Instructor: Andrey Sarantsev
Time and Place: 9:30am-10:45am Tue, Thu; NH 1006
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Office: SH 5522
Office Hours: 5pm-6pm Mon, 1pm-3pm Tue, 1pm-3pm Wed, 1pm-2pm Thu; SH 5421

Teaching Assistant: Mihnea (Mike) Andrei
Section 52217: 11:00am-11:50am Fri; ARTS 1356
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Office: SH 5431 R
Office Hours: 10am-12pm Tue; SH 5431 R

Teaching Assistant: Mostafa Mousavi
Section 52225: 12:00pm-12:50pm Fri; HSSB 1214
Section 52233: 1:00pm-1:50pm Fri; HSSB 1214
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Office Hours: 10am-11am & 2:30pm-3:30pm Fri; SH 5431 S

Teaching Assistant: Sarah Marquis
Section 74542: 10:00am-10:50am Fri; HSSB 1228
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Office: SH 5431 R
Office Hours: 2pm-3pm Thu; SH 5431 R

Syllabus. This course covers foundations of discrete-time stochastic processes.

1. Review of probability
2. Markov chains: stationary distributions, convergence, recurrence and transience, irreducibility and aperiodicity, mean time in transient states, comparison of hitting times
3. Conditional expectation and conditional distribution with respect to $\sigma$-algebras
4. Martingales: definitions, optional stopping theorem
5. Random walk: transition probabilities, transience and recurrence, reflection principle
6. Simulations of random variables and random processes

Prerequisites. Probability (PSTAT 120A and 120B), calculus (including multivariable calculus), and matrix algebra.

Textbook. Lecture notes on probability and discrete-time stochastic processes (PSTAT 120A and 160A) are available on Gauchospace. We will closely follow them.

Homework Assignments and Weekly Quizzes. Each week from 3 to 9, there is a homework assignment (10-15 problems), which is not collected. Instead, at the end of
the section (20 minutes), there is a quiz which contains two problems from this homework (alternatively, one of them can also be from the previous homework). The quiz will be graded and returned to you on the next section. Homework assignment will be posted no later than Thursday of the preceding week.

**Python Problems.** Two homework assignments (approximately weeks 4 and 7) also contain Python problems, which should be submitted via Gauchospace. They will be graded separately and will not be included in quizzes. Instructions on how to use Python are available on Gauchospace.

**Final Exam.** The Final Exam is on Tuesday, June 13, 8:00am-11:00am, in the same room as the lectures. This exam is cumulative (covers all course). You can have a standard note sheet: 8.5x11 inches, handwritten, two-sided. You do not need to submit it after the midterm. You will need a calculator. The final will be graded during the break and will be available from the beginning of Summer Quarter. Before the final exam, a practice final with solutions will be provided to help you prepare. In addition, I will hold additional office hours.

**Grading Scheme.** The class will not be "curved": Your grade depends only on you, not on your classmates.

- 3.5% each Python problem
- 9% each quiz
- 30% Final Exam

Total $3.5\% \cdot 2 + 9\% \cdot 7 + 30\% = 100\%$.

**Make-Ups.** In case of observance of religious holidays or participation in UCSB-sponsored activities, arrangements must be made at least 2 days in advance for quizzes. You will be required to provide documentation for your absence. Make-up quizzes will not be given. If you miss a quiz due to unavoidable, compelling, and well-documented circumstances, your other quizzes will be weighted more heavily.

**Registration.** If you cannot register for the class I am sorry. I would like you to attend this class, but because of space limitations, the place in the class is not guaranteed. Adding students is decided independently of the instructor, by the staff of the Department of Statistics and Applied Probability. Please attend lectures and the section of your choice, and do not forget to sign on the crashlist at the end of the lecture and the section. Then I can add you to Gauchospace. During the first week, there is usually a lot of moving in and out of the course, so keep checking: you might be able to register yourself. If your efforts are unsuccessful, please ask Sarah Anderson, South Hall (SH) 5607A, at the beginning of the second week.