

## MATH 545, Probability II

Term 2, 2012–13

**Time:** MWF 13:00 – 14:00 Mathematics 202

**Instructor:** D. Brydges,  
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**Office hours:** Mon 4–5, Wed 11–12, Fri 2–3.

**Text:** Probability Theory: A Comprehensive Course by Achim Klenke, Springer 2006.

**Prerequisites:** Math 544 or consent of the instructor.

**Description:** This course is a continuation of Math 544. Together the two courses give a comprehensive introduction to measure-theoretic probability theory, useful for those planning to do research in probability, or who use probability as a tool in other fields such as analysis, statistics, finance, or applied mathematics.

### Outline:

1. Martingales: examples, convergence theorems, optional stopping theorems.
2. Markov chains: recurrence and transience, stationary measures, convergence theorem.
3. Brownian motion: construction, strong Markov property, Donsker's theorem on convergence of random walks to Brownian motion.
4. If time permits: Ergodic theorems: Birkhoff's ergodic theorem, subadditive ergodic theorem, applications.

**Homework/solutions:** posted at <http://www.math.ubc.ca/~db5d/math545/assignments.html>

**Grading:** Course mark will be based on homeworks (50 %) and final (50%).

**Booklist:** Useful references are

- R. Durrett, Probability: Theory and Examples, 4rd edition, Cambridge University Press (2010).
- L. Breiman. Probability. SIAM.
- P. Billingsley. Probability and Measure.
- K.L. Chung. A course in probability theory.
- O. Kallenberg. Foundations of Modern Probability.
- D.W. Stroock. Probability Theory. An analytic view.
- John Walsh. Knowing the Odds. An Introduction to Probability. AMS (2011).
- D. Williams. Probability with Martingales. [Covers martingale part of the course in a rather different way.]
- I. Karatzas and S.E. Shreve: Brownian motion and stochastic calculus.

Updated Feb 8 2013.