East China Normal University

GEC International Summer School

MAT42: Mathematics Analysis 1

Term: June 16th to July 18th, 2025

Class Hours: Monday through Friday, 110 minutes each day (2,750 minutes in total)

Instructor: TBD

Home Institution: TBD

Office Hours: TBD Email:
TBD

Course Description

This course is a course designed to introduce students to the basic principles and tools in the field of mathematical analysis. Through in-depth study of preparatory knowledge such as logic, sets, and functions, students will lay a solid foundation in mathematics. Next, the course will delve into the concept of real numbers, from integers to rational numbers and irrational numbers, as well as the algebraic and sequential properties of real numbers. Students will learn how to produce rigorous reasoning and proofs in mathematics. On the basis of learning real numbers, the course will guide students to explore the concept of sequence, including the properties and characteristics of common sequence such as arithmetic sequence and geometric sequence. Students will learn how to use the concept of limits to describe the convergence and divergence of a sequence. Next, the course will delve into the concepts of limits and continuity, including the limit of a function at a point and the continuity of a function. Students will learn how to calculate the limits of various functions and explore the continuous properties of functions at different points. The course will introduce the basic concepts and techniques of differential calculus, including the definition of derivatives, derivation rules and applications. Students will learn how to use differential calculus to solve realworld problems and explore applications of differential calculus in mathematics and the natural sciences.

Recommended Reading

Real Mathematical Analysis, Second Edition; Charles Chapman Pugh, 2015
ISBN: 9780387952970

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:

Class Participation	5%
Assignments	10%
Midterm	30%
Final Exam	55%

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*
  - *Course Overview*
  - *Preliminaries*

- *Day 2 : Chapter 1: The Real Numbers*
  - *The The Axiom of Completeness*

- *Day 3 : Chapter 1: The Real Numbers*
  - *Consequences of Completeness*
  - *Cardinality*

- *Day 4 : Chapter 1: The Real Numbers*
  - *Cantor's Theorem*

– *Day 5*

  o *Tutorial/Discussion*

  o *Home Assignment 1*

<u>*Week 2*</u>

– *Day 1:   Chapter 2:Sequences and Series*

  o *The Limit of a Sequence*

– *Day 2:   Chapter 2:Sequences and Series*

  o *The Algebraic and Order Limit Theorems*

– *Day 3:   Chapter 2:Sequences and Series*

  o *The Monotone Convergence Theorem*

  o *Bolzano-Weierstrass Theorem*

– *Day 4:   Chapter 2:Sequences and Series*

  o *The Cauchy Criterion*

  o *Properties of Infinite Series*

– *Day 5*

  o *Tutorial/ Discussion*

  o *Home Assignment 2*

<u>*Week 3*</u>

– *Day 1:   Chapter 2:Sequences and Series*

  o *Double Summations and Products of Infinite Series*

– *Day 2:   Chapter 3:Limits and Continuity*

  o *Functional Limits*

- o *Continuous Functions*

- *Day 3: Chapter 3:Limits and Continuity*

  - o *Continuous Functions on Compact Sets*

  - o *Sets of Discontinuity*

- *Day 4*

  - o *Midterm Review Session*

  - o *Discussion/Tutorial*

- *Day 5*

  - o *Midterm*

Week 4

- *Day 1: Chapter 4:Sequences and Series of Functions*

  - o *Uniform Convergence of a Sequence of Functions*

- *Day 2: Chapter 4:Sequences and Series of Functions*

  - o *Uniform Convergence and Differentiation*

- *Day 3: Chapter 4:Sequences and Series of Functions*

  - o *Series of Functions*

- *Day 4: Chapter 4:Sequences and Series of Functions*

  - o *Power Series & Taylor Series*

- *Day 5*

  - o *Tutorial/Discussion*

  - o *Home Assignment 3*

Week 5

- *Day 1: Chapter 5:Limits and Continuity*

  o *One-sided limits*

  o *Limits at infinity*

- *Day 2: Chapter 5:Limits and Continuity*

  o *Continuity at a point and on an interval*

- *Day 3: Chapter 5:Limits and Continuity*

  o *Intermediate Value Theorem*

- *Day 4*

  o *Tutorial/Discussion*

  o *Final Exam Review Session*

- *Day 5*

  o *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.