

STAT 2400 Section A01  
Introduction to Probability  
Winter 2019

**Time** MWF 9:30 a.m.-10:20 a.m.  
**Location** 111 Armes  
**CRN** 51089

**Instructor** Jenna G. Tichon  
321 Machray Hall  
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**Web Pages** UMLearn: <http://umanitoba.ca/umlearn>  
Statistics: <http://umanitoba.ca/statistics>  
R Download: <http://cran.utstat.utoronto.ca/>  
R Studio Download: <https://www.rstudio.com/products/rstudio/download/>

**Office Hours:** Monday 11:00 a.m.- 12:00 p.m.  
Thursday 5:00 p.m. - 6:00 p.m.  
Friday 1:00 p.m. - 2:00 p.m.

(Or by appointment. If the above times are not convenient for you, please call, email or speak to me to arrange an alternate time to meet. )

## Calendar Description

(Lab Required) Basic probability, discrete distributions including binomial, hypergeometric, geometric and Poisson, joint distributions, continuous distributions, statistical inference and applications involving discrete random variables. This course is not available to any student who has previously obtained credit for STAT 3500. Prerequisites: STAT 1150 (C), STAT 2000 (B), or STAT 2001 (B); and one of MATH 1232 (C), MATH 1690 (C), MATH 1700 (B), MATH 1701 (B), MATH 1710 (B), or the former MATH 1730 (B).

## Textbook, Readings, and Course Materials

**Required Textbook:** The textbook for this course is

Weiss, N.A. (2006), *A Course in Probability*, Pearson Ed. (Addison-Wesley).

A copy of the textbook should be available on four-hour reserve at the Science Library. The course follows the text very closely and there will be suggested problems from the text for each section which may appear on the midterms or final exam.

**Supplementary Readings:** Occasionally I will assign supplementary readings in the form of short articles or website URLs to complement the lectures. These will be made available through the course website on UMLearn under the course content for the appropriate unit.

The following books should also be available on four-hour reserve if you would like supplementary resources:

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

**Required Materials:** All students will be required to purchase and bring with them to class a scientific non-programmable calculator. It will also be required for all midterms and the final exam.

## Course Technology

**Use of Technology in the Classroom:** Please ensure that any technology used in the class is used in a responsible manner that is mindful of the students around you. You may have cell phones on your person as long as they are kept on silent and are not brought above table height. You may use laptops or tablets in class to help with note taking or follow along with any computer demonstrations but please keep only academic matters up on your screen and refrain from distracting the students around you.

**R Studio:** In this class we will be making use of the statistical software R. It is available as a free download from <http://cran.utstat.utoronto.ca/>. While you need to download the original R software in order to install the packages, you may find it easier to use the program using R Studio which may be downloaded at <https://www.rstudio.com/products/rstudio/download/>.

Throughout the course I will demonstrate how to carry out some of the calculations using R and will make use of simulations to demonstrate some topics. The statistics computing lab has copies of R Studio installed on all of the computers that you can use during the open lab hours.

**UMLearn:** All course material will be posted on UMLearn in the Contents section. All important dates can be found on the calendar and I will make class announcements through the news feed on the course website.

In addition, there will also be discussion forums available. For each class I will open up a discussion forum where I will post the material covered that class, any announcements, and suggestions for preparation for the next class. Please be in the habit of checking it after every class. If you have questions about anything during the lecture or any announcements, you can ask directly on the forum for the relevant class.

There will also be a forum opened where you can ask questions relevant to the lab, the lab T.A. can send you notices, and you can submit requests to the lab T.A. for problems you would like to see.

All discussion will be monitored closely by me. Please be courteous in posing questions and replying to questions on the board. Your best effort should be made to make clear questions in complete English sentences.

**Crowdmark:** The weekly problems, the midterms, and the final exam will be marked using the Crowdmark software, an online grading tool. All exams will be written on provided paper and then scanned for grading. Additional instructions will be given prior to the first assessment to ensure the examinations can be scanned correctly. Upon completion of the quizzes and the midterm, an electronically marked copy of your exam will be emailed to your UManitoba e-mail address. I will send out an email when the marked copies have been sent. Please check your spam folders if you do not see it in your inbox. For the weekly problems, you will receive the questions via email from Crowdmark and upload your solution to the provided link.

**Notice Regarding Collection, Use, and Disclosure of Personal Information by the University:** Your personal information is being collected under the authority of the *University of Manitoba Act*. It will be used for the purposes of grading papers and providing feedback to students. Personal information will not be used or disclosed for other purposes, unless permitted by *The Freedom of Information and Protection of Privacy Act* (FIPPA). The University of Manitoba has taken steps to ensure that its agreement with Crowdmark, Inc. for services provided by the Crowdmark application in compliance with FIPPA. Please be aware that information held by Crowdmark Inc. may be transmitted to and stored on servers outside of the University of Manitoba, or Canada. The University of Manitoba cannot and does not guarantee protection against the possible disclosure of your data including, without limitation, against possible secret disclosures of data to a foreign authority in accordance with the laws of another jurisdiction. If you have any questions about the collection of personal information, contact the Access and Privacy Office (tel. 204-474-9462), The University of Manitoba, 233 Elizabeth Dafoe Library, Winnipeg, Manitoba, Canada, R3T 2N2.

## Expectations: I Expect You To

In my class I expect you to:

- Attend lectures and listen attentively.
- Participate in small group activities when asked.
- Use technology respectfully as outlined in the syllabus.
- Come prepared the class with paper, writing utensils, and a scientific calculator.
- Arrive to your exams with writing utensils, a scientific calculator, and a ruler if appropriate.
- Do your utmost to arrive on time and be as quiet as possible should you unavoidably need to arrive late or leave early.
- Not talk to your neighbours while I am lecturing.
- Ask questions during my lecture as needed and interrupt me if I write something incorrect on the overhead.
- Be respectful of your lab T.A. and extend to them all courtesies you would extend to me.
- Be mindful of my time outside of class and allow me sufficient time to answer emails or look in to your concerns.
- Follow all policies in the syllabus and consult it as needed.
- Come to me with any constructive feedback that would improve the running of the course.

**Academic Dishonesty:** It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

<http://umanitoba.ca/science/undergrad/resources/webdisciplinedocuments.html>

**Class Communication:** The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. Please see

[http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)

You are required to obtain and use your U of M email account for all communication between yourself and the university.

**E-mail:** To schedule an appointment outside of office hours or to ask a question that would not be suitable for the discussion forums (it involves your personal information or the answer would not be of interest to other students) you may email me at my university email address. Please note that if your question is answered on the course outline (which will be posted on UMLearn) I will simply direct you to find the answer yourself. The subject line of your emails should contain “STAT 2400 A01”. All emails should start with an opening salutation, be written in complete English sentences and be signed with your name and student number. Please note that I will not divulge grades over email. All emails received during the work week will be replied to within 24 hours. While I will generally check my work emails over the weekend in case there is an emergency, you can expect a reply to non-urgent matters received over the weekend by Monday at noon.

**Office Hours:** My office hours are listed at the top of the course outline. You do not need to make an appointment and may just show up to ask any questions that you may have. This is the perfect time to ask questions about course material, your assignment, review your coursework, or receive help with R. If you can not make my scheduled office hours, please email me to make an appointment.

**Student Accessibility Services:** If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

<http://umanitoba.ca/student/saa/accessibility/>

### **Expectations: You Can Expect Me To**

As your instructor you can expect me to:

- Treat you with respect inside and outside of the classroom.
- Arrive early to class and remain for a few minutes afterwards to answer questions.
- Come prepared to my lectures.
- Be available during my office and make my best attempt to provide sufficient notice if an office hour needs to be moved or canceled.
- Answer your questions thoughtfully and follow up if needed.
- Listen to your feedback/concerns and do my best to take reasonable requests in to account.
- Monitor the lab demonstrators and ensure all materials are returned in a reasonable time period.

- Set assessments that are reasonable and contain questions that match the learning objectives for the course.
- Be passionate about my subject and what I teach.

## Course Schedule and Evaluation

Week	Content	Special Notes	Evaluation		
			Type of Assessment	Date	Value of Final Grade
Week 1 Jan 7-11	Welcome & Unit 1	First day, Jan 7			
Week 2 Jan 14-18	Unit 1 & 2	Jan 18 Drop Date w/o penalty	Week 1 Q due	Jan 18	1%*
Week 3 Jan 21-25	Unit 2 & 3		Week 2 Q due	Jan 25	1%*
Week 4 Jan 28-Feb 1	Unit 3		Week 3 Q due	Feb 1	1%*
Week 5 Feb 4 - 8	Unit 4		Week 4 Q due	Feb 8	1%*
Week 6 Feb 11-15	Unit 4 & 5		Midterm 1 Week 5 Q	Feb 13 Feb 15	(25/15)%** 1%*
Week 7 Feb 18-22 1	Reading Week	No Classes			
Week 8 Feb 25 - Mar 1	Unit 5		Week 6 Q due	Mar 1	1%*
Week 9 Mar 4-8	Unit 5		Week 8 Q due	Mar 8	1%*
Week 10 Mar 11 -15	Unit 6		Week 9 Q due	Mar 15	1%*
Week 11 Mar 18-22	Unit 6	Mar 20, VW Date	Week 10 Q due	Mar 22	1%*
Week 12 Mar 25-29	Unit 7		Midterm 2 Week 11 Q	Mar 27 Mar 29	(15/25)%** 1%*
Week 13 Apr 1-5	Unit 7		Week 12 Q due	Apr 5	1%*
Week 14 Apr 8-9	Unit 7	Last Class, Apr 9			

\* Best 10 out of 11 problems will be counted.

\*\* Best midterm is worth 25% and worst midterm is worth 15%. Held during the lab,

Please note that all dates for content coverage in these schedules are approximate and subject to minor changes.

**Lab Expectations:** This course comes with a mandatory lab component. The lab will be run by a graduate student from the Department of Statistics with previous lab demonstrating experience.

The labs will be a mix of problem solving, small activities, and occasionally they will be used for additional instructional material. Questions from the lab will be used on the midterms and the final exam.

**Grading:**

Midterm Tests (2)	40%
Weekly Problems (11)	10%
Final Examination	50%

Marks will be uploaded to UMLearn.

The following are the minimum percentage grades required to receive each of the various letter grades: A<sup>+</sup> (90%), A (80%), B<sup>+</sup> (75%), B (70%), C<sup>+</sup> (65%), C (60%), D (50%).

**Midterm Info:**

- There will be two midterm tests scheduled during the lab period. The dates are scheduled for Wednesday, February 13 and Wednesday, March 27.
- Your best midterm will be worth 25% and your worst midterm will be worth 15% of your final grade.
- Your midterms will consist entirely of long answer questions. Practice midterms will be provided.
- If you miss a midterm test, you will be assigned a mark of zero, unless reasons and acceptable evidence are provided. If you miss for an acceptable reason, the weight will be shifted to the final exam. In the event that you miss a midterm, the midterm that you write will be worth 25% and 15% will be shifted to the final.

For quizzes, the midterm test and the final examination: (i) nonprogrammable handheld calculators are permitted (graphing calculators are **not** permitted), (ii) electronic devices, such as cell phones or headphones, are prohibited. There will be no formula sheet.

**Weekly Problem Info:** Commencing week 2 of the course, there will be an assigned problem due each Friday at 11:59 p.m. (excluding Reading Week) based on the previous week's material. You will receive an email from Crowdmark when the question is available a week beforehand and you must click the link to see the question. You will have a week to submit your solution to the Crowdmark website as either a pdf, jpg, or png file to the link where you received the question. You may resubmit your answer as many times as you want up until the submission deadline. After the deadline, you may not resubmit your solution. While the system will allow you to submit a question late up until the marking is finished, you will

receive a mark of 0 automatically for all late work.

Your best 10 out of 11 weekly problems will be counted with each being worth 1% of your final grade. This is to allow for life circumstances if you are unable to submit your question one week.

While the expectation is that your solutions be written up completely independently from your peers, it is acceptable to discuss with your class mates: what is the general problem type, which techniques/tricks you may be required to use, and which examples you've been given previously and how they are similar. You should not be looking directly at each other's solutions but may speak in generalities about what you did. It is also permissible for questions with long calculations that require a simplified answer for you to verify verbally if you had the same simplified solution as a peer. Note that while I may ask for a simplified answer, my interest is in your work and not the numerical answer. If you submit a solution where your work is incorrect but your simplified answer is correct, you will receive an automatic 0 on the entire question. Students suspected of inappropriate collaboration will have their work forwarded to the appropriate disciplinary body as required.

**Practice Questions:** Through out the course I will provide extra practice problems in pdf form and suggest questions from the textbook. These are not for marks but you should complete them for the extra practice. The pdf questions in particular will be helpful as they were written by me and will reflect the way I ask questions on the midterms and tests. Suggested problems will appear on the midterm tests and the final exam.

**Final Exam Info:** The final exam will be 3 hours in duration and will be scheduled by the Student Records Office. Please check your exam schedule on Aurora once it becomes available for this information. The final exam will cover Units 1 – 7, with emphasis on Units 4 – 7. Should you miss the final exam or require a deferred, please contact your home faculty. I do not personally handle any deferred exam requests.

## Statistics Help Centre

In room 311 Machray Hall (which contains a number of computers), there is an open statistics help center primarily for STAT 1000, 1150 2000, and 2150. There are two T.A.'s, Lahiru and Calvin, that are available for you to drop by for help in STAT 2400 when they are working. While you are welcome to sit and work in the lab any time that it is open, these are the only T.A.'s that you should be asking for assistance.

They are available:

Monday - Thursday	9:30 a.m. – 12:30 p.m.
Friday	9:30 a.m. – 12:00 p.m.

\*The lab is closed on holidays, during reading week, and the exam period.

# Voluntary Withdrawal

The voluntary withdrawal date is **March 20** (by which time you will have received your marks for the first midterm and 8 weekly problems).

## ROASS Schedule A

Schedule A of the Responsibilities of Academic Staff with regards to Students (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. Schedule A will be posted on the UMLearn page.

## Outline of the Covered Topics

Basic Concepts (Weiss, Chap. 1 and 2)

- A review of set theory
- Sample space, events
- Axioms of probability and basic probability rules

Combinatorial Probability (Weiss, Chap. 3)

- Counting: permutations and combinations
- The use of counting rules in probability calculations

Conditional Probability and Independence (Weiss, Chap. 4)

- Conditional probability and the general multiplication rule
- Independence
- Bayes' rule

Discrete Random Variables and Probability Distributions (Weiss, Chap. 5)

- Discrete random variables and probability mass functions
- Important counting random variables
- Poisson approximation to the binomial
- Binomial approximation to the hypergeometric

Jointly Discrete Random Variables (Weiss, Chap. 6)

- Marginal and joint probability mass functions
- Conditional probability mass functions

- Independent random variables
- Sums of discrete random variables

Expected Values of Discrete Random Variables (Weiss, Chap. 7)

- Basic properties of expected values
- Mean, variance, covariance and correlation of discrete random variables
- Conditional expectation

Introduction to Continuous Random Variables (Weiss, Chap 8.) (Time permitting)

- Continuous random variables, cumulation distribution functions and probability density functions
- Uniform, exponential and normal random variables
- Mean and variance of continuous random variables