STA 447/2006S: Stochastic Processes (Winter 2018)

STA 447/2006S is a course about random (stochastic) processes, designed for graduate and senior undergraduate students in statistics and related disciplines. [See also the evolving lecture notes, to be updated after each lecture.]

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Lectures: Thursdays, 6:10 - 9:00 p.m., in room 2102 of Sidney Smith Hall (building "SS" on campus map). First class Jan 4. Last class March 29. No class Feb 22 (Reading Week). During lectures, please **put away your laptops and cell phones** (unless you are using them specifically for a class-related purpose with prior permission), and **pay attention** to the material being presented.

Course Web Page: Visit probability.ca/sta447 for course information and announcements.

Prerequisite: STA347. **NOTE:** This prerequisite will be **strictly enforced** for undergraduate students: undergraduate students without STA347 will **not** be permitted to remain in STA447 except in **very special circumstances**. (It does **not** suffice to simply have taken some other advanced statistics courses.) For graduate students, it suffices to have taken a course equivalent to STA347 at another university; if you are unsure about the equivalence then please ask me.

Evaluation:
8% Homework #1 (assigned by Jan 11, due Jan 25 at 6:10 pm sharp);
26% Midterm test (on Thurs Feb 8, during class time, in BA1160 [surnames C-S] and GB404 [surnames A-B and T-Z]; see solutions);
8% Homework #2 (assigned by Feb 15, due Mar 8 at 6:15 pm sharp);
8% Homework #3 (assigned by Mar 15, due Mar 29 at 6:15 pm sharp);
50% Final Exam (some time during April 9-30 exam period, to be announced).
Note: On the midterm and exam, **BRING YOUR STUDENT CARD**, and **DO NOT SIT NEXT TO ANYONE THAT YOU KNOW**, and **NO AIDS ALLOWED** (not even calculators).

Instructor Office Hours: You are welcome to talk to the instructor after class, or any time you find him in his office (SS 5022), or you can e-mail him to arrange another time to meet. Special office hours in SS 5022: Mon Jan 22 at 11:30-12:30; Wed Jan 24 at 3:30-5:30; Wed Jan 31 at 4:30-5:30; Wed Feb 7 at 3:30-5:30. Additional office hours will be arranged as needed.

TA Office Hours in SS 623B (basement level): Mon Feb 5 at 10:00-12:00; Wed Feb 7 at 6:00-8:00 pm. (More hours to be announced later.)

Tentative list of topics to be covered: Markov chains in discrete and continuous time, martingales, Poisson processes, renewal theory, and Brownian motion, with applications (as time permits) to Monte Carlo algorithms, random walks on graphs, branching processes, option pricing, queueing

networks, and more.

Supplementary Readings: There is no required textbook. The instructor will post his rough lecture notes on this course web page after each lecture. In addition, the following books (among others) may be useful for further reading:

- R. Durrett (1999), Essentials of stochastic processes. Springer, New York. [See free online version of second edition, 2011.]
- G.R. Grimmett and D.R. Stirzaker (1992), Probability and random processes, second edition. Oxford University Press. [Or: third edition, 2001.]
- G.E. Lawler (1995, or 2nd ed. 2006), Introduction to stochastic processes. Chapman & Hall.
- O. Häggström (2002), Finite Markov chains and algorithmic applications. Cambridge University Press.
- S. Resnick (1992), Adventures in stochastic processes. Birkhauser, Boston.
- J.S. Rosenthal (2006), A first look at rigorous probability theory, 2nd ed. World Scientific Publishing Company, Singapore. [Especially chapters 7,8,14,15.]

Lateness policy: Homeworks are due **sharp** at the indicated time. Lateness penalties are: 1-5 mins = 1 point; 6-10 mins = 2 points; 11-30 mins = 5% of total points; 31 mins - 24 hours = 10% of total points; longer = (10% of total points) x (number of days late, rounded **UP**).

Regrading policy: Regrading requests should only be made for **genuine grading errors**, and should be initiated by writing or typing a complete explanation of your concern (together with your full name, student number, e-mail address, and telephone number) on a **separate piece of paper**, and giving this together with your original **unaltered** homework/test paper to the instructor **within one week** of when the graded homework or test was first available. **Warning: your mark may end up going down rather than up.** (Note: for final exams, a different Faculty-wide process should be followed instead.)

This document is available at probability.ca/sta447 or probability.ca/sta2006, or permanently at probability.ca/jeff/teaching/1718/sta447/