East China Normal University
GEC International Summer School

MAT 36: Complex Analysis

Term: June 16th to July 18th, 2025
Class Hours: Monday through Friday, 110 minutes each day (2,750 minutes in total)
Instructor: Xiaochang Wang
Home Institution: Mcmaster University
Office hours: TBD
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Course Description

This course is an introduction to complex analysis, which is the study of the properties of functions whose domain and range are subsets of the complex plane. The subject is not only a subdiscipline of analysis, but also it is intimately connected to geometry and topology, number theory, transcendental algebraic geometry, differential equations and dynamical systems, and mathematical physics. There are also numerous applications to many areas in engineering, e.g., signal processing.

Prerequisite*: MAT12 Calculus 2 and MAT21 Linear Algebra*

Learning Objective

Analytic functions, Cauchy-Goursat theorem, Cauchy's integral formula, Cauchy's inequality, Liouville's theorem, Maximum principle, Laurent series, Residues, Zeros and poles of analytic functions, Applications of residues, Argument Principle and Rouche's Theorem.

Required Text

The only textbook required is **Complex Variables and Applications**, 9th Edition (2014); by James Ward Brown & Ruel V. Churchill.

Print ISBN: 978-0-07-338317-0

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday. ECNU awards 3 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

Attendance

Summer school is very intense and to be successful, students need to attend *every class*. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, C, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:

Assignments*2	20%*2=40%
Midterm Exam	20%
Final Exam	40%

General Expectations

Students are expected to:

- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade.
- Arrive to class on-time: Late arrivals are disruptive to your fellow students and to the conduct of the class.
- Complete the day's required reading and assignments before class
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading
- Refrain from texting, phoning or engaging in computer activities unrelated to class during class (不要用手机) It is highly disrespectful to

the professor and to the class.
- Participate in class discussions and complete required written work on time.

Course Schedule

The planned schedule sketched out below may be modified to suit the interests or abilities of the enrolled students or to take advantage of special opportunities or events that may arise during the term.

Week 1

- *Day 1*
  - *Algebraic Properties of Complex numbers*
  - *Triangle Inequality*
- *Day 2*
  - *Complex Conjugates*
  - *Products and Powers in Exponential Form*
- *Day 3*
  - *Arguments of Products and Quotients*
  - *Roots of Complex Numbers*
  - *Regions in the Complex Plane*
- *Day 4*
  - *Functions and Mappings*
  - *Theorems on Limits*
- *Day 5*
  - *Continuity and Derivatives*
  - *Rules for Differentiation*

Week 2

- *Day 1*
  - *Cauchy-Riemann Equations*
  - *Sufficient Conditions for Differentiability*
- *Day 2*
  - *Polar Coordinates*
  - *Analytic Functions*
- *Day 3*
  - *Harmonic Functions*
  - *Assignment 1 due*

- *Day 4*
  - *Exponential Functions and Logarithmic Functions*
  - *Branches and Derivatives of Logarithmic Function*
- *Day 5*
  - *Power Functions*
  - *Trigonometric Functions and Hyperbolic Functions*

Week 3

- *Day 1*
  - *Definite Integrals of Complex Functions w(t)*
  - *Contour Integrals*
- *Day 2*
  - *Upper Bounds for Moduli of Contour Integrals*
  - *Antiderivatives*
- *Day 3*
  - *Midterm*
- *Day 4*
  - *Cauchy-Goursat Theorem*
  - *Cauchy Integral Formula*
- *Day 5*
  - *Liouville's Theorem*
  - *Maximum Modulus Principle*

Week 4

- *Day 1*
  - *Convergence of Series*
  - *Taylor Series*
  - *Negative Powers Series*
- *Day 2*
  - *Laurent Series*
- *Day 3*
  - *Multiplication and Division of Power Series*
  - *Assignment 2 due*
- *Day 4*
  - *Cauchy's Residue Theorem*
  - *Three Types of Isolated Singular Points*
- *Day 5*
  - *Zeros and Poles*

Week 5

- *Day 1*
  - *Evaluation of Improper Integrals*
  - *Definite Integrals Involving Sines and Cosines*
- *Day 2*
  - *Argument Principle*
  - *Rouche's Theorem*
- *Day 3*
  - *Final review session*
- *Day 4*
  - *Final review session*
- *Day 5*
  - *Final exam*

Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.