STOCHASTIC PROCESSES
26:960:580

Place: 1 Washington Park, Room 204, Newark
Time: Tuesdays 11:30 - 2:20
Instructor: Michael N. Katehakis
Office: 1 Washington Park, 1070
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Office Hours: after class, and by appointment.

Teaching Material:

- Required Text:

- Recommended:

- Other resources:
  - I will provide additional reading materials during the course.
  - Start with: Review of Probability

Prerequisites: Graduate students who have finished a basic course in Probability are allowed to take the course.
Grading: Mid-term: 40%. Homework 10% Final Exam: 40%.

Outline of the Course: The course will focus on Chapters 3,4,5,6 and 7 from Ross’s text: Poisson processes, renewal processes, discrete and continuous time Markov chains. I also hope to cover at least a portion of chapter 9, the Wiener Process and finance applications. Further, I will have some extra topics such as simulation, martingales and applications to optimizations of Markov Chains. The course will begin with a review of basic probability.

Tentative Course Outline.

- Weeks 1-3: Basic concepts
  - (a) Conditional Probabilities and Conditional Expectations.
  - (b) Generating Functions
  - (c) Large Deviations and Insurance problems.
  - (d) The Poisson Process.
    - Exponential Distribution.
    - Defining the Poisson Process.
    - Compound Poisson Processes.
  - (e) Renewal Processes.
    - Laws of Large Numbers.
- Key Renewal Theorems.

- Week 4: Random Walks
  (a) Special Examples.
  (b) Exit Distributions and Exit Times.
  (c) Harris Paper.

- Weeks 5-6: Markov Chains.
  (a) Transient probabilities, Stationary probabilities.
  (b) Classification of States.
  (c) Semi-Markov Chains.

- Weeks 9-10: Markov Decision Processes.
  (a) Examples, Basic Properties.
  (b) Optimality Criteria.
  (c) Value functions and Solution Methods.
  (d) Blackwell Papers.

  (a) Gambling Strategies, Stopping Times.
  (b) Binomial Model.
  (c) Capital Asset Pricing Model.
  (d) American Options
  (e) Calls and Puts