

# Math 240: Probability

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Fall 2016

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Office Hours: M 3:10-5:00; TR 1:50-3:20; F 3:10-4:20

Office: 410 Briggs Hall

Web: [math240-lu.github.io](https://math240-lu.github.io)

Class Hours: MWF 9:50-11:00

Class Room: 422 Briggs Hall

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## What is this class about?

This course provides a comprehensive introduction to probability, as a language and set of tools for understanding statistics, science, risk, and randomness. Both the mathematical results of the subject and applications to solving problems will be studied, with examples ranging from gambling to genetics. It will cover

- **Basics:** sample spaces and events, counting, the naive definition of probability, Kolmogorov's axioms, conditional probability, and Bayes' Theorem.
- **Univariate distributions:** mass/density functions, expectation and variance, Normal, t, Binomial, Negative Binomial, Poisson, Beta, and Gamma distributions.
- **Multivariate distributions:** joint and conditional distributions, independence, transformations, and the Multivariate Normal distribution.
- **Limit laws:** the law of large numbers and the central limit theorem.

## Course Logistics

**Mathematical background:** This course will utilize tools from Calculus I, II, and III. As our textbook authors state, "The main mathematical challenge lies not in performing technical calculus derivations, but in translating between abstract concepts and concrete examples" (p. xiii). Appendix A in the textbook provides brief refreshers on many topics.

**Required textbook:** *Introduction to Probability*, Blitzstein and Hwang, 2014, CRC Press, ISBN 978-1-4665-7557-8.

**Online discussion forum:** Piazza is a platform where we can post announcements, have discussions, and ask questions. Please use Piazza to ask content questions that you would generally ask via email. This will help out other students who have the same question, and a classmate may be able to answer your question more quickly than I can.

## Course Components

**Preparation and study:** You must read the assigned sections of the text BEFORE I lecture on them, so that you are already working with the ideas in advance of hearing about them from me. In addition, review your lecture notes after each lecture, carefully reconstructing for yourself the ideas, arguments, and overall story that is developing. Listening to someone else talk for 70 minutes 3 times a week is not sufficient to learn mathematics and reorganize your thought processes.

**Class attendance:** During class we will explore major results, prove some of them, work on guided examples and additional practice problems. Office hours are not substitutes for class attendance.

**Homework:** Solving a lot of problems is an extremely important part of learning probability. To encourage this I will assign a few problems (~3-5) each Monday and Friday. You should start working on the problems as soon as they are assigned, and work on them a little (or a lot) every day. While the homework will help you grapple with the material, you may need more practice than the homework provides to master the material. The textbook provides approximately 250 strategic practice problems throughout the book that are marked with an (S). Detailed solutions are available for these problems on the course webpage, but you should work hard to solve the problems before looking at the solution.

**Presentations:** During some class periods will be focused on problem-solving and the discovery of new results. On such days, I will ask students to present solutions to problems that were either assigned ahead of class, or were introduced during class. All students will be required to share a number of their solutions with the class throughout the term. The purpose of these presentations is to hone your communication skills and share problem-solving strategies with the class.

**Exams:** There will be two midterm exams and a final exam. The midterm exams are (tentatively) scheduled for Wednesday, October 5, and Friday, October 28, during class. The final exam will be held on Tuesday November 22 from 3:00–5:30 p.m. The date and time of the final exam is set by the registrar, and under no circumstances will you be allowed to take the final at a different time due to early travel plans.

## Course Policies

**Assessment Procedure:** Problem sets will be worth a total of 35% of your final grade, and your lowest two scores will be dropped. Presentations will be 5% of your final grade. The midterm exams will be worth 15% and 20% of your grade, respectively, and the final exam will be worth 25% of your grade.

**Homework deadlines:** The problems assigned on Monday are due Friday by 4:00 p.m., while those assigned Friday are due Tuesday by 4:00 p.m. Problems are due in my office and no late

work will be accepted. I understand that this policy is strict, so I will drop your two lowest scores when computing your homework average.

**Classroom Culture:** If you would rather be talking, sleeping, reading the news, listening to music, or texting, I suggest that you do that somewhere much more comfortable than the classroom. When you attend class, please arrive on time and stay engaged throughout the entire class.

**Honor Code:**

*No Lawrence student will unfairly advance their own academic performance or in any way limit or impede the academic pursuits of other students of the Lawrence community.*

All students are expected to uphold Lawrence University's Honor Code. All work on exams must be your own. You may collaborate on homework, but you must submit your own assignment that reflects your own thinking, work and organization. Any assignment you submit for a grade should be your own work, and not a facsimile of a classmate's work, which would constitute academic dishonesty. To check if your homework meets this standard, imagine I asked you to explain your reasoning for each problem—you should be able to do so with ease using language similar to your submission. All written work must be accompanied by a reaffirmation of the Honor Code. Finally, cell phones will be prohibited during exams.

**Disability Policy:** Lawrence University is committed to providing reasonable accommodations for students with disabilities. Students establish eligibility and request accommodations through the Center for Academic Success. View the Accessibility Services web page at [go.lawrence.edu/cas](http://go.lawrence.edu/cas) for more information.

**Healthy Balance:** All members of the Lawrence community—students, staff, and faculty—have the responsibility to promote balance in their lives by making thoughtful choices. Balance results from two skills: avoiding imbalance through careful planning, and managing and containing imbalance when it occurs. This course will be demanding, but should not overwhelm your academic (let alone whole) life. If it threatens to, come talk to me, a tutor, friend, counselor, or advisor.