Mathematics 420/507 (Real Analysis I / Measure Theory and Integration)

Fall 2015

Instructor: Prof. I. Laba

- Contact information: Math Bldg 200, 604-822-4457, ilaba(at)math.ubc.ca
- Lectures: MWF 9-10, MATH 202
- Office hours (tentative): Mon 1-2, Wed 10-11, Fri 11-12, in MATH 200
- The best way to contact the instructor is by email. Please note that email received on evenings and weekends will be answered on the next business day. If you cannot attend regular office hours due to schedule conflict, please make an appointment in advance. Drop-ins and same-day requests for appointments cannot always be accommodated.

Prerequisite: A score of 68% or higher in MATH 321, or equivalent.

Textbook: Gerald B. Folland, *Real Analysis: Modern Techniques and Their Applications*, 2bd ed., John Wiley and Sons, 1999, ISBN 0-471-31716-0

This is a cross-listed 4th year undergraduate and graduate course which develops the theory of measure and integration. This material is a cornerstone of mathematical analysis and is an essential part of an advanced mathematical education. It will be used in functional analysis, harmonic analysis, partial differential equations, probability, mathematical physics and information theory. The course will be primarily based on the first 3 chapters of the text:

- **Measures (Chapter 1):** sigma-algebras, outer measures, Borel measures on the real line, Lebesgue measure
- **Integration (Chapter 2):** measurable functions, integration, convergence theorems, product measures and Fubini's theorem
- **Differentiation of Measures (Chapter 3):** signed measures, Radon-Nikodym theorem, Hardy-Littlewood differentiation, fundamental theorem of calculus revisited

If time allows, we may also include:

- **Elements of Functional Analysis (Chapter 5):** normed vector spaces (introduction only)
- **L^p Spaces (Chapter 6):** basic theory only.

Your course grade will be based on homework (50%) and the final exam (50%). Homework problem sets will be assigned roughly biweekly (you should expect 5-6 assignments in total). Each one will be assigned and posted here at least a week in advance; I will also send a broadcast email to the class mailing list to alert you to each posted assignment. To allow for minor absences and short illnesses, the lowest score will be dropped. Late assignments will not be accepted.

The final exam will be 2.5 hour long (standard length at UBC). The date of the final examination will be announced by the Registar later in the term. Attendance at the final examination is required, so be careful

about making other committments (such as travel) before this date is confirmed. The examination will be strictly closed-book: no formula sheets, calculators, or other aids will be allowed.

[Mathematics Department] [University of British Columbia]