MATH 4317 Syllabus

Analysis I, 3 credit hours

Fall 2026

Instructor Information

Instructor: Galyna Livshyts

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Office Hours: MW 1:45pm-3:15pm

General Course Information

Description

This course is a rigorous introduction to real analysis. The course covers the construction of real numbers, limits and Cauchy sequences, completeness, continuity and compactness, uniform continuity, series of functions, integration, and Fourier series.

Prerequisites and Scheduling

Prerequisite: MATH 2106

Lecture hours: 3

Lab hours: 0

Recitation hours: 0

Total credit hours: 3

Course Learning Outcomes

Upon successful completion of this course, students should be able to:

- work rigorously with the ordered field properties and completeness of the real numbers;
- use the basic topology of Euclidean spaces, including open and closed sets, compactness, and connectedness;
- analyze sequences and series in Euclidean spaces and determine convergence using standard criteria;
- distinguish between pointwise, uniform, and L^2 convergence for sequences of functions;
- prove and apply core results about continuity, uniform continuity, compactness, and approximation;
- read, write, and communicate clear proofs at the level of an upper-division analysis course.

Required Course Materials

Primary text:

- Terence Tao, *Analysis I*, 4th edition.

Additional reading, lecture notes, and supplementary references may be assigned or recommended during the semester.

Topic Outline

The course will cover the following topics:

- Upper bounds, least upper bounds, and completeness of the real numbers.
- Topology of Euclidean spaces: norms, the Cauchy–Schwarz inequality, open and closed sets, compactness, the Bolzano–Weierstrass and Heine–Borel theorems, and connectedness.
- Sequences in Euclidean spaces: Cauchy sequences, monotone sequences, and pointwise, uniform, and L^2 convergence of sequences of functions.
- Continuity: local properties of continuous functions, preservation of compactness and connectedness, uniform continuity, contractions, and operator norm continuity of linear operators.
- Sequences of continuous functions: Bernstein and Weierstrass approximation theorems.
- Infinite series: convergence and absolute convergence, convergence tests.
- Series of functions, power series, and Fourier series.
- Integration.

Grading Policy

Final grades will be based on a combination of homework, two midterms, and a final exam. Any adjustments to the grading scheme will be announced in class and posted on Canvas.

Assignments

- Homework: 30%
- Midterm exam 1: 25%
- Midterm exam 2: 25%
- Final exam: 20%

Letter grades will be assigned according to standard cutoffs.

Description of Graded Components

- **Homework:** Regular homework will be assigned throughout the semester. Students are expected to write complete and logically organized solutions, with appropriate justifications for all claims.
- **Midterm exams:** The midterm exams will assess understanding of the core concepts and proof techniques developed in the course and will take place on September 30 and November 4 correspondingly.
- **Final exam:** The final component will emphasize synthesis of major themes from the course.

Course Policies

Attendance and Participation

Regular attendance is expected. Because this is a proof-based course, much of the learning happens through active engagement with definitions, examples, and arguments developed during class. Students who miss class are responsible for obtaining notes, announcements, and assignments from Canvas or from classmates.

Participation may include asking questions, contributing to discussions, and, where appropriate, presenting solutions or reading assignments. Students should notify the instructor as soon as possible in the event of a serious illness, an Institute-approved absence, or another significant circumstance affecting attendance.

Communication

Course announcements, assignments, and other materials will be distributed through Canvas. Students are responsible for monitoring Canvas and their Georgia Tech email regularly.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Collaboration on general ideas may be permitted on homework unless otherwise stated, but each student must write up and submit their own independent solutions. Any use of outside sources must be acknowledged clearly. Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your needs and obtain an accommodations letter. Please also email me as soon as possible so that we can arrange a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.