STAT 131: Introduction to Probability Theory

Summer 2024

Instructor:	Sheng Jiang	**Time:**	TuTh 9:00 AM – 13:30 PM
Email:	sjiang45@ucsc.edu	**Place:**	Zoom

Description: This course is to equip undergraduate students with basic knowledge of probability theory and its applications. Main topics include 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.

Course Pages:

1. Canvas
2. My personal website for other materials (lecture notes, past exams, etc.).

TAs:

- Shuangjie Zhang (szhan209@ucsc.edu)
- Benjamin Ticknor (bticknor@ucsc.edu)
- Ziyue (Patrick) Zheng (zzheng95@ucsc.edu)
- Peter Trubey (ptrubey@ucsc.edu)

Learning Support Services (LSS) tutor(s):

- The Small Group Tutor:
  - Debi Majumdar (she/her) (demajumd@ucsc.edu)
- Important Dates:
  - Students can sign-up for tutoring on Monday June 24th at 12pm on TutorHub.
  - Sessions begin Wednesday, June 26th

Office Hours:

- Sheng: Mondays 13:30-15:30 over Zoom, and/or by appointment.
- Peter: Mondays 10:00-12:00 over Zoom, and/or by appointment.
- Patrick: Wednesdays 13:00-15:00 over Zoom, and/or by appointment.
- Shuangjie: Wednesdays 15:00-17:00 over Zoom, and/or by appointment.
- Ben: Fridays 10:00-12:00 over Zoom, and/or by appointment.

Discussion Sections:

- Ben: Tuesdays 15:00-17:00 over Zoom.
- Patrick: Wednesdays 10:00-12:00 over Zoom.
- Shuangjie: Thursdays 15:00-17:00 over Zoom.
- Peter: Fridays 13:00-15:00 over Zoom.

Textbook:

- Schervish, M. J., & DeGroot, M. H. (2014). *Probability and statistics*. London, UK:: Pearson Education.

Useful references:

- Wasserman, Larry. *All of statistics: a concise course in statistical inference.*

  The first five chapters present all of the essential aspects of probability theory. Very concise.

- Blitzstein, J. K., & Hwang, J. (2019). *Introduction to probability.* Chapman and Hall/CRC.

  Free copy of Blitzstein & Hwang is available at this link. Exercises are trickier than the textbook. This is the textbook used by Harvard and other universities for the same course.

- Jaynes, E. T. (2003). *Probability theory: The logic of science.* Cambridge university press.

  Fun to read.

- Durrett, R. (2019). *Probability: theory and examples* (Vol. 49). Cambridge university press.

  Standard graduate level probability textbook where you can find rigorous proofs.

Prerequisites:

An undergraduate-level understanding of calculus is assumed: AM 11B or ECON 11B or MATH 11B or MATH 19B or MATH 20B. (Check the **math Quiz**.) Take this course only when you are comfortable with calculus.

For a better learning experience, a good understanding of essential concepts of linear algebra and/or multivariate calculus is very helpful.

Course Policy:

- We shall strictly follow the honor code (academic misconduct policy).
- Feel free to interrupt me and ask questions in class.
- English is my second language. If you spot any errors or have suggestions, please let me know.
- Lecture recordings will be available via YuJa.

DRC/CARE Statement

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 email, preferably within the first two weeks of the quarter. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all

students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089, or by email at drc@ucsc.edu.

Grading Policy:

- Weekly Canvas quizzes: $4 \times 10\%$
  - Ten questions are assigned on each Friday and due on the following Sunday.
  - *unlimited* attempts, and late submissions are accepted until the final exam.
  - no late penalty.
- Weekly **extra credit** quizzes: $5 \times 2\%$
  - Five questions are assigned on each Friday and due on the following Sunday.
  - Three attempts. Late submissions are not accepted.
- Two midterm exams (on Canvas): 10 % + 15%.
  - Only *one* attempt is allowed.
- Final exam (35%) , with 10% **extra credits**.
  - You can prepare one A4 cheat sheet, two-sided, handwritten or typed.
  - The final exam is mandatory.
  - NO makeup final.
- SET survey 2% **extra credits** if the completion rate $\geq 70\%$.

Grading Scale:

Letter Grades	Score	Letter Grades	Score	Letter Grades	Score
A+	great job in the final	A	$X \geq 90$	A−	$90 > X \geq 85$
B+	$85 > X \geq 80$	B	$80 > X \geq 75$	B−	$75 > X \geq 70$
C+	$70 > X \geq 65$	C	$65 > X \geq 60$	C−	$60 > X \geq 55$
		D	$55 > X \geq 50$	F	$50 > X \geq 0$

Important Dates:

Midterm Quiz I ..... July 3, 2024
Midterm Quiz II ..... July 15, 2024
Final exam ..... 10:00–11:30 a.m., July 25, 2024
Grades are posted ..... July 30, 2024

Tentative Course Outline: The 4.5-hour lecture is broken down into three mini-lectures:

- 9:00-10:15, lecture
- 10:15-10:30, break
- 10:30-11:45, lecture
- 11:45-12:15, lunch break
- 12:15 - 13:30, lecture.

Five-week lectures:

- Classical probability theory, counting methods, etc. (two lectures, the first week)
- Theory of random variables: distribution functions, discrete/continuous, univariate/multivariate, etc. (three lectures, the second and the third weeks)
- Expectation (two lectures, the fourth week)
- Important inequalities and large sample theory (one lecture, the fifth week)