

Winter 2025
Math 525: Probability Theory
TR 10:00 – 11:20AM in 268 Weiser Hall

Instructor: Zaher Hani, [5834 East Hall \(EH\)](#), *Email:* zhani@umich.edu,
Website: <https://sites.lsa.umich.edu/zhani/>. *Office hours:* Tuesdays and Thursday from 12-1pm in EH5834.

Teaching Assistant:

1. Preetham Mohan (preetham@umich.edu). Office Hours: Wednesdays 4-6pm, and Monday 5-6pm in the **Math Atrium**.

Prerequisites: A solid knowledge of multi-variable calculus (at a level comparable to Math 205, 215, or 285) AND undergraduate single-variable analysis (at a level comparable to Math 295-296 or Math 351 or Math 451). A prior experience with counting (permutations, combinations, etc) and elementary probability would be helpful, but not absolutely necessary.

Course Coordinates: The class meets on TR 10:00-11:20AM in 268 Weiser Hall. The course format will be in-person lectures; which will NOT be recorded, so you are strongly encouraged to attend class in-person.

Textbook: The recommended textbook for this course is

A First Course in Probability, by Sheldon Ross, Tenth Edition.

You can also use other earlier editions (just make sure that the Section and exercise numbering is the same as that in the Tenth Edition). The book can be found inexpensively online by googling its name. Here are some other textbooks that you can consult for a different or deeper treatment:

1. *Introduction to Probability Models*, by Sheldon Ross, Tenth Edition.
2. *Probability and Random Processes*, by Geoffrey Grimmet and David Stirzaker.

Homework: There will be weekly homework sets that are posted and submitted on Gradescope (see Canvas).

Grading: Homework 40%, midterm 25%, final exam 35%.

Course description and projected topics: This is an introductory graduate course on probability. The following topics will be covered, modulo minor modifications and rearrangements:

1. Elementary counting techniques: permutations, combinations, binomial coefficients, etc.
2. Axioms of Probability: sample spaces, events, probability.
3. Conditional probability and independence: Bayes formula, independent events.
4. Discrete random variables: expectations, variance, Bernoulli, Binomial, and Poisson random variables.
5. Continuous random variables: expectations and variance, normal random variables, exponential random variables.
6. Joint distribution functions and sums of independent random variables.
7. Conditional expectations, covariance, moment generating functions.
8. Limit theorems: weak law of large numbers, central limit theorem, strong law of large numbers.
9. Some additional topics if time permits: Markov chains, entropy, martingales.

There is a substantial overlap in topics between this course and Math 425. However, the treatment here will be more fast-paced and featuring more emphasis on theory and proofs relative to Math 425.

Testing and Disability: If you think you need an accommodation for a disability, please let me know as soon as possible. In particular, a Verified Individualized Services and Accommodations (VISA) form must be provided to me at least two weeks prior to the need for a test/quiz accommodation. The Services for Students with Disabilities (SSD) Office VISA forms.

Important Dates

January 9	First day of classes
January 28	Deadline to disenroll and for regular drop/add (no Ws)
March 1-March 9	Winter Break-No Class
March 18 (tentatively)	Midterm in class
March 21	Deadline to late drop/add and late pass/fail – March 21
April 22	Last day of classes.
April 30	Final Exam (10:30 am - 12:30 pm).