Stochastic Processes – 18.445
MIT, FALL 2011

COURSE INFORMATION

Instructor: Alberto De Sole, room: 2-470, phone: (617) 253-4326, email: desole@mat.uniroma1.it
Graders: Wenzhe Wei, room: 2-251, email: wenzhe@math.mit.edu
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Meeting times: Lectures: Tue-Thur, 9:30–11 pm, in room 4–270. Office hours: Wed 5:00–7:00 pm in the instructor’s office.
Course Web Page: http://math.mit.edu/classes/18.445
   Course announcements and homework assignments will be posted here.

COURSE DESCRIPTION
We will cover material from Karlin and Taylor’s book, Chapters 3–9, omitting some parts. The main topics are: basics of stochastic processes, random walk, markov chains, Poisson process, birth and death processes, and Brownian motion. Time permitting, we will also cover something (about one week) of mathematical finance. A day by day lecture outline will be available on the course web page as we go along.

COURSE REQUIREMENT
Usually, the homework will be assigned on Thursday and will due next Thursday, in class. Late homework will be accepted at 10% off per school day, and 50% off after solutions are given out.
   There will be two in class midterm exams and no final exam. The midterm exams will be on Thursday, October 27, and on Thursday, December 8. The final grade will be based on homework grades (counting 40%), and the exams grades (counting 60%).

WEEKLY SYLLABUS (tentative) Suggested Reading

Week 1 (thu 9/8) Presentation of the course. The random walk. K&T ch.3
Week 2 (9/13–15) Markov chains. (PS1 due) K&T ch.3-4
Week 3 (9/20–22) Classification of states. Branching processes. (PS2 due) K&T ch.5
Week 4 (9/27–29) The exponential distribution and the Poisson process. K&T ch.6
Week 5 (10/4–6) Continuous time Markov chains. (PS4 due) Holyday (tue 10/11): Columbus day
Week 6 (10/13) Time reversibility in a continuous time Markov chain K&T ch.6
Week 7 (10/18–20) Renewal theory (PS5 due) K&T ch.7
Week 8 (10/25–27) Review and Mid Term Exam 1 (on 10/27) K&T ch.9
Week 9 (11/1–3) Queueing Theory (PS6 due) K&T ch.9
Week 10 (11/8–10) Queueing networks (PS7 due) K&T ch.8
Week 11 (11/15–17) Brownian motion and Gaussian processes (PS8 due) K&T 2.5
Week 12 (11/22) Martingales Holyday (thu 11/24): Thanksgiving
   Week 13 (11/29–12/1) Finance (PS9 due) K&T ch.8
Week 14 (tue 12/6–8) Review and Mid Term Exam 2 (on 12/8) K&T ch.8
Week 15 (tue 12/13) Review

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