

**MATH 418/544: Probability I**  
(2026 Winter Term 1, 3 credits)

**Instructor:** Dr. Mathav Murugan

**Lectures:** MWF 10:00–11:00 AM in MATH 203.

**Office hours:** Tue, Thu 9:30–10:30 AM and Fri 1:00–2:00 PM in MATH Annex 1104.

**Course webpage:** We will use Canvas: <https://canvas.ubc.ca/courses/195431>.

**Piazza:** There is a link to Piazza on Canvas. Please use Piazza for questions that arise in your learning and for questions about all issues related to the course.

**Text:** There is no required textbook. The following books cover much of the course material, and lecture notes will be provided on Canvas.

R. Durrett, *Probability: Theory and Examples*, 5th ed., Cambridge University Press (2019). Available online at: [https://services.math.duke.edu/~rtd/PTE/PTE5\\_011119.pdf](https://services.math.duke.edu/~rtd/PTE/PTE5_011119.pdf).

J.S. Rosenthal, *A First Look at Rigorous Probability Theory*, 2nd ed., World Scientific (2006). This book is available through the UBC Library. A solutions manual for the even-numbered exercises is available at: <http://www.probability.ca/jeff/grprobbook.html>. Corrections to the text are available at: <http://www.probability.ca/jeff/ftplib/errata2.pdf>.

**Prerequisite:** Math 321 (or equivalent).

**Outline.** Together with Math 419/545 in term 2, these courses give a comprehensive introduction to mathematically rigorous and measure-theoretic probability theory for honours undergraduates and graduate students. Prior knowledge of measure theory (or taking MATH 420/507 concurrently) is useful but not essential; the necessary measure theory will be developed as part of the course. Topics include

- Probability spaces, random variables, independence, Borel–Cantelli lemma, Kolmogorov 0-1 law
- Expectation
- Modes of convergence, laws of large numbers.
- Characteristic functions, weak convergence, central limit theorem.

The course is intended to be useful for those who use probability as a tool in other fields, or planning to do research in probability. Probability theory has applications in analysis, electrical and computer engineering, statistics, finance, applied mathematics, math biology, combinatorics and partial differential equations and has ties to many other fields. Students interested in these fields are encouraged to enroll.

**References:** S.R.S. Varadhan, *Probability Theory*, Courant lecture notes in mathematics, Volume 27, 2016,

D. Stroock, *Probability Theory, an Analytic View*, Cambridge University Press, 2nd Edition.

**Evaluation:** The final mark will be calculated (subject to possible scaling) according to the following formula :

Homework: 35%

Midterm: 25%

Final Exam: 40%.

**Homework:** Homework will be assigned approximately once every two weeks. Late submissions will not be accepted. You are encouraged to discuss the homework problems and collaborate with your classmates, but the solutions you submit must be written independently in your own words. Solutions

will be graded both on accuracy and quality of exposition. Solutions should be mathematically rigorous, well-crafted, and written in complete English sentences. Solutions must always be legible; use of LaTeX is encouraged and appreciated. The use of generative AI tools in solving homework problems, generating solutions or proofs, or obtaining mathematical explanations related to the assignments is prohibited. AI tools may be used only for checking spelling, grammar, and LaTeX formatting.

**Midterm:** There will be one 50-minute test held in person during the regularly scheduled class hour on: Friday, October 23

**Final Exam:** There will be a final examination during the December examination period.

**Academic integrity:** By enrolling as a student at UBC, you have agreed to abide by the University Rules on Academic Honesty. Here is what you have agreed to and are bound by: “Academic honesty is essential to the continued functioning of the University of British Columbia as an institution of higher learning and research. All UBC students are expected to behave as honest and responsible members of an academic community. Breach of those expectations or failure to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic honesty may result in disciplinary action. It is the student’s obligation to inform himself or herself of the applicable standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions. If a student is in any doubt as to the standard of academic honesty in a particular course or assignment, then the student must consult with the instructor as soon as possible, and in no case should a student submit an assignment if the student is not clear on the relevant standard of academic honesty. If an allegation is made against a student, the Registrar may place the student on academic hold until the President has made his or her final decision. When a student is placed on academic hold, the student is blocked from all activity in the Student Service Centre.”

**University policies:** UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website: <https://senate.ubc.ca/policies-resources-support-student-success>.

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