Math 616, Real Analysis I, Fall 2024

Class Time:	MWF 9-9:50am in 193 Anstett Hall
Instructor:	Dr. Marcin Bownik
E-Mail:	`mbownik@uoregon.edu`
Office:	323 Fenton Hall
Office Hours:	M 11am–12pm, Tu 1pm–2pm, and F 10am–11am, or by appointment
Textbooks:	*Measure Theory*, D. Cohn, 2nd ed., Birkhäuser,
	Real and Complex Analysis, W. Rudin, 3rd ed., McGraw-Hill.

1. **Background and goals.** This course introduces students to the subject of real analysis, and to a lesser extent: functional analysis, harmonic analysis, and complex analysis. Topics covered in the first term include: outer measures, Lebesgue measure, measurability, integration, L^p-spaces, signed and and complex measures, Lebesgue-Radon-Nikodym Theorem, product measures, and Fubini's Theorem. The course, which is the first of three in the sequence, covers most of the chapters 1–5 of Cohn's textbook.
2. **Learning Outcomes.** Students should be able to solve problems by providing clear and logical proofs involving the following concepts:
   - σ-algebras, outer measures, Lebesgue measure, and Borel regularity,
   - simple functions, measurable functions, Lebesgue integral, Fatou's Lemma, Lebesgue Monotone and Dominated Convergence Theorems, and Egorov's Theorem,
   - Hölder's inequality, Minkowski's inequality, L^p spaces of measurable functions and their approximation by continuous functions,
   - signed and complex measures, absolute continuity and singularity of measures, Lebesgue-Radon-Nikodym Theorem, and Hahn Decomposition Theorem,
   - product measures and Fubini's 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 on Wed., Nov. 13, and a final exam on Wed., Dec. 11, 10:15a.m.–12:15p.m.
4. **Homework.** Homework problems will be assigned every week and be due in on Wednesday on the material of the previous 1–2 weeks. Homework needs to be submitted on Canvas. 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`