Hunter College of The City University of New York

STAT 312 Stochastic Processes   3 hrs, 3 cr.

Required Textbook:

Introduction to Probability Models, Eighth Edition (December, 2002), by Sheldon M. Ross.

Recommended Lecture Notes:

1. Prof. William J. Anderson's notes on Markov Chains can be found at
http://www.math.mcgill.ca/anderson/447/447 Notes.pdf. These notes contain a good discussion of
Discrete/Continuous Time Markov Chains.
2. Prof. Joseph T. Chang's notes on Stochastic Processes can be found at
http://pantheon.yale.edu/_jtc5/251/. These notes contain a good discussion of Martingales and Brownian
Motion.

Material Covered:

1. Review: Conditional Probability and Conditional Expectation

2. Introductory Example: Simple Random Walk

3. Discrete-Time Markov Chains
(a) Classification of States
(b) Stationarity and the Ergodic Theorem
(c) Ehrenfest Model for Gaseous Diffusion

4. Review: Exponential and Poisson Distributions

5. Continuous-Time Markov Chains
(a) Counting Process, Poisson Postulates
(b) Birth-Death Processes, Kolmogorov's Forward Equations

6. Martingales
(a) Stopping Times, Optional Stopping Lemma
(b) Gambler's Ruin Problem
(c) Martingale Representation Theorem: Application to Option Pricing
(d) Martingale Convergence: Application to Branching Processes

7. Brownian Motion
(a) Markov and Martingale Properties
(b) Reection Principle
(c) Scale Invariance
(d) Construction as a Limit of a Simple Random Walk
(e) Diffusions