

ORI 390R.1
Applied Probability
Fall 2020

Professor

Dr. Benjamin D. Leibowicz
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ETC 5.128D

Topics Covered

Concepts of probability and mathematical statistics; application of these analytical methods to planning and evaluation of research and industrial experimentation. Basic probability theory, combinatorial analysis of random phenomena, conditional probability and independence, parametric families of distributions, expectation, distribution of functions of random variables, limit theorems.

Lecture Time and Location

Lectures will be held on Tuesdays and Thursdays from 9:30 – 11:00 AM. Due to the ongoing COVID-19 pandemic, all lectures will be held virtually using the Zoom platform within Canvas. I will record videos of all lectures and make these recordings available on the course website, so that you can view them at any time. However, I strongly encourage you to stay in the habit of attending the virtual lectures synchronously in real time (if possible), as this will help you remain on track with the material, keep a good schedule in general, ask questions when you have them, and interact with your classmates.

Office Hours

I will hold virtual Zoom office hours from 1:00 – 2:00 PM on Tuesdays and from 2:00 – 3:00 PM on Thursdays. I encourage you to attend my office hours if you want help understanding the course material, want to go over specific problems or solutions, or want to discuss the course in general. If you need to meet with me outside these office hours, please email me stating the specific problem or topic you wish to discuss.

In-Person Meetings by Request

While the core components of this course will be conducted virtually, you may request a one-on-one, in-person meeting with me if you would like. The availability of this option throughout the semester will depend on the current state of the COVID-19 pandemic at any given time. For any in-person meeting, face coverings must be worn properly at all times.

Required Textbook

A First Course in Probability, 10th Edition by Sheldon Ross (Pearson)

Please note that I will assign problems from this edition of the textbook. If you choose to work with an older or international edition, it is your responsibility to make sure you do the correct problems.

Grader

The grader for this course is Helen Lu (helenlule@utexas.edu). If you have questions about the grading of a problem set or exam, then please contact her.

Materials and Equipment

During lectures, please have a notebook and scientific calculator (or equivalent calculator on your computer) available so that you can practice solving example problems in real time.

Course Website

All course materials will be posted on Canvas. I will generally post lecture slides and video recordings after each lecture.

Grading

Your final grade will be calculated using the following weights:

Problem Sets – 30%
Midterm Exam – 30%
Final Exam – 40%

Letter grades will be determined according to the following conversion:

| | |
|----|----------------|
| A | 93% or greater |
| A- | 90% to <93% |
| B+ | 87% to <90% |
| B | 83% to <87% |
| B- | 80% to <83% |
| C+ | 77% to <80% |
| C | 73% to <77% |
| C- | 70% to <73% |
| D+ | 67% to <70% |
| D | 63% to <67% |
| D- | 60% to <63% |
| F | <60% |

I may choose to raise your final grade by curving or some other method. However, these adjustments will never lower your grade.

Attendance

I will not take attendance or formally penalize you for not participating in the lectures synchronously. You are responsible for learning all of the course material and you are ultimately free to decide whether to attend the lectures synchronously, watch the lecture videos on your own time, or skip them. Even with lectures taking place online due to the COVID-19 pandemic, I believe strongly that participating in the lectures in real time is immensely valuable because it allows you to fully engage with the material, interact with your classmates, and ask questions to deepen your understanding. Furthermore, I am more likely to feel comfortable adjusting your grade upward at the end of the semester if you regularly attended and participated in lecture.

Problem Sets

Problem sets will be assigned about once a week and will be due at the beginning of class one week later. Please submit them electronically via Canvas as PDF files, which can be based on typed documents or scanned written work. Problem sets will include exercises from the textbook as well as additional problems. You may discuss problem sets with your classmates and work in small teams, but you must individually write up and submit your own solutions. Based on my own experience, problem set teams should be limited to four people or fewer to ensure that you fully participate in solving the problems and thoroughly understand your solutions. Late problem sets will be penalized by 10% per late day, up until three days after the due date. At that point, the solutions will be posted, and zero credit will be received for any subsequently submitted problem set.

Exams

Midterm Exam

Thursday, October 8

During regular lecture time

Final Exam

Thursday, December 10 (scheduled by the university registrar)

2:00 – 5:00 PM

Honor Code

I expect everyone to follow the UT Honor Code, which states:

“The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”

All suspected violations of the Honor Code will be referred to the Administration for adjudication. I have formally disciplined students for Honor Code violations in the recent past, and I will do so again without hesitation if any incidents occur in this course. Violating the Honor Code undermines the quality and integrity of your academic experience and degree, and is unfair to the majority of students who go about their work the right way. Cheating can easily result in probation, suspension, or expulsion from the University. Trust me — it’s not worth it!

To avoid ambiguity, all of the following actions related to problem sets will be treated as violations of the Honor Code: copying from a solutions manual, obtaining solutions from the internet, copying from students who took the course in prior years, and copying solutions from classmates without fully participating in solving the problems. For take-home exams, you are not allowed to talk to any other person (whether they are in this class or not) about the exam in any capacity for the full duration between its release and deadline — zero exceptions. Do not make course materials available to anyone outside this course, including websites that can be accessed by the general public (e.g., CourseHero). Doing so is not only a violation of academic integrity, but is also copyright infringement subject to legal consequences.

If you witness or become aware of other students committing academic integrity violations, please report the issue to me, or directly to Student Conduct and Academic Integrity. Given that this course will primarily take place online this semester, I view this responsibility as more important than ever, and I strongly urge you to do the right thing and speak up if you know of any Honor Code violations taking place in this course. For more information, please see: <http://deanofstudents.utexas.edu/conduct/index.php>

Disability Statement

Students with disabilities who require special accommodations need to get a letter that documents the disability from the Services for Students with Disabilities area within the Division of Diversity and Community Engagement (contact information below). This letter should be presented to me at the beginning of the semester and necessary accommodations should be discussed at that time. Five business days before an exam the student should remind me of any testing accommodations that will be needed.

Services for Students with Disabilities
512-471-6259
ssd@austin.utexas.edu
<http://diversity.utexas.edu/disability/>

Feedback

I am always interested in receiving constructive feedback that helps me enhance your learning experience, improve the course, and be the most effective instructor I can be. Throughout the semester I may elicit your feedback through both informal and formal channels. Please feel free to attend office hours or schedule a meeting with me at any time to discuss your own learning experience in the course, and whether there are any changes that would enhance it. Near the end of the semester you will have an opportunity to anonymously evaluate the course and myself using the standard College of Engineering evaluation form. Your feedback and suggestions are greatly appreciated, and I promise to give them careful consideration.

Tentative Course Schedule

The course schedule below is subject to change and will be updated as frequently as possible.

| Date | Topic | Reading | Problem Set Assigned | Problem Set Due |
|--------------|---|-----------|----------------------|-----------------|
| 8/27 | Welcome | | | |
| 9/1 | Counting | Chapter 1 | PS 1 | |
| 9/3 | Axioms of Probability | Chapter 2 | | |
| 9/8 | Equally Likely Examples | | PS 2 | PS 1 |
| 9/10 | Marriage Problem | | | |
| 9/15 | Conditional Probability | Chapter 3 | PS 3 | PS 2 |
| 9/17 | The Classics <i>* Asynchronous lecture</i> | | | |
| 9/22 | Random Variables | Chapter 4 | PS 4 | PS 3 |
| 9/24 | Discrete Random Variable Families | | | |
| 9/29 | Continuous Random Variables | Chapter 5 | PS 5 | PS 4 |
| 10/1 | Continuous Random Variable Families | | | |
| 10/6 | Distribution of a Function of a Random Variable | | PS 6 | PS 5 |
| 10/8 | <i>MIDTERM EXAM</i> | | | |
| 10/13 | Joint Random Variables | Chapter 6 | | |

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|--------------|---|------------|-------|----------------------------------|
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| 10/15 | Midterm Recap and Coin Flipping Bet | | PS 7 | PS 6 |
| 10/20 | Sums of Independent Random Variables | | | |
| 10/22 | Expectation | Chapter 7 | | |
| 10/27 | Conditional Expectation | | PS 8 | PS 7 |
| 10/29 | Covariance | | | |
| 11/3 | NO LECTURE * <i>IISE Conference</i> | | PS 9 | PS 8 |
| 11/5 | Limit Theorems | Chapter 8 | | |
| 11/10 | NO LECTURE * <i>INFORMS Conference</i> | | | |
| 11/12 | Markov Chains | Chapter 9 | PS 10 | PS 9 |
| 11/17 | Entropy | | | |
| 11/19 | Simulation | Chapter 10 | PS 11 | PS 10 |
| 11/24 | Maximum Likelihood Estimation | | | |
| 11/26 | NO LECTURE * <i>Thanksgiving Day</i> | | | |
| 12/1 | Scoring Rules | | PS 12 | PS 11 |
| 12/3 | Probability Riddles | | | PS 12 <i>Due Monday, 12/7</i> |

12/10

FINAL EXAM