STOCHASTIC MODELS OF OPERATIONS RESEARCH
26:711:685

Place: 100 Rockafeller Road, Room TBA
Time: Thursdays 12:00-2:50
Instructor: Michael N. Katehakis
Office: 100 Rockafeller Road, Room 5147, Piscataway, NJ 08854
E-Mail: mnk@rutgers.edu
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 (open book):: 40%. Homework 10% Final Exam (open book): 40%.

Outline of the Course: This course provides an introduction to the modeling and analysis of various random phenomena occurring in operations research and businesses such as inventory theory, queueing theory, genetics, demography, epidemiology, competing populations. The course covers topics such as renewal processes, discrete and continuous time Markov chains and depending on time some extra topics from simulation, martingales and optimization of Markovian systems. The course also includes selected financial applications such as pricing and hedging with partial information, and stock selling problems.

Homework: Assignments, given on a weekly/biweekly basis, are to be done individually, unless otherwise stated. You may discuss the problems with each other; yet the work that you submit must be your own. You are expected to refrain from using solutions from other sources (e.g. previous years? classes, etc). If you do use outside information, you must state your sources.

Participation: The class sessions are meant to provide a learning environment that involves all participants. I am always open for questions, both inside the classroom and outside. Your are expected to come prepared to class, ask relevant questions, and actively participate in classroom discussions.

Tentative Course Outline.

◦ Introduction to discrete-time Markov chains
◦ Gambler’s ruin problem
◦ Stopping times
⋄ Recurrence and limiting (stationary) distributions
⋄ Time-reversible Markov chains
⋄ Uniform integrability
⋄ Borel-Cantelli Lemmas
⋄ Continuous-time Markov chains: Poisson processes, Birth and Death Processes
⋄ Queueing theory: Little’s law
⋄ Renewal Theory: inspection paradox, renewal reward theorem, central limit theorem for counting processes, stationary renewal processes, elementary renewal theorem, key renewal theorem, weak convergence Regenerative processes
⋄ Gambling Strategies, Stopping Times, Binomial Model, Capital Asset Pricing Model, American Options Calls and Puts
⋄ Discrete-time martingales; the optional stopping theorem and applications