MTH463/MTH563 - Stochastic Processes (Spring 2011)

When: Tuesday and Thursday 11:00AM-12:20PM
Where: MATH 250

Instructor: Avner Peleg
Office: Math Building, room 325
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Office hours (tentative): Monday 4:00PM-5:00PM, Friday 11:30AM-1:00PM.

Textbook: An Introduction to Stochastic Modeling, Third Edition, S. Karlin and H. M. Taylor, Academic Press (1998).

Prerequisites: MTH 411 (or MTH 511), MTH 309 and MTH 306, all with grade of C or higher.

Tentative syllabus: Review of Chapters 1-2 in Karlin and Taylor; Chapters 3-6 and 8 in Karlin and Taylor. Class notes will be provided for stochastic integration.

Course description:
(1) Review of concepts and methods from probability theory: distribution functions, probability density functions, joint distribution functions, important discrete and continuous distributions, conditional probability and conditional expectation.
(2) Introduction to Markov chains: transition probability matrices, examples of Markov-chain models, first-step analysis, random walks, success runs.
(3) Long-term behavior of Markov chains: limiting probability distributions, irreducible Markov chains, recurrence and transient, the basic limit theorem.
(4) Poisson processes: homogeneous and nonhomogeneous, the law of rare events, the uniform distribution and Poisson processes.
(5) Continuous-time Markov chains: birth-and-death processes and their limiting behavior, birth-and-death processes with absorbing states.
(6) Brownian motion: definition and properties, the reflection principle and the first passage time, reflected, absorbed, and geometric Brownian motion, Brownian motion with drift.
(7) Stochastic integration: martingales – definition and examples, integration with respect to random walk and Brownian motion, Ito's formula and its extensions, Stratonovich's formula.

Homework: Homework will be assigned each week. Selected homework problems on each assignment will be graded. Homework is an important component of the course and is worth 20% of the final grade. Notice that: (1) Late homework will not be accepted. (2) It is your responsibility to show your

work and to present it in readable form. Unreadable answers or answers without justification will not receive credit.

Computing problems: During the semester a few problems that involve numerical computation or simulation will be given. You may use any computer software to solve these problems. When you submit the solution you should include a description of the software and commands that you used. The weight of the computing problems is 25%.

Exams: There will be one midterm exam and a final exam. The midterm exam is scheduled for Thursday, March 24. It will take place in the classroom during regular class time. The time, date, and location of the final exam will be announced when they become available. The weight of the midterm exam is 20%, and the weight of the final exam is 40%.

Grade:	Homework	20%
	Computing problems	25%
	Midterm	20%
	Final	40%

The final number grade will be translated to a letter grade, and the translation will not be worse than:

85-100	A
70-84	B
60-69	C
50-59	D
0-49	F

The boundaries for plus/minus grades (A-, B+, B-, etc.) will be determined only after the final exam.

Course web site: http://www.math.buffalo.edu/~apeleg/mth563.html
This web site will be updated with announcements, homework assignments and other useful resources. It is recommended that you visit the web site on a regular basis.

Attendance: Students are expected to attend every scheduled class. All students attending the class must be registered for the class.

Academic Integrity: Students are expected to behave in accordance with the university policy on Academic Integrity. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Cheating and plagiarism will result in formal charges.

Incomplete: A grade of incomplete (I) will be assigned only under extraordinary circumstances, which are beyond the student's control (like a non-elective surgery during the last week of class).

Students with disabilities: If you have a diagnosed disability (physical, learning or psychological), which will make it difficult for you to carry out the coursework as outlined, or requires accommodations such as recruiting note takers, readers, or extended time on exams and/or assignments, please advise me during the first two weeks of the course, so that we may review possible arrangements.

Studying strategy: Below are some tips on how to do well in the course.
(1) Review background material in probability theory at the beginning of the semester. A good source for the background material in probability theory that will be reviewed in the first lectures is: Fundamentals of Probability, with Stochastic Processes, Third Edition, S. Ghahramani, Pearson Prentice Hall, 2005.
(2) Study regularly throughout the semester.
(3) Read each topic in the book before class.
(4) Review the theory afterwards using your notes and the book.
(5) Do the homework regularly.
(6) Seek help from me when you don't understand something.

Some important dates:
Fri Jan 28: (a) Last day to add/drop the course (no record will appear on your transcript if you drop the course). (b) Last day to file “Petition to make up an Incomplete” with the Math Department.
Mon Mar 14 through Sun Mar 20: No class (Spring Recess).
Fri Apr 1: Last day to resign from the course (an “R” will appear on your transcript).
Thu Apr 28: Last MTH463/MTH563 class.
Mon May 2: Semester ends.