

# Math 280C Topics

Spring 2005

**1. Concluding discussion** of Chapter 10 in the Resnick text

## **2. Markov Chains**

- (a) Strong Markov property
- (b) Transience and recurrence
- (c) Limit theorems and invariant measures

## **3. Brownian Motion**

- (a) Construction and basic properties
- (b) Brownian motion as martingale
- (c) Brownian motion as Markov process; reflection principle
- (d) Functional Central Limit Theorem; Donsker's Theorem
- (e) Law of the Iterated Logarithm

## **4. Stochastic Integral** (with respect to Brownian Motion)

- (a) Construction and basic properties
- (b) Itô's Formula
- (c) Lévy's characterization of Brownian Motion
- (d) Predictable Representation Theorem
- (e) Brownian Motion and PDE; Black-Scholes Formula

## Reading List

### On Reserve.

1. Chung, K.L. & R.J. Williams: *Introduction to stochastic integration* (2nd ed) [QA274.22 .C48 1990]
2. Durrett, R. *Probability: theory and examples* [QA273 .D865 1996]
3. Elliott, R.J. *Stochastic calculus and applications* [QA274.2 .E44 1982]
4. Freedman, D. *Brownian motion and diffusion* [QA274.75 .F74]
5. Karatzas, I. & Shreve, S.E. *Brownian motion and stochastic calculus* (2nd ed) [QA274.75 .K37 1991]
6. Kallenberg, O. *Foundations of modern probability* (2nd ed) [QA273 .K285 2001]
7. Knight, F.B. *Essentials of Brownian motion and diffusion* [QA274.75 .K58]
8. Kopp, P.E. *Martingales and stochastic integrals* [QA274.5 .K67 1984]
9. Norris, J.R. *Markov Chains* [QA274.7 .N67 1997]
9. Øksendal, B.K. *Stochastic differential equations: an introduction with applications* (5th ed) [QA274.23 .O47 1998]
10. Rogers, L.C.G. & Williams, D. *Diffusions, Markov processes, and martingales* (2 vol.) [QA274.7 .W54 2000 1, QA274.7 .W54 2000 2]

### More advanced reading.

11. Ito, K. & H. P. McKean, Jr *Diffusion processes and their sample paths* (2d print., corr) [QA273 .I89 1974]
12. Protter, P.E. *Stochastic integration and differential equations: a new approach* [QA274.22 .P76 1992]
13. Revuz, D & Yor, M. *Continuous martingales and Brownian motion* (3rd ed) [QA274.5 .R48 1999]