PSTAT 120A: Summer 2022

—*Syllabus*—

Instructor:	Ethan P. Marzban
Email:	epmarzban@pstat.ucsb.edu
OH:	T, Th 4:00 - 5:30pm PDT
OH Location:	South Hall 5421 (The "StatLab")

TA:	Moya Xiong	*TA:*	Lucas Hahn de Castro
Email:	moyaxiong@ucsb.edu	*Email:*	lwh152@ucsb.edu
OH:	M 8am - noon	*OH:*	M, W 1 - 2pm
OH Location:	Zoom [click here]	*OH Location:*	Zoom [click here]

WELCOME TO PSTAT 120A! I am very excited to introduce to you the wonderful world of probability. As we will learn, probability provides us with a rigorous way of quantifying uncertainty and, consequently, with a way to better understand the randomness that surrounds us in our day-to-day lives. I am very much looking forward to a great quarter with all of you! — ETHAN

Lecture Times M, T, W, Th from 2 - 3:05pm (PDT) in Psychology 1902

Course Description The main topics we will cover in this class are:

- Axioms of Probability, and Probability Spaces
- Counting/Combinatorial Principles
- Random Variables
- Distributions (univariate and multivariate)
- Transformations of Random Variables
- Moment Generating Functions
- Limit Laws (CLT; WLLN; Markov's and Chebyshev's Inequalities)
- Conditional Distributions and Expectation

You have a 50% chance of winning the lottery: either you win, or you don't

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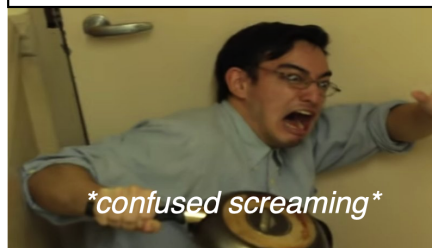
Time permitting, we may also briefly discuss Poisson Point Processes, Bivariate Transformations, and Mixed Distributions.

Prerequisites As this is a somewhat math-heavy course, there are a few mathematical prerequisites I assume you have. You are expected to have familiarity with calculus (both derivatives and integrals), as well as infinite series; we will also be performing some double-integration later in the course, but I will not expect you to have seen double integrals before.

If you feel you do not fulfill these prerequisites, please reach out to the me (Ethan) ASAP to discuss.

Textbook The required textbook for this course is: ***Introduction to Probability*, by David Anderson, Timo Seppäläinen, and Benedek Valkó; ISBN 978-1108415859.** A few other textbooks that might prove useful are:

- *Probability*, by Jim Pitman. [A free (and high-quality) PDF is available to UCSB students through SpringerLink]
- *A First Course in Probability*, by Sheldon Ross.

Course Components The following are the assignments and metrics that will be used to compute your final grade in this course:

- **Homework:** You will have **2 Homeworks** every week: one due on Friday, and one due on Tuesday. A full schedule of due dates and coverage can be found here. Homeworks will be graded on a mix of completion and correctness; two questions (or parts) will be graded on correctness, and the remainder will be graded on completion.
- **Quizzes:** Every week (except for exam weeks), you will have one 20-minute quiz consisting of around 3-5 problems. These quizzes are not meant to be overly challenging; rather, they are mainly a means to ensure that you are keeping up with course material. Quizzes will take place **on Gradescope**, on **Thursdays** and between the hours of 6pm and 11:59pm PDT.
- **Exams:** We will have one midterm and one final, on the following dates:
  - **Midterm:** Thursday, July 7 from 2 until 3:05pm [Class Time]
  - **Final:** Thursday, July 28 from 4 - 7pm (PDT).

  You are required to take both the midterm and the final; failure to do so will result in a grade of "*F*". Additionally, **we will not be offering any make-up exams,** so please ensure you are able to take the exams on the above listed dates!

Grading Scheme Your final grade will be computed using the following weights:

Homework:	20%
Quizzes:	15%
Midterm Examination:	30%
Final Examination:	35%

Please note that late submissions for any of the above will **not** be accepted. Instead, your lowest homework quiz scores will be dropped.

Your final letter grade will be issued according to the following scheme:

- A (+/-): 90 - 100%
- B (+/-): 80 - 89.99%
- C (+/-): 70 - 79.99%
- D (+/-): 60 - 69.99%
- F: 0 - 59.99%

Please note: I have elected to adopt an uncurved grading scheme to eliminate any sense of "competition" among students; I highly encourage you all to collaborate with and uplift each other! I also offer the following guarantee: I may lower the cutoffs later in the quarter, depending on the general class performance, but I do not foresee a need to raise them!

Academic Integrity
As a member of the UCSB community, it is expected that you will act with academic integrity. This means, among other things, that the work you submit should be entirely your own and not copied from any external sources. Collaboration on homework assignments is perfectly acceptable (even encouraged) but the work you submit should still be your own; you can't have someone else write up solutions for you, nor can you consult cites like Chegg, CourseHero, etc. Anyone found guilty of academic misconduct will be reported to the Academic Senate, and will receive *at minimum* a failing grade on the assignment in question; actions may also include failing the course, and marks being made on permanent records. Depending on the severity of the infraction, expulsion is also a possibility.

Basically, don't cheat- please! If you're ever struggling with course material, please come talk to me or the TA's. We are truly here for you, and want only the best for you!

Disclaimer
The instructor reserves the right to modify this syllabus if he deems such modifications academically advisable.

Intellectual Property
All of the materials I provide in this class (including, but not limited to: homeworks, exams, solutions, quizzes, lecture notes, etc.) are the intellectual property of myself, and may not be shared with anyone outside this class without my explicit written permission.

Having said that, I will be posting nearly everything from this course to a [course website], which will be accessible to everyone!

Disabled Students Program
If you have a disability, or otherwise require accommodations for the exams and/or quizzes please reach out to the Disabled Students Program (DSP) ASAP to ensure your request(s) for accommodation can be processed. Please note that we cannot grant any requests for accommodations unless they come to us from DSP directly.

Schedule:
Please note that this schedule is only **tentative**, and may change at the discretion of the instructor (and also according to how quickly we run through the material this quarter).

Week 1
- **Tuesday:** Basic Probability/Axioms
- **Wednesday:** Axioms (cont'd); Counting
- **Thursday:** Counting (cont'd) Conditional Probability and Independence

Week 2
- **Monday:** Random Variables; Expectation
- **Tuesday:** Variance; moments; Distributions
- **Wednesday:** Distributions
- **Thursday:** Continuous Random Variables and Distributions

Week 3
- **Monday:** Named Continuous Distributions; Moment-Generating Functions
- **Tuesday:** Transformations
- **Wednesday: Review/Catch-Up**
- **Thursday: Midterm Examination**

Week 4
- **Monday:** Double Integrals
- **Tuesday:** Joint Distributions
- **Wednesday:** Independence, Correlation/Covariance
- **Thursday:** Linear Combinations of Random Variables

Week 5
- **Monday:** Limit Laws (Markov, Chebyshev, CLT, DeMoivre-Laplace)
- **Tuesday:** Limit Laws (cont'd); Ratios and Products
- **Wednesday:** New Distributions from Old (Cauchy, Rayleigh, etc.)
- **Thursday:** Conditional Expectations and Distributions

Week 6
- **Monday:** Conditional Expectations and Distributions; TBD
- **Tuesday: Review/Catch-Up**
- **Wednesday: Review/Catch-Up**
- **Thursday: Final Examination**

Image Source: https://knowyourmeme.com/memes/confused-screaming