

University of Manitoba  
Department of Statistics

**STAT 3150—Statistical Computing**

Fall Term 2020

---

**Course Details**

---

**Course Number & Title:** STAT 3150—Statistical Computing  
**Section & CRN:** Section A01, CRN: 19998  
**Course Schedule:** Tuesday/Thursday, 10:00 to 11:15 am,  
on Webex.  
**Prerequisites:** STAT 2150 (Statistics and Computing) and  
STAT 2400 (Introduction to Probability 1)

---

**Instructor Contact Information**

---

**Instructor:** Max Turgeon  
**Office Location:** 373 Machray Hall  
**Email:** Max.Turgeon@umanitoba.ca  
**Office Hours:** By appointment only.

---

**Student Learning Objectives**

---

This course aims to provide students with a broad overview of computational techniques used in modern statistical analysis. Throughout the course, students will:

- Become proficient in R, to the level that they can analyse data using the tools from this class.
- Be able to choose and produce an appropriate data visualization given the context.
- Learn how to sample from various distributions, directly and indirectly.
- Become familiar with several resampling techniques and know which one to use for a particular problem.
- Be introduced to numerical methods and optimisation techniques.

---

**Textbook and Other Materials**

---

**Textbook:** The following textbook is not required, but *strongly recommended*:  
*Statistical Computing with R* (2nd ed.) by Maria L. Rizzo, CRC Press, 2019.

**Course Material:** Interactive tutorials, lecture videos and lecture slides will all be made available on UM Learn.

---

## Course Assessment

---

**Assignments:** There will be six (6) assignments during the term, worth a total of 50% of the final grade. Only five of the six assignments will count towards the final grade:

- Once during the semester, a student can choose to **not** submit an assignment. The remaining five assignments will then all be worth 10% of the final mark.
- If a student submits all six assignments, then only the five assignments with the highest mark will count equally towards the final grade.

Students are encouraged to form study groups to discuss assignment questions but not the answers. Each student must submit his or her own individual written work. Copying, in whole or in part, the work of another will not be tolerated and will result in disciplinary action (see Academic Integrity section). Assignments should be handed in electronically via UM Learn on the due date. **Late submissions will be accepted**, but 5% will be deducted from your assignment mark for each 24h period following the submission deadline (e.g. for an assignment worth 10% of the final and submitted 2 days after the deadline, the penalty will correspond to 1% of the final mark).

**Midterm:** There will be two (2) midterm tests. They are tentatively scheduled to be held during class time on October 13 and November 17. Each test will be worth 15% of the final mark, for a total of 30%. Test content is defined by the lecture notes along with the relevant chapters from the textbook. There will be no make-up tests. If you miss a test with a valid reason and inform me within 48 hours, the weight of the other assessments will be scaled accordingly.

**Final Exam:** There will be one (1) final exam in this course. It will be worth 15% of the final grade.

**Class participation:** Students will be assessed according to their level of participation in the lectures and/or on the UM Learn Discussion groups, as well as completion of the quizzes on UM Learn. This assessment will represent 5% of the final mark.

**Grading Timeline:** Work will be graded and returned within two weeks of submission.

---

## Course Evaluation and Grading Scheme

---

**Final Mark:** The final mark for the course will be obtained according to the following rule:

|                     |     |
|---------------------|-----|
| Assignments (6)     | 50% |
| Midterm Tests (2)   | 30% |
| Final Exam          | 15% |
| Class Participation | 5%  |

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

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

However, I might elect to use lower thresholds for some letter grades if I think they are more appropriate (i.e. use a smaller lower bound for the ranges above). I will not use higher thresholds.

---

## Outline of Covered Topics

---

The course is expected to cover the following topics, as time permits:

1. Data Visualization (Chapter 5)
2. Generating Random Variables (Chapter 3)
3. Monte Carlo Integration (Chapter 6)
4. Importance Sampling (Chapter 6)
5. Monte Carlo Methods for Inference (Chapter 7)
6. Bootstrap and Jackknife (Chapter 8)
7. Resampling Applications (Chapter 9)
8. Permutation Tests (Chapter 10)
9. Numerical Methods (Chapter 13)
10. Introduction to Optimisation (Chapter 14)

---

### Important Dates

---

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

| Date      | Information                       |
|-----------|-----------------------------------|
| Sep 10    | First lecture                     |
| Oct 13    | Tentative date for First Midterm  |
| Nov 9-13  | Fall Term break–no class          |
| Nov 17    | Tentative date for Second Midterm |
| Nov 23    | Last day to VW the course         |
| Dec 10    | Last lecture                      |
| Dec 12-23 | Final Examination Period          |

The date for the midterm tests is tentative (and subject to change at my discretion and/or based on the learning needs of the students). Changes are subject to Section 2.8 of the ROASS Procedure.

---

### Class Communications

---

The University requires all students to activate an official U of M email account, which should be used for all communications between yourself and 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: [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)

Questions of an administrative nature should be directed to me via email. Questions related to the course content should be directed to the Discussion Groups on UM Learn (which I will regularly visit). This is in order to provide an opportunity for learning and collaboration between the students.

---

### Copyrights

---

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.

More details are available online at <http://umanitoba.ca/copyright/>.

---

### Student Accessibility Services

---

If you are a student with a disability, please contact Student Accessibility Services (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.

---

## 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. This document is available from the Department of Statistics web page at: <http://umanitoba.ca/science/statistics/>.

Students enrolled in this course must ensure they satisfy the following minimum technological requirements:

1. A computing device where one can create and edit documents,
2. An internet connection capable of streaming videos and downloading software, and
3. Access to a web-cam and microphone.

---

## University of Manitoba Acknowledgement of Traditional Territories

---

*The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.*

*We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.*