STA 624.01
Applied Stochastic Processes
Spring Semester, 2007
Monday Wednesday Friday 12:00 PM–12:50 PM
Room CB 307

Instructor:	Ruriko Yoshida
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Office hours:	Monday Wednesday 10:00-11:00 AM
	(I'm usually available to talk whenever I'm in my office so
	feel free to drop in, except two minutes before class starts.)
Text:	"Introduction to Stochastic Processes" Lawler

Overview: This is a course on stochastic processes, which involve collections of random variables indexed by time or by space. In this course you will learn the nomenclature and techniques needed for understanding the major types of stochastic processes, how to apply these processes in mathematical modeling, and how to effectively compute and simulate using these processes. We will cover materials including (not limited to) discrete-time and continurous-time Markov Chain, Reversible Markov Chain, hidden Markov Model (HMM). For computing I will be teaching the basics of MATLAB, although you may utilize any environment you are familiar with for completing the assignments.

Course Website: All course materials (including the homework assignments) will be posted on the class website, which you can access using the Blackboard system found at

`https://www.ms.uky.edu/~ruriko/courses/Stat624S07/`

Homework: Assignments will be weekly, handed out on Friday and due back the next Friday. Typically these assignments contain 4 or 5 regular problems and one computer problem.

While you are welcome to work together on the assignments, the final writeups should be your own. In the writeups, indicate your calculations and reasoning for all the work submitted. For numerical answers, draw a box around your answer and use four significant figures for approximations unless the answer is an integer, or instructed otherwise in the problem statement.

Homework will be graded on a ten point scale 0 meaning that you did not turn in the homework and 10 meaning that Athena, goddess of wisdom could not have completed the assignment any better. You will receive two scores, one for the regular problems and one for the computer work. **ALSOLUTELY NO LATE homework**.

Before handing in your homework paper, please staple all papers together and clearly write your name and the assignment number on the first page. Turn in papers held together by paper clips or origami at your own risk.

The lowest homework score of each semester will be thrown out. This is basically to handle those emergencies where you are unable to complete an assignment for external reasons. I strongly recommend you save this freebie as long as possible and do not blow off an early assignment.

Tests: There will be 2 midterms during the semester, both in class. They will test your ability to recall key definitions and theorems from the class, and apply them to simple problems. In addition, there will be a final exam roughly twice the length of the midterms.

Grading: The regular problems of the homework are worth 20% of your grade, the computer problems 15%, midterm 1 is 20%, midterm 2 is 20%, and the final will be 25%.

Schedule: The following is a tentative schedule. It might be changed.

Week	Topic	Section
Jan 10	Basic Probability	Handout
Jan 12		
Jan 15	No class	
Jan 17	Matlab Tutorial	Some Matlab Tutorial and Finite Markov Chain
Jan 19	Finite Markov Chains	Examples (1.1)
Jan 22		Large time behavior (1.2)
Jan 24		Classification of states (1.3)
Jan 26		Classification of states (1.3)
Jan 29		Return time and Transient States (1.4 – 1.5)
Jan 31		Return time and Transient States (1.4 – 1.5)
Feb 2	Countable Markov Chains	Introduction (2.1)
Feb 5		Recurrence and Transience (2.2)
Feb 7		Recurrence and Transience (2.2)
Feb 9		Positive Recurrence and Null Recurrence (2.3)
Feb 12		Branching Process (2.4)
Feb 14	Continurous-time Markov Chains	Poisson Process (3.1)
Feb 16		Finite State Space (3.2)
Feb 19		Finite State Space (3.2)
Feb 21		Birth and Death Process (3.3)
Feb 23		Birth and Death Process (3.3)
Feb 26	Reversible Markov Chains	Reversible Processes (7.1)
Feb 28		Convergence to Equibirium (7.2)
March 2		Markov Chain Algorithms (7.3)
March 5		Criterion for Recurrence (7.4)
March 7	Review	
March 9	First MT	
March 18	Optimal Stopping	Optimal Stopping of Markov Chains (4.1)
March 20		Optimal Stopping of Markov Chains (4.1)
March 22		Optimal Stopping with Cost (4.2)
March 25		Optimal Stopping with Cost (4.2)
March 27		Optimal Stopping with discounting (4.3)
March 29	Renewal Processes	Introduction (6.1)
April 2		Introduction (6.1)
April 4		Renewal Equations (6.2)
April 6		Discrete Renewal Processes (6.3)
April 9		Discrete Renewal Processes (6.3)
April 11		M/G/1 and G/M/1 Queues (6.4)
April 13	Hidden Markov Model (HMM)	
April 16	Review	
April 18	Second MT	
April 20	No class	
April 23	Applications to computational biology	Evolutional models
April 25		Applications of HMM to computational biology
April 27	Review (two hours)	
Aprill 30	Final	1 PM in class