

MATH 420/MATH 507: Measure and Integration (Real Analysis I)

Instructor: M. Barlow

Office: Math. Annex 1209

Time MWF 9.00

Room: MATH 202

Office hours: to be announced

Course webpage www.math.ubc.ca/~barlow/m420

Text: G.B. Folland. *Real Analysis - Modern techniques and their applications* (2nd ed.).

Outline. This cross-listed 4th-year undergraduate/1st-year graduate course will give an introduction to measure theory and advanced integration. The topics covered will include σ -algebras, Lebesgue measure, Borel measures, measurable functions, integration, convergence theorems, L^p spaces, Hölder and Minkowski inequalities, and Radon-Nikodym differentiation.

This is core material which, together with the function space theory covered in Math 421/510, provides the foundation for much of mathematical analysis. This material is useful in many areas of pure and applied mathematics, including harmonic analysis, differential equations, probability theory, information theory, differential geometry, and mathematical physics. The course will be based on Chapters 1-3 of the textbook.

Topics.

1. σ -algebras, measures and outer measures.
2. Borel and Lebesgue measure.
3. Measurable functions, integration. The Lebesgue integral.
4. Convergence theorems, including monotone convergence, dominated convergence and Fatou's Lemma.
5. Product measures and Fubini's theorem.
6. Radon-Nikodym theorem.
7. Hölder and Minkowski inequalities, L^p spaces.

Prerequisites: 68% in Math 321, or equivalent.

Grading: Homeworks 30%, 2 quizzes (on September 29th, November 10th) 30%, final exam 40%.

You may find it useful to discuss and work on homework problems with other students, but you should write the solutions on your own.

Version 4 September 2017. Please check course webpage for updates.