

Math 616, Real Analysis I, Fall 2014

Class Time:	MWF 1-1:50p.m. in 210 Deady Hall
Instructor:	Dr. Marcin Bownik
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Office:	323 Fenton
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Office Hours:	12-1p.m. Mon. and Fri., 11-12p.m. Wed., or by appointment
Primary Textbook:	<i>Real and Complex Analysis</i> , W. Rudin, 3rd ed., McGraw-Hill
Secondary Textbooks:	<i>Measure Theory</i> , D. Cohn, 2nd ed., Birkhäuser <i>Real Analysis</i> , G. Folland, 2nd ed., John Wiley & Sons

- 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: measurability, integration, outer measures, Lebesgue measure, L^p -spaces, signed 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. 11/5, and a final exam on Mon. 12/8, 2:45–4:45p.m.
- 4. Homework.** Homework problems will be assigned every other week and be due in class on Wednesday on the material of the previous 2–3 weeks. No late homework will be accepted. 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%