PSTAT 160A. Applied Stochastic Processes I
University of California, Santa Barbara
Spring Quarter 2018

**Instructor:** Andrey Sarantsev  
**Dates:** April 2 - June 8  
**Time and Place:** Tue, Thu; 9:30am-10:45am; Buchanan Hall 1930  
**E-mail:** sarantsev@pstat.ucsb.edu  
**Web Page:** [http://www.pstat.ucsb.edu/faculty/sarantsev/](http://www.pstat.ucsb.edu/faculty/sarantsev/)  
**Office:** South Hall 5519  
**Office Hours:** Mon, Tue, Wed, Thu, 1:00pm-3:00pm; Wed, 9:30am-10:30am  
South Hall 5421 (Graduate Conference Room)  
First week of Spring Quarter, April 2-8: Office hours only Tue, Thu

**Teaching Assistants, Sections, Office Hours:** There are 4 TA sections.

- **Andrea Angiuli:** 5:00pm-5:50pm Thu, North Hall 1111; 11:00am-11:50am Fri, Girvetz Hall 1116;  
  Office hours: 12:00pm-1:00pm Tue, 12:00pm-1:00pm Thu, South Hall 5432S

- **Chang Yuan Li:** 10:00am-10:50am Fri, HSSB 1233; 1:00pm-1:50pm Fri, HSSB 1214;  
  Office hours: 11:00am-12:00pm Wed, 12:10am-12:10pm Fri, South Hall 6432B

**Syllabus.** Probability Theory, discrete-time Stochastic Processes, Poisson processes.

1. Review of Probability Theory: random variables, Central Limit Theorem (Sections 3-6)  
2. Generating and moment generating functions (Section 8)  
3. Conditional expectation and conditional distribution (Section 10)  
4. Markov chains (Section 11)  
5. Random walk (Section 12)  
6. Martingales (Section 13)  
7. Poisson process (Section 14)  
8. Simulations of random variables and random processes in Python (Section 21)

**Prerequisites.** Differential & Integral Calculus (MATH 2B or 3B), Linear Algebra (MATH 4A or 4AI), Proofs (Math 8), Probability 1 (PSTAT 120A). Probability 2 (PSTAT 120B) is recommended.

**Textbook.** Lecture Notes on Probability Theory and Stochastic Processes are posted on Gauchospace and on my web page. We will closely follow them, and take all homework and final exam problems from them. In addition, Introduction to Stochastic Processes with R by Robert Dobrow is available online at UCSB library (student login required) free of charge.

**Homework Assignments and Weekly Quizzes.** Each week from week 2 to week 9, there will be a homework assignment (10-15 problems) consisting of problems from the lecture notes. This homework will not be collected and graded. Instead, at the end of the section (20 minutes), there will be a quiz which contains two problems randomly selected from this homework assignment. These problems might be different for different sections. The quiz will be graded by the professor and returned to you on the next section. Homework assignment will be posted no later than the Tuesday of the previous week. The quiz is closed book: no note sheet and no calculator is allowed.

**Python Problems.** Computer programming is an essential part of your education in Probability & Statistics. Each week from week 2 to week 9, a Python programming problem from Section 20 of lecture notes will be posted. This is a simple simulation of a random variable or a random process. This problem should be submitted via Gauchospace. This problem is graded by a TA and will not be included in the quiz. Instructions on how to use Python are available on Gauchospace. You are allowed to ask your professor or teaching assistant, or look up the Internet. But you are not allowed to collaborate with other students in your class or anyone else on Python problems, or ask questions online. These actions will be considered cheating.

**Installing Python.** Go to [https://www.enthought.com/products/canopy/](https://www.enthought.com/products/canopy/) and download Canopy by clicking “Get Canopy”. This is a Python environment.

**Final Exam.** Tue, June 12; 8:00am-11:00am, in the same room as the lectures. This exam is cumulative (covers all course), and consists of 12 problems, randomly selected from the lecture notes (from the sections we
You can have a standard note sheet: 8.5x11 inches, handwritten, two-sided. You do not need to submit it after the exam. You are allowed to use a calculator. The final exam will be graded during the finals week and will be available starting from Mon, June 18. I will hold additional office hours before the final exam.

**Grading Scheme.** You are allowed to drop the lowest quiz and the lowest Python problem. The total score is calculated as follows.

- 3% each Python problem
- 5% each quiz
- 44% Final Exam

Total: 3% \cdot 7 + 5\% \cdot 7 + 44\% = 100\%.

**Class Grade.** This class is not a competitive environment. I wish every one of you succeeds. Therefore, your grade depends on your own total score, calculated as above. As an example, getting your total score above 93% guarantees you an A, regardless of what the rest of the class did. Relative comparison of students ("the curve") will be used to push grades up, not down.

- A: top 10% of class or total score above 93%
- A-: next 10% or total score above 90%
- B+: next 10% or total score above 87%
- B: total score above 83%
- B-: total score above 80%
- C+: total score above 76%
- C: total score above 72%
- D: total score below 72%

**Make-Up Quizzes.** 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.** All student must attend the first TA section, unless there is a valid and documented reason. See also the letter about switching sections.

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 by the staff of the Department of Statistics and Applied Probability, depending on the needs of students. The professor cannot add students. The class may be overloaded, letting in more students than the maximum number published in the schedule.

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 manually add you to Gauchospace, and you will be able to see the course web page and receive emails from me and TAs to students. 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 you did not register by Monday of the second week, please see the Undergraduate Adviser at the Department of Statistics and Applied Probability: Linda Figueroa, South Hall (SH) 5607A, at the beginning of the second week. Her office hours: Monday - Friday 9:00am-12:00am and 1:00pm-4:00pm.

**Switching Sections.** If you need to switch sections, please attend the first section which you wish to attend, and notify the TA teaching this section, as well as the TA you are currently enrolled with. Switching sections will be approved only in case of scheduling conflict. See also the letter about switching sections.

**Requests and Complaints.** If you have a problem, request, or complaint, please take to me. If we did not resolve the situation, please talk to Raya Feldman (South Hall 5516). If this still does not resolve the problem, please talk to the Department Chair Yuedong Wang (South Hall 5509).

**Recommendation Letters.** If you are applying to Master, PhD, or other graduate programs, and if you got an A or A- in this class, I can write you a recommendation letter. I can also help you write your statement and CV. Please send me your photo, CV, statement, and a list of schools you are applying to, together with exact names of programs, and application deadlines.