sunysb.edu

Web site: http://www.math.sunysb.edu/ blaine

Office Hours: Tu.-Thu. 12:30 – 2:00 PM, or make an arrangement for another time. The best way to contact me is by e-mail, which I read often.

GRADER: Myeongjae Lee

E-mail: myeongjae.lee@stonybrook.edu

Office: Math Tower 5-125A

Office hours:
- Tu 2:00 pm - 4:00 pm
- W 2:00 pm - 3:00 pm
- also by appointment

HOMEWORK. Homework will be due at the beginning of class each Tuesday.

EXAMS.
There will be a midterm on March 25th.
The final exam is on Tuesday May 13th from 11:15 to 1:45.

COURSE GRADING. Homework will count 25%, the midterm 30% and the final 45%.

TEXTBOOK.

Title: **Complex Analysis**,
Author: Lars V. Ahlfors
Publisher: McGRAW-HILL
ISBN 0-07-000657-1. They say that for ordering use ISBN 0-07-085008-9.
However,

There are many used versions of this book on line.
Do not worry about which edition you have. It will not make a difference.

COURSE OUTLINE

1. Complex Numbers.
2. Complex Differentials.
   - Holomorphic functions
   - Cauchy-Riemann equations Properties
   - Power series
   - Elementary functions
3. Holomorphic functions as Mappings.
   - Conformality
   - The Riemann sphere
   - Linear fractional transformations
   - Rational functions
4. The fundamental Theorem.
   - Greens Theorem
   - Complex differentials
   - Cauchys Theorem and Cauchys Integral Formula
   - Cauchys Inequalities and consequences
   - Uniform limits of holomorphic functions
   - Analyticity of holomorphic functions
5. Local Properties.
   - Removable singularities
   - Zeros, poles and essential singularities
   - Local form of a holomorphic function
   - Maximum Modulus Principle
   - Schwarz Lemma
6. Residues.
   - The Residue Theorem
   - The Argument Principle and Rouché's Theorem
   - Applications to definite integrals

7. Infinite Series.

   Taylor and Laurent series
   Infinite Products

8. Normal Families.

9. The Riemann Mapping Theorem.

10. Harmonic Functions.

    Mean value property
    Poissons Formula
    Schwarz's Theorem
    The Reflection Principle The Dirichlet Problem

11. The Big Picard Theorem.

Disability Support Services: If you have a physical, psychological, medical, or learning disability that may affect your course work, please contact Disability Support Services (DSS) office: ECC (Educational Communications Center) Building, room 128, telephone (631) 632-6748/TDD. DSS will determine with you what accommodations are necessary and appropriate. Arrangements should be made early in the semester (before the first exam) so that your needs can be accommodated. All information and documentation of disability is confidential. Students requiring emergency evacuation are encouraged to discuss their needs with their professors and DSS. For procedures and information, go to the following web site http://www.ehs.sunysb.edu and search Fire safety and Evacuation and Disabilities.

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/.

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.