COURSE OUTLINE

IOE 316

Introduction to Markov Processes

Fall Term 2004

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COURSE DESCRIPTION:

This is an introductory course on discrete and continuous time Markov chains. The emphasis will be on model formulation and probabilistic analysis. Topics to be covered include discrete time Markov chains, a review of the exponential distribution and its properties, the Poisson process, continuous time Markov chains, and an introduction to queueing systems.

TEXT:

Ross, S., Introduction to Probability Models, Academic Press, 8th edition, 2003.

REFERENCES:

- Solomon, F., Probability and Stochastic Processes, Prentice-Hall, NJ 1987
- Clark, A. and Disney, R., Probability and Random Processes, Wiley, 2nd Edition, 1985.
- Hillier, F. and Lieberman, G., Intro to Operations Research, McGraw Hill, 1995.
- Bertsekas D, and Tsitsiklis, Introduction to Probability, Athena Scientific, 2002.
- Feldman, R. and Valdez-Flores, C., Applied Probability and Stochastic Processes, 1996.

GRADING:

Quizzes[1]	25%
Homework[2]	25%
Exam 1[3]	25%
Exam 2[4]	25%

[1] Pop Quizzes will be given in the Lab meetings of the course
[2] Assigned Tuesdays and due the following Tuesday
[3] 12:10-1:30pm Thurs Nov 18
[4] 12:10-1:30pm Tues Dec 14

Week	Date	Topic	Reading
1	10/26	Introduction	
2	11/2	Discrete Time Markov chains: models and transient analysis	4.1-4.2
3	11/9	Long run behavior: irreducibility, aperiodicity and recurrence	4.3-4.5
4	11/16	Exponential distributions and the memoryless property/ Exam 1	5.1-5.2
5	11/23	Independent and stationary increments and the Poisson process	5.3.1-5.3.2
6	11/30	Interevent and event time distributions	5.3.3-5.3.5
7	12/7	Queueing systems, continuous time Markov chains and balance equations	8.1-8.2, 6.1-6.3,6.5,8.3
8	12/14	Exam 2	

ABET COURSE OUTCOMES	1. Define the states and transition probabilities of a discrete time Markov Chain. Understand the concept of steady state; be able to solve small systems for steady state probabilities. 2. Define the states and transition intensities of a continuous time Markov Chain. Be able to calculate limiting probabilities using balance equations. 3. Be able to define and use a Poisson process and understand its relationship to the exponential distribution. 4. Obtain familiarity with a queue as a birth-death process and be able to calculate steady state probabilities. 5. Be able to use Little's formula for queues.

COURSE POLICIES:

Homework:

Students are allowed to work in groups on homework. However each student is individually responsible for expressing their answers in their own terms. Also you may not acquire, read, or otherwise utilize answers from solutions handed out in previous terms. Homework is due at the beginning of class one week after it is assigned. Late homework will not be accepted.

Exams:

a) Please note the exam time above. Valid excuses for failing to meet an exam are personal illness or illness in your immediate family. You must observe the Honor Code (see

http://www.engin.umich.edu/dept/aero/docs/honor_code.pdf) with respect to examinations and all other aspects of this course.

b) If you believe an exam or quiz or homework question was graded in error and wish to have the exam or quiz or homework question regraded, you must submit the exam or quiz or homework to GSI together with a *written* explanation for requesting the regrade. This must be done within *one week* from the date the graded exam or quiz or homework was returned. Be aware that an exam or quiz or homework that is regraded will result in *all* of the graded problems being regraded so that you may lose or gain points by resubmitting.