University of Manitoba
Department of Statistics

STAT 2400 – Introduction to Probability I

Winter Term 2024

Course Details

Course Number & Title:	STAT 2400, Introduction to Probability I
Section & CRN:	Section A01, CRN: 51089
Course Schedule:	Monday/Wednesday/Friday, 9:30 to 10:30 a.m. (Slot 2), in room 201 Armes.
Lab Schedule:	Wednesday, 14:30 to 16:00, in room 204 Armes.
Prerequisites:	one of STAT 1150 (C) or STAT 2000 (B); one of MATH 1232 (C) or MATH 1700 (B). No special permissions are given with respect to prerequisites.

Instructor Contact Information

Instructor:	Alexandre Leblanc
Office Location:	367 Machray Hall
Phone:	(204) 474-6273
Email:	Alex.Leblanc@umanitoba.ca
Office Hours:	Tuesday 13:00 to 14:30 and Friday 13:00 to 15:00. I'm also generally available after class or by appointment. Changes/additions to be announced on UMLearn.

Teaching Assistant (TA) Contact Information

TA:	Tessa Reimer
Office Location:	355 Machray Hall
Email:	reimer42@myumanitoba.ca
Office Hours:	Thursday 9:30 - 10:30. Changes/additions to be announced on UMLearn.

General Goals for this Course

This course is meant to start your basic training in probability theory by providing a semi-formal introduction to its most important basic concepts. As such, some goals for the course are to help you build and develop

- a solid foundation in basic probability that you can rely on for your upper level courses in Statistics, Actuarial Mathematics and Data Science,
- skills related to the understanding and writing of basic mathematical proofs,
- analytical skills related to problem solving.

In this course, you will have an opportunity to develop a solid intuition and understanding of probabilistic ideas, along with solid skills in calculus and applied mathematics. All these skills will be essential to your success.

The course is quite demanding and your success will depend heavily on your hard work and ability to solve many practice problems yourself. For instance, getting the solutions from your friends (rather than doing the problems yourself), learning the course notes by heart and cramming for exams are typically not very successful strategies. Always remember that the work you do to get to a solution (including all the mistakes made along the way) is often more important than the solution itself: you will learn more from the work and research you do to get to the answer than from copying down a solution found online or in some textbook!

Course Delivery

Lecture Delivery: This class will be delivered through in-person teaching: all the lectures and labs for this course will be delivered synchronously, in a traditional classroom setting. Currently, there are no plans to have any remote lectures.

COVID-19 Policy: Although that may change during the term, the current policy regarding COVID-19 stipulates that proof of vaccination and masks are no longer required to come to campus. This being said, please wear a mask or stay at home if you are feeling unwell. I will be posting scanned notes from class after each lecture in order to help students keep up with the pace of the course even after missing a lecture. I'm happy to hold individual meetings and office hours virtually via Zoom to accommodate students that are self-isolating.

Textbook and Other Materials

Textbook: The course will be based on

- Weiss, N.A. (2006), A course in Probability, Pearson.

Two copies of the textbook will be available on reserve at the Science Library. This being said, you should be able to get by without making use of the textbook if you carefully study the provided lecture materials and occasionally read from the other references.

Note that, unfortunately, the textbook is very hard to find as it is currently out-of-print.

Other references: The following are other useful references that will be available on reserve at the Science Library:

- Ross, S.M. (2006), A First Course in Probability,
- Ghahramani, S. (2005), Fundamentals of Probability with Stochastic Processes,
- Roussas, G. (2007), Introduction to Probability.

Other references that are downloadable in PDF through SpringerLinks and the University of Manitoba Libraries are:

- Pitman (1993), *Probability*,
- Dekking, Kraaikamp, Lopuhaä & Meester (2005), *A Modern Introduction to Probability and Statistics*,
- Devore & Berk (2012), *Modern Mathematical Statistics with Applications*.

Other Materials: Lecture notes, practice problems, sample tests and exams, solutions, short videos and other materials will be added to the UM Learn portal regularly.

Practice Problems: There are no assignments to be handed in for credit in this course, but opportunities to practice will be provided to you. First, a list of practice problems will be provided to you. You are free (and encouraged) to work in groups on the practice problems, but remember the work you do to get to a solution is more important than the solution itself: it is all about the process needed to get to a solution, rather than the answer itself. So, getting the solutions from a classmate is not going to help you develop the skills you will be examined on.

In order to help you find the motivation to work on your practice problems, each test/exam will ask for some small number of problems taken from those lists, in original or slightly modified form. Historically, the number of problems taken from the lists was typically between two and five on each test/exam, but most often three or four.

Practice Tests: You will also be provided with practice tests (with complete solutions). It is expected that you use these practice tests as practice assessments: work on the questions like you would on a regular test, without looking at the solutions. This will allow you to evaluate your level of readiness for writing your test.

Assessments and Grading Scheme

Final Mark: The final mark for the course will be obtained from the following rule.

Tests (3)	60%	(best 30%, worst 10%, other 20%)
Final Exam	40%	(covering all course content)

The weights provided above will be adjusted for students that miss one or more tests. See below.

Letter Grade: I normally use the following cutoffs when assigning letter grades:

Letter Grade	Mark out of 100	Letter Grade	Mark out of 100
A+	90-100	C+	65-70
A	80-90	C	60-65
B+	75-80	D	50-60
B	70-75	F	below 50

However, I might elect to use slightly lower thresholds for some letter grades if I think they are more appropriate. I will not use higher thresholds.

Caveat: To receive a passing grade in the course, you need to have completed and have received a passing grade on at least two of the four assessments.

Tests and Exam

Tests: There will be three 75-minute tests, currently scheduled for February 7, March 13 and April 3, all during the lab time slot between 14:30 and 16:00.

Make-up tests will not be scheduled. If you miss a test, you will be assigned a mark of zero unless you notify me by email within 48 hours of the scheduled test. If I am appropriately notified, I use the following rules:

- if you miss one test, the final exam will count for 50% of your final mark for the course, and the two other tests will be respectively worth 30 and 20% of your final mark,
- if you miss two tests, the final exam will count for 70% of your final mark for the course, and the test you have written will be worth 30% of your final mark.

Do note the potential impact of the above caveat in these cases. For instance, you will receive a grade of F if you miss all three tests. Also, you should drop the class if you are having significant health problems and, as a result, cannot keep up with the course.

Final Exam: The Final Exam will be scheduled by the Registrar's office during the University-wide examination period taking place on April 12-26, and should normally be of a 3-hour duration. If you miss the final exam, you should contact a student advisor from your home Faculty within 48 hours of the scheduled exam time. Remember that you must remain available until all examination obligations have been fulfilled.

Grading timeline: Under normal circumstances, test results should be available within two weeks of a test being written.

Important Dates

The following dates are important as to how the course will progress throughout the term.

Date	Information
Jan 8	First class
Jan 10	Lab is replaced by lecture
Jan 17	First Lab
Jan 19-22	End of the registration revision period
Feb 7	Test 1 (Modules 1 and 2)
Feb 19-23	Winter Term Break - no classes or lab
Mar 13	Test 2 (Modules 3 and 4)
Mar 20	Last day to VW the course
Mar 29	Good Friday - no classes
Apr 3	Test 3 (Module 5)
Apr 10	Last lecture
Apr 12-26	Final Examination Period

The dates and covered materials for the tests are tentative (and subject to change at my discretion). Changes are subject to Section 2.8 of the ROASS Procedure.

Outline of Covered Topics and Approximate Timeline

Module and Title	Approx. Duration (in weeks)
1. Basic Concepts (Weiss, Chap. 1 and 2) – Axioms of probability and basic probability rules	2
2. Combinatorial Probability (Weiss, Chap. 3) – Counting rules and probability calculations	1.5
3. Conditional Probability and Independence (Weiss, Chap. 4) – Conditional probability, Independence & the Bayes rule	2
4. Discrete Random Variables (Weiss, Chap. 5) – Discrete random variables and probability mass functions	2.5
5. Continuous Random Variables (Weiss, Chap. 8) – Continuous random variables, cdf, pdf	2.5
6. Expected Values (Weiss, Chap. 7, 10, 11) – Basic properties of expected values, mean and variance	2
7. Additional Optional Topics – Joint Distributions - many independent random variables – Central limit theorem	Time permitting

Respectful Behaviour and Use of Technology in the Classroom

It is expected that you conduct yourself professionally and do not distract your fellow students while in the classroom. It is also a general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. Students should restrict their use of technology to those approved by the instructor *for educational purposes only.* Electronic messaging, email, social networking, gaming, etc. should be avoided during class time. Cell phones should be turned off. If a student is on call for emergencies, their cell phone should be in vibrate mode and the student should leave the classroom before using it.

Class Communications

The University requires all students to activate an official U of M email account. You should be using this for all communications between you and me (and, in fact anything related to the university, including all your instructors). All these email communications should comply with the University's policy on electronic communication with students, which can be found at

`umanitoba.ca/governance/governing-documents/governing-documents-university-community`

When emailing me, please make sure to follow proper email etiquette: emails should start with an opening salutation, be written in complete English (or French) sentences and be signed with your name and student number. I will generally reply to emails within 24 hours, depending on the urgency of the situation and my availability, except during weekends. Note that I will not divulge grades over email.

Copyrights

Copyrighted Materials: We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission.

In particular, note that you do not have permission to upload any course notes, tests, practice problems and tests, or any other handout I will use for this course to any note sharing websites. Videos and other recordings available to you through UMLearn are meant for your own personal use only.

Lectures: No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without my permission.

More details are available online at `www.umanitoba.ca/copyright/`.

Academic Integrity

The value of a degree from the University of Manitoba is dependent on students and faculty strictly upholding values of honesty and academic integrity in all their work. Academic dishonesty devalues the hard work and effort of students who are working honestly to achieve their degrees. For these reasons, it is important that you understand the basics of academic integrity, what constitutes academic dishonesty and what are its very serious consequences. Useful resources can be found at

`umanitoba.ca/student-supports/academic-supports/academic-integrity`

and

`umanitoba.ca/science/student-experience/academic-integrity`

I generally expect students to hold themselves to the highest standards of academic integrity. Impersonation, plagiarism, and using unauthorized materials are all very serious offences. When in doubt, it is generally a good idea to contact your instructor to discuss what is and what is not allowed. Asking is a sign of integrity, not a signal that you are planning to cheat. All your instructors expect you to follow the rules: ignorance is not an acceptable excuse for academic misconduct.

ROASS Schedule A

Schedule "A" of the *Responsibilities of Academic Staff with regards to Students* (ROASS) policies of the Faculty of Science at the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. This document is available in UMLearn in the *Syllabus and Course Notes* folder for the course.

c Alexandre Leblanc, Department of Statistics, University of Manitoba.
This document is dated December 13, 2023.