STAT 131: Introduction to Probability Theory

Summer 2023

Instructor:	Sheng Jiang	**Time:**	Tu/Th 13:00–16:30
Email:	sjiang45@ucsc.edu	**Place:**	Jack Baskin Aud 101

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.).

TA:

- Seokjun Choi (schoi90@ucsc.edu)

Office Hours:

- Sheng: Thursdays 10:30-12:30 (E2 539B)
- Seokjun: Fridays 10:00-12:00 (over Zoom)

Textbook:

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

  This book is the textbook and the major reference. We will only cover the first five chapters. The concise fashion makes the book suitable for the summer course.

Useful references:

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

  This is the standard textbook for elementary probability theory with calculus. But it is a bit lengthy, hence not suitable for a five-week crash course.

- 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 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.

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:

- Four Canvas quizzes (4×10%), assigned on each Friday.
- Take-home midterm (25 %), with 5% extra credits.
- Final exam (35%) , with 10% extra credits.
  - You can prepare one A4 cheat sheet, two-sided, handwritten or typed.
  - The in-person final is mandatory unless the COVID outbreak in the final week.
  - NO makeup final.
- SET survey 2% extra credits if the completion rate $\geq$ 70%.

Grading Scale:

Letter	Score	Letter	Score
A	x >= 94 pts	C+	70 pts <= x < 74 pts
A-	90 pts <= x < 94 pts	C	64 pts <= x < 70 pts
B+	84 pts <= x < 90 pts	C-	60 pts <= x < 64 pts
B	80 pts <= x < 84 pts	D	50 pts <= x < 60 pts
B-	74 pts <= x < 80 pts	F	x < 50 pts

Important Dates:

Take-home midterm exam assigned 00:01 July 10, 2023
Take-home midterm exam due ..... 13:00 July 11, 2023
Final exam, in class ..... 13:00-15:00 July 27, 2023
Grades are posted ..... July 29, 2023

Tentative Course Outline:

5-week lecture:

- Classical probability theory, counting methods, etc. (one week)
- Theory of random variables: distribution functions, discrete/continuous, univariate/multivariate, etc. (two weeks)
- Expectation (one week)
- Important inequalities and large sample theory (one week)