

Math 617, Real Analysis II, Winter 2025

Class Time: MWF 9-9:50am in 373 McKenzie Hall
Instructor: Dr. Marcin Bownik
E-Mail: mownik@uoregon.edu
Office: 323 Fenton Hall
Office Hours: M 11am–12pm, W 10am–11am, and F 11am–12pm, or by appointment
Textbook: *Real and Complex Analysis*, W. Rudin, 3rd ed.

1. **Background and Goals.** This course introduces students to the subject of real analysis, and to a lesser extent, complex and functional analysis. Topics include: the Riesz Representation Theorem, Hilbert spaces, Banach spaces, dual spaces, Lebesgue points of differentiability, the Fundamental Theorem of Calculus and the change of variables theorem. The course, which is the second of three in the sequence, covers most of the chapters 2 and 4–7 of Rudin’s textbook.
2. **Learning Outcomes.** Students should be able to solve problems by providing clear and logical proofs involving the following concepts:
 - the Riesz Representation Theorem for positive functionals on $C_c(X)$, the Lusin Theorem, the Vitali-Carathéodory Theorem,
 - Hilbert spaces, orthonormal sequences, orthonormal projections,
 - Banach spaces, the Banach-Steinhaus Theorem, the Open Mapping Theorem, the Hahn-Banach Theorem,
 - Fourier series of L^2 functions and continuous functions, summability kernels,
 - dual spaces, duality of L^p spaces, duality of $C_0(X)$ spaces, weak topologies, Alaoglu’s Theorem,
 - Lebesgue points of differentiability, absolutely continuous functions, the Fundamental Theorem of Calculus, the change of variables theorem.Students should be able to give examples and counterexamples illustrating connections between the above concepts and to critically analyze all steps of a mathematical argument for correctness and clarity. In particular, self-check one’s own work to find insufficiently explained steps.
3. **Exams.** There will be one midterm in-class exam (tentatively) on Fri. 2/14, and a final exam on Friday, March 21, 2025, 10:15am–12:15pm.
4. **Homework.**
 - Homework problems will be assigned every week and be due on Wednesday on the material of the previous 1–2 weeks.
 - No late homework will be accepted. The lowest homework grade will be dropped from your final grade.
 - Group work on homework is encouraged, but each student must individually write and turn in her/his own assignment.

5. **Grading.** The grading distribution will be as follows:

Homework	40%
Midterm Exam	20%
Final Exam	40%

6. **University policies.** University policies on academic misconduct, accessible education and accommodations, mandatory reporting obligations, and emergency policies can be found at: <https://provost.uoregon.edu/standard-university-syllabus-language>