Math 616, Real Analysis I, Fall 2020

Class Time:	MWF 8-8:50a.m.
Zoom meeting:	`https://uoregon.zoom.us/j/92702144563` passcode: `math616`
Instructor:	Dr. Marcin Bownik
E-Mail:	`mbownik@uoregon.edu`
Office:	323 Fenton
Office Phone:	541-346-5622
Office Hours:	M 10–11a.m., W 11a.m.-12p.m., and F 10-11a.m., or by appointment

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 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. 11/4, and a final exam on Mon. 12/7, 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. **Primary Textbooks.** *Measure Theory*, D. Cohn, 2nd ed., Birkhäuser, *Real and Complex Analysis*, W. Rudin, 3rd ed., McGraw-Hill.

7. **Secondary Textbook.** *Real Analysis*, G. Folland, 2nd ed., John Wiley & Sons.

8. **Homework grading.** In this course homeworks are graded by a graduate employee (GE). The homework grader is in a later stage of the program from the GEs enrolled in the course, and so this should minimize the chances of any conflict of interest occurring with one GE grading the work of another. However, sometimes unexpected conflicts do occur. If at any point during the quarter a graduate student enrolled in this course has a concern related to a conflict of interest, privacy, fairness, or any other aspects of the grader's conduct please come talk to me about it. You may also speak directly with the Director of Graduate Studies or Department Head about your concerns. If such concerns arise, you may request that I grade your homework instead of the GE grader.