STAT 302 - Introduction to Probability
University of British Columbia - Winter 2024/2025 - Term 1

Instructor
Jiahua Chen.

Course Description
Basic notions of probability, random variables, expectation and conditional expectation, discrete and continuous probability distributions, limit theorems.

Prerequisites
One of MATH 200 (multivariable calculus), 217 (multivariable and vector calculus), 226 (advanced calculus I), 253 (multivariable calculus) or 254 (Multivariable and vector calculus for mechanical engineering).

Audience
Undergraduates majoring in Mathematics or Statistics, and students from other disciplines seeking an exposition of the basic elements of probability theory and an introduction to probabilistic modelling.

Reference Textbook
A First Course in Probability (10th ed. or later) by Sheldon Ross, Prentice Hall, 2019. Most earlier editions are acceptable.

Strictly speaking, the reference textbook is not required, but it may be helpful for providing alternative and more complete explanations, as well as additional practice problems.

Syllabus
The syllabus below is a tentative schedule. The topics covered and the order in which they will be presented in this course may change. Chapter numbers indicated in parentheses correspond to chapters in the reference textbook.

1. Definition and rules of probability (Chapter 2).

   Assignment 0 (not marked): Get familiar with submission system.

2. Combinatorial Analysis: permutation and combination (Chapter 1).

3. Conditional probability, independence (Chapter 3).

   Midterm I (Oct 4) will cover materials in Chapters 1-3.

4. Random variables, distributions, and their expected values and variances. Well-known discrete distributions (Chapter 4).

5. Well-known continuous distributions, functions of random variables (Chapters 5).

   Midterm II (Nov 8) will cover materials in Chapters 1-5.

6. Bivariate and multivariate probability distributions: Joint, marginal and conditional distributions, multinomial distribution, moment generating functions (Chapters 6)

7. Definitions and properties of expectations, covariance and correlations, conditional expectations, moment generating functions (Chapter 7).

8. Limit theorems: Convergence in probability, convergence in distribution, the Central Limit Theorem (Chapter 8).

   Final Exam (Date TBA) will cover materials in Chapters 1-8.

Course Evaluation

In-class iClicker (10%): We use iClicker Cloud to encourage attendance, keep your attention during lectures, and gauge your understanding of the course material. iClicker questions will be uniformly but randomly distributed throughout lectures.

   A generous buffer is provided for absences and incorrect responses to in-class questions, rewarding participation over correct answers. There is no need to inform the instructors if you miss a few lectures due to illness, family emergencies, and so on.

Assignments (20%): There will be 4 hand-in assignments. TAs are instructed not to award partial marks if part of your answer is relevant but does not contribute meaningfully to the overall solution. Partial marks may be granted for minor typographical errors that affect the overall answer. Different parts of the same question will be graded independently. The same typographical error will generally not be penalized twice. In general, you are less likely to earn partial marks if the overall structure of your solution is flawed. The aim is to inform students that incorrect answers will be marked as wrong, rather than partly correct with partial marks.

If you achieve a grade above 40% on an assignment, your marks will be scaled. No scaling will occur if your grade is 40% or less. For a grade of a% (where $a > 40$), the scaled grade will be calculated using the formula

$$40 + \sqrt{(a - 40) \times 60}$$

to calculate your scaled grade. Scaling will be applied separately to each of the 4 assignments. The goal is to encourage a complete understanding of the material, rather than relying on guessing to earn course credit.

Two Midterm Exams (25%): There are two midterms, weighing 10% and 15%, scheduled for October 4 and November 8 during lecture hours. The midterm exams will start at the beginning of class, so please ensure you arrive on time.

Midterms will cover all course materials, including graded assignments, other ungraded problems assigned periodically, lectures, and in-class activities. There will be no make-up midterms. If you miss a midterm for a valid reason (documented when appropriate), please submit a self-declared academic concession form (available on Canvas) to the Instructor as soon as possible. The weight of the missed midterm will be shifted to the final exam.

Please have your student ID available for both the midterms and the final exam.

Final Exam (45%): The Final Exam will include all materials covered in the course.

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