MATH 521: Analysis I, Lecture 001
(3 Credits), Spring 2024

Course Information

Description. The real numbers, elements of set theory, metric spaces and basic topology, sequences and series, limits, continuity, differentiation, integration, sequences and series of functions, uniform convergence.

Prerequisites: (MATH 234 and 467), (MATH 322, 341, 376, or 421), graduate/professional standing, or member of the Pre-Masters Mathematics (Visiting International) Program

Level: Advanced
Instruction Mode: Classroom
L & S Credit Type: Counts as Liberal Arts and Science credit
Breadth: Natural Science

This class meets for three 50-minute class periods each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for at least 2 hours out of classroom for every class period.

Meeting Time and Location. MWF 2:25 PM-3:15 PM, Van Vleck Hall B119

Instructor. Alex Waldron
Email: waldron@math.wisc.edu
Office Hours: M:3:15–4:15pm, directly after class; Th:2:30–3:30pm, in Van Vleck 313.

Textbook. W. Rudin, *Principles of Mathematical Analysis,* 3rd ed., Ch. 1-7.
This textbook is required.

Supplemental texts. Edmund Landau, *Foundations of Analysis* (available on canvas).

Course Website. canvas.wisc.edu

Homework, exams, and grading

Homework. Homework is the most important component of this course.

Weekly assignments will be handed out on paper each Monday and posted to Canvas. Homework is due by the next **Wednesday at the beginning of class**, with some exceptions due to our midterm exams. Whether you choose to handwrite your homework or use LaTeX, a hard copy must be turned in at the beginning of class on Wednesday. Late homework will not be accepted.

Each problem should be completed with neat, understandable, detailed solutions and explanations. Your explanations and proofs must be sound and rigorous, paying attention to detail and clarity. The lowest assignment score will be dropped from your overall score.

You are encouraged to study in groups and collaborate on the homework problems. However, you must write up solutions separately and in your own words. If you collaborated with or were helped by another student, you should briefly acknowledge this in your writeup.

Please address questions to your instructor in person (before or after class, or during office hours) rather than by email. The Math Learning Center (MLC) is also open for your benefit every week. There are two CA's dedicated to our class (Erik Reed and Kevin Williams), who will be present at certain hours (TBD). **Use of outside internet resources is not permitted.**

Exams. There will be two midterm exams, occurring at **7:30pm** (locations TBD) on **Tuesday, February 27th** and **Tuesday, April 2nd**. The final exam will be a two-hour cumulative exam, on **Thursday, May 9th** from **12:25 - 2:25pm** (location TBD).

Grading Scale. In this course, you will be evaluated based on four components described below with their corresponding percentages.

Homework	20%
Midterm 1 (Feb 27)	15%
Midterm 2 (Apr 2)	25%
Final Exam (May 9)	40%

The following scores correspond *roughly* to the letter grades in this course.

$$\text{A} \geq 93\% > \text{AB} \geq 88\% > \text{B} \geq 82\% > \text{BC} \geq 78\% > \text{C} \geq 70\% > \text{D} \geq 60\% > \text{F}$$

Learning Outcomes

By the conclusion of this course, students are expected to be able to:

- Recall and state the standard theorems of classical real analysis. (e.g., the Bolzano- Weierstrass theorem, monotone bounded sequences converge, the fundamental theorem of calculus, etc.). Moreover, the student will be able to recall the arguments for these theorems and the underlying logic of their proofs.
- Recall and state the formal definitions of the mathematical objects and their properties used in classical real analysis (e.g., the of a set, continuity of a function, limit of a sequence, etc.).
- Convey arguments in oral and written forms using English and appropriate mathematical terminology, notation and grammar.
- Prove or disprove statements related to the above definitions, properties, and theorems using techniques of mathematical argument (direct methods, indirect methods, constructing examples and counterexamples, induction, etc.).
- Prove or disprove statements related to the definitions, properties, and theorems of calculus using the techniques of mathematical argument; and
- Use the above theorems in the context of longer arguments by examining their premises (e.g., proving that a function has a maximum by verifying that it is continuous on a compact set).
- Use the above definitions to prove if a mathematical construct does or does not have the condition of being a particular mathematical object or having a particular property (e.g., that a given function is continuous, that a given set is compact, that a series converges absolutely, etc.).

Academic Policies

Academic Integrity. By enrolling in this course, you assume the responsibilities of an active participant in the University of Wisconsin-Madison's community of scholars in which everyone's academic work and behavior are held to the highest standard. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which will result in disciplinary action. This includes failure on the assignment or course, disciplinary probation, suspension, or expulsion.

Additional policies. https://guide.wisc.edu/courses/#SyllabusStatements