University of California, Santa Cruz
Department of Statistics
Baskin School of Engineering

AMS 131-01: Introduction to Probability Theory (Fall 2018)
General course information

	Athanasios Kottas (*Instructor*)
Office	365A Baskin Engineering
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Office hours	Mon 12-1pm; Wed 12-1pm

	Sisi Song (*TA*)	Xingchen Yu (*TA*)	Hyotae Kim (*TA*)
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Office hours	TBD	TBD	TBD

Course web page: `https://courses.soe.ucsc.edu/courses/ams131/Fall18/01`

Lectures: Tuesday, Thursday 3:20pm–4:55pm (Thim Lecture 003)
Discussion sections:
Section 01A: Tuesday 8:30am–9:35am (Phys Sciences 114); TA: Sisi Song
Section 01B: Monday 2:40pm–3:40pm (Phys Sciences 114); TA: Sisi Song
Section 01C: Wednesday 10:40am–11:45am (Engineer 2 192); TA: Xingchen Yu
Section 01D: Wednesday 1:20pm–2:25pm (Engineer 2 192); TA: Xingchen Yu
Section 01E: Friday 10:40am–11:45am (Engineer 2 192); TA: Hyotae Kim

Course description (from the registrar): Introduction to probability theory and its applications. Combinatorial analysis, axioms of probability and independence, random variables (discrete and continuous), joint probability distributions, properties of expectation, Central Limit Theorem, Law of Large Numbers, Markov chains. Students cannot receive credit for this course and course 203 and Computer Engineering 107. Prerequisite(s): course 11B or Economics 11B or Mathematics 11B or 19B or 20B. (General Education Code(s): Q, SR - Statistical Reasoning)

Course objectives: To provide an introduction to the basic ideas of probability, distribution theory, and their applications. The main goal is to develop key mathematical tools to study models that incorporate uncertainty using a probabilistic framework. We will begin by introducing the axioms of probability and the rules needed to perform calculations with probabilities. Next, we will move to the concepts of independence and conditional probability, discuss Bayes theorem, define a random variable (both discrete and continuous), and consider its probability distribution function as well as its expectation and higher order moments. We will extend these ideas to the multivariate case. We will study some of the most commonly used discrete and continuous distributions. Moreover, we will consider some key theoretical limit results, including the Law of Large Numbers and the Central Limit theorem. Finally, as time permits, we will provide a brief introduction to certain classes of stochastic processes, including Markov chains and Poisson processes.

Mathematical background: This is a calculus-based introduction to probability. A good working knowledge of calculus is assumed. We will mainly be using tools from integral calculus, including techniques such as change of variables and integration by parts. Multivariate integration will also be needed, albeit to a smaller extent than working with univariate integrals.
Please take some time to review your calculus, especially if it has been a while since you completed the relevant courses. The first 3-4 weeks of the course material do not require substantial calculus background, which provides some flexibility for calculus review, if needed. A brief overview of integration methods with some examples will be given during the first week's discussion sections.

Textbook: M.H. DeGroot and M.J. Schervish (2012), *Probability and Statistics* (Fourth Edition), Addison Wesley.

Reading: The course material is cumulative and may go quickly. It is expected that you will stay up to date by reviewing your notes from lectures and discussion sections, reading from the relevant textbook chapters, and, very importantly, practicing with homework problems.

Discussion sections: Although attendance of the discussion sections is not mandatory, it is **strongly recommended**. The sections will mainly focus on discussing solutions to homework problems. The TAs will also work through additional examples that supplement the material covered in the lectures, and answer questions on the course material.

Homework: Homework will be assigned (every one or two weeks) and collected, but it will **not** be graded. Homework assignments will be posted on the course webpage. Nominal credit will be given for submitting your solutions for the homework problems. You must submit your homework to your TA during your discussion section.
Detailed solutions to several homework exercises will be given during the discussion sections and, for some problems, during the lectures. Working on the homework problems will enable you to develop facility in probabilistic thinking through regular practice. Moreover, it will provide early and regular feedback on your performance in the course through the solutions discussed during the sections, lectures, and office hours. Please plan to work consistently throughout the quarter on the homework problems, attempting to solve them *before* they are discussed in sections or class. **The importance of regular practice with the homework problems can not be overemphasized.** Based on several years of collective experience with this course, the capacity to independently solve homework problems is a strong predictor for good performance in the exams.

Exams: There will be two exams during the quarter and a final. The dates are as follows:

Exam 1: Thursday October 25 (in class)
Exam 2: Tuesday November 27 (in class)
Final exam: Monday December 10, 9am–11am (**two-hour** final)

All three exams will be closed-book, closed-notes, but you may bring one (letter size) piece of paper with formulas on both sides. The final exam will be cumulative. *Requests for make-up exams will be considered only for truly exceptional circumstances.*

Course grade distribution: Homework: 10%; Exams 1 and 2: 55% (with 20% used for the lower exam score and 35% for the higher exam score); Final exam: 35%

Academic integrity and misconduct:
Homework assignments. Collaboration with fellow students to discuss some of the homework problems is acceptable. However, please note again the importance of working independently on the homework assignments before discussing solutions in section or during office hours (or possibly with other students).
Exams. Suspected academic misconduct during any of the exams, involving copying from other students or using any materials other than the permitted piece of paper with formulas, will be dealt with following the "Academic Misconduct Policy for Undergraduates". Please refer to

`https://ue.ucsc.edu/academic-misconduct.html`

The *academic sanction* for misconduct in a particular exam will be a score of 0 in the exam.

Accommodations for students with disabilities
UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment. Please do so as soon as possible, preferably within the first week of the quarter. Please contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu for more information.