SYS 6005 – Stochastic Systems

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TA's Office hours: Wednesdays, 9-11am. Location: Olsson Hall, Room 228, Lobby.

Meeting times and place: TTh 9:30-10:45am in Rice Hall 032.

Course Description: The goal of this course is to develop an operational understanding of the basic tools of probabilistic modeling, including:
(i) review of undergraduate probability,
(ii) Bernoulli and Poisson processes with applications,
(iii) Markov chains and applications,
(iv) limit theorems, and
(v) introduction to Bayesian and classical statistics.
Homework and exams will emphasize the use of basic concepts of probability theory in applications.

Co-requisites: SYS 6001.

Text: D. P. Bertsekas & J. N. Tsitsiklis, Introduction to Probability, 2nd Ed., Athena Scientific, 2008.

Other Potentially Useful References:
- W. Drake, Fundamentals of Applied Probability Theory, McGraw-Hill, 1967.
- S. M. Ross, Introduction to Probability Models, 8th Ed., Academic Press, 2003.

Grading:

- Homework: 30%
- Midterm: 20%
- Final Exam: 40%
- Project: 10%

Schedule:

Date	Topic	Homework
23-Aug	Probability Models	Homework 1 assigned
25-Aug	Conditional Probability	
30-Aug	Probabilistic Independence	
1-Sep	Chapter 1 Advanced Topics (1.42, 1.48)	
6-Sep	Discrete Random Variables	Homework 1 due
8-Sep	Expectation	
13-Sep	Chapter 2 Advanced Topics (2.28, 2.34) (Lecture by S. Patek)	
15-Sep	Continuous Random Variables (Lecture by S. Patek).	
20-Sep	Multiple Continuous Random Variables	Homework 2 due
22-Sep	Cond. Expect., Law of Iterated Expect., Random Sums of RVs	
27-Sep	Chapter 3 Advanced Topics (3.3, 3.4, 3.9, 3.14)	
29-Sep	Chapter 4 Advanced Topics (4.2, 4.21, 4.25, 4.26, 4.27, 4.28)	Homework 3 due
6-Oct	Bernoulli Processes	
11-Oct	Poisson Processes	
13-Oct	Poisson Process Applications	Homework 4 due
	MIDTERM EXAM (covers everything through Chapter 4)	
18-Oct	Analyzing Memoryless Arrival Processes	Midterm Assigned
20-Oct	Discrete-Time Markov Chains (DTMCs)	
25-Oct	DTMC: Steady State	Midterm Due
27-Oct	DTMCs with Absorbing States	
1-Nov	Continuous-Time Markov Chains (CTMCs)	
3-Nov	Law of Large Numbers	Homework 5 due
8-Nov	Central Limit Theorem	
10-Nov	MDPs	
15-Nov	Advanced Topics	Homework 6 due, Final project assigned
17-Nov	Advanced Topics	
22-Nov	Advanced Topics	
29-Nov	Project Day 1	
1-Dec	Project Day 2	
6-Dec	Semester Wrap-up (preview of SYS 7005)	Final Project Due
TBD	*FINAL EXAM*	*Final Exam Assigned*