

**MA/ST 747, Probability and Stochastic Processes II**  
**Syllabus, Spring 2009**

**Instructor:**

Robert Buche  
HA 150  
515-7453  
rtbuche@unity.ncsu.edu

**Office Hours:** Tuesdays, 3:30 - 4:30 and Fridays, 12:30-1:30, or by appointment.

**Course Website:** <http://www4.ncsu.edu/%7Ertbuche/MA747Site/index747.htm>. Or go to [math.ncsu.edu](http://math.ncsu.edu) and click on my webpage.

**Prerequisite:** MA/ST 546 or similar.

**Textbook:** Durrett, Rick. *Probability: Theory and Examples*. Duxbury Advanced Series, Third Edition, 2005.

**Grading:** Homeworks at about two week intervals. No late homeworks allowed except under very extenuating circumstances. A mid-term exam: an in-class and a take-home part. The **final exam**: the scheduled exam time is **Thursday, April 30, 8:00 - 11:00 AM**, but we may be open to a take-home final. For your personal scheduling purposes, for now suppose the scheduled exam time. *Weightings:* Homeworks: 30 %, Mid-Term: 25 %, Final: 45 %.

**Topics include:**

1. Short “review” of probability spaces, random variables, and expected value.
2. Chapter 4 (Durrett)
  - (a) Conditional expectation
  - (b) Martingales, submartingales, supermartingales
  - (c) Doob’s decomposition
  - (d) Doob’s inequality
  - (e) Uniform integrability
  - (f) Convergence theorems
  - (g) Optional stopping theorems
3. Chapter 5 (Durrett)
  - (a) Markov chains: discrete-time
  - (b) Examples of Markov chains (queueing, birth-death, etc.)
  - (c) Properties of Markov chains (recurrence, transient, etc.)
  - (d) Stationary measures
4. Chapter 7 (Durrett) Brownian motion
  - (a) Probability spaces for continuous-time processes (E.g. “path space”).

- (b) Definition and some properties of Brownian motion
  - (c) A few applications with Brownian motion models
5. If time, brief coverage of:
- (a) continuous-time Markov chains
  - (b) large-deviations theory: Cramér's and Sanov's Theorems

**Important Note:** If you have a disability, contact the Disability Services Office; here is the address: <http://www.ncsu.edu/dso/students/> and we will make accommodations.