

STAT 2150
Statistics and Computing
Fall 2022

Time Tuesdays/Thursdays, 1:00 p.m. – 2:15 p.m.
Location 207 Buller
CRN 17120

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Web Pages UM Learn: <http://umanitoba.ca/umlearn>

Office Hours: Mondays 10:00 a.m. – 11:30 a.m.
Wednesdays 10:00 a.m. – 11:30 a.m.

(or by appointment, excluding university holidays)

Office hours are drop-in. You do not need an appointment; simply come to my office at the indicated time if you'd like to meet with me. If the above times are not convenient for you, please contact me to arrange an alternate time to meet. I will do my best to return all email or telephone messages within 24 hours.

Calendar Description

(Lab required) This course is recommended for students in mathematically rich disciplines, including Statistics, Mathematics, Actuarial Science, Computer Science, and related interdisciplinary programs. Topics to be covered include: exploratory data analysis and visualization, graphical methods, random number generation, random variables, simple statistical models and computing, Monte Carlo methods, large sample and simulation-based inference, statistical software packages. Prerequisites: [one of STAT 1150, STAT 2000 (B), STAT 2001 (B), or STAT 2220] and [one of MATH 1230, MATH 1500, MATH 1501, MATH 1510, MATH 1520, or MATH 1690].

Textbook

There is no required textbook for this course. However, the following textbooks, all available in the form of e-books through the UM Libraries, are excellent resources to learn the basics of statistical computing.

Understanding Statistics Using R, Randall Schumacker and Sara Tomek, Springer (2013).

Statistical Analysis and Data Display: An Intermediate Course with Examples in R, Richard M. Heiberger and Burt Holland, Springer (2015).

Introduction to Statistics and Data Analysis, Christian Heumann, Michael Schomaker and Shalabh, Springer (2016).

Data Wrangling with R, Bradley C. Boehmke, Springer (2016).

Software

This course will make use of the R statistical software in both lectures and labs. You can download R for free from the *Comprehensive R Archive Network (CRAN)* at: <https://cran.r-project.org>. The preferred interface for R is RStudio, which can be downloaded from <https://www.rstudio.com/products/rstudio/download>.

Evaluation

Assignments (3)	15%
Lab Work	10%
Term Tests (2)	40%
Final Exam	35%

Each Term Test is worth 20% of the overall grade. If you miss either term test, documentation will be required to transfer the weight of the test. If you miss Term Test #1, then Term Test #2 will become worth 30% and the Final Exam will be worth 45%. If you miss Term Test #2, then the Final Exam will be worth 55%.

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

Assignments

There will be three assignments during the term. Assignments will be submitted via a Crowdmark link. See the Important Dates section for due dates. Late submissions will be subject to a 20% penalty for submission within 24 hours after the deadline. No late submissions will be accepted thereafter. You are expected to work independently on the assignments: copying, in whole or in part, the work of another student will not be tolerated and will result in disciplinary action (see Academic Integrity section).

Tutorials

You will attend tutorials once per week for 10 weeks, beginning the week of September 12-16. No tutorials will be held on the weeks of October 10-14 and November 14-18. You will work

on a lab worksheet in groups of 2-4 students. The worksheet must be submitted by the end of the tutorial session, and you must check in with your TA before you leave to confirm your attendance. Only one submission is required per group.

If you can, you should bring a laptop to your tutorials. If you do not have access to a laptop, you may work in a group with a classmate who does.

Worksheets will be marked on a pass/fail basis. As long as your group has made a reasonable effort on the worksheet, you will receive a grade of 1/1 for that tutorial. Only the best 7 of 10 weekly grades will be considered, so you can miss three tutorials with no penalty.

Exam Information

There will be two 75-minute term tests, tentatively scheduled for **Thursday, October 13** and **Thursday, November 17**, to take place during the scheduled class time.

The final exam will be 3 hours in duration and will be scheduled by the Registrar's Office during the December exam period.

Important Dates

Date	Event
Tuesday, September 27	Assignment 1 Distributed
Thursday, October 6	Assignment 1 Due
Thursday, October 13	Term Test #1
Tuesday, October 25	Assignment 2 Distributed
Thursday, November 3	Assignment 2 Due
November 7-10	Fall Term Break
Thursday, November 17	Term Test #2
Tuesday, November 29	Assignment 3 Distributed
Thursday, December 8	Assignment 3 Due

Tentative List of Topics

Unit 1 – R Software

- What is R and downloading instructions
- Syntax and R objects
- In-built functions in R
- Reading data from various sources and writing data
- Basics of writing R functions
- Loops/if/while and other control-flow constructs
- Libraries and packages
- R Markdown

Unit 2 – Exploratory Data Analysis

- Types of variables and data
- Summarizing data and identifying characteristics
- Additional visualization tools in R

Unit 3 – Probability Distributions and Data Simulation

- A review of probability
- Conditional probability
- Random variables
- Probability distributions: continuous and discrete
- Generating samples from probability distributions

Unit 4 – Statistical Inference

- Methods of estimation
- Measures of efficiency and accuracy
- Pivots and confidence intervals

Unit 5 – Hypothesis Tests

- Terminology and notation
- Size and power
- Cross-tabulation and tests of association
- Goodness-of-fit tests

Unit 6 – Resampling Methods and Assessments of Inferential Methods

- Jackknife
- Bootstrap
- Permutation tests
- Monte Carlo methods
- Assessing inferential methods via simulation

Unit 7 – Regression

- A review of simple linear regression
- Regression on categorical variables
- Multiple regression
- Residuals and other diagnostic checks

Unit 8 – Introduction to Data Science

Academic Integrity

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. The following link describes various types of academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation), and offers several resources to help students understand and avoid academic dishonesty:

<http://umanitoba.ca/student-supports/academic-supports/academic-integrity>

The Student Discipline Bylaw, which describes the potential consequences of academic dishonesty, can be found at the following link:

http://umanitoba.ca/admin/governance/media/Student_Discipline_Bylaw_-_2018-09-01.pdf

An academic integrity and student conduct tutorial can be found at the following link. For this course, it is recommended in particular that you view the parts on Tests & Exams and Inappropriate Collaboration.

http://umanitoba.ca/student/resource/accessibility/files/AI-Student-Conduct-Tutorial/story_html5.html

Voluntary Withdrawal

The voluntary withdrawal date is **November 22**. If you are unlikely to be successful in the course, or are not achieving the grade that you are aiming for, you should consider a VW from the course. Students enrolled in the course after the VW deadline will be assigned a final grade.

Authorized Withdrawal

In some instances, medical or compassionate circumstances arise in a student's life that prevent them from performing as they would in normal circumstances. If you are in this position, please contact a Faculty academic advisor to discuss your options. Be prepared to provide documentation, which supports your situation.

Copyrighted Material

All course notes, assignments, tests, exams, practice questions and solutions are the intellectual property of your instructor or the Department of Statistics. **The reproduction, posting or distribution of these materials is strictly forbidden without their consent.** It is **illegal** to upload any course material to any website. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright>.

Recording of Class Lectures

Your instructor holds copyright over the course materials, presentations and lectures which form part of this course. **No audio or video recording of lectures or presentations is allowed in any format** without permission from your instructor.

Class Communication

The University requires all students to activate an official University email account. Please note that all communication between you and your instructor 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

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

Professional Conduct

Students in the University community can freely express their thoughts, opinions, and beliefs; however, they must observe the Respectful Work and Learning Environment Policy (<https://umanitoba.ca/about-um/respectful-work-and-learning-environment-policy>) and treat each other, staff, and faculty with respect. Students who are alleged to have breached the Respectful Work and Learning Environment Policy will be investigated and disciplined according to the Student Non-Academic Misconduct and Concerning Behaviour Procedure.

Academic Accommodations

Student Accessibility Services

Students who have, or think they may have, a disability (e.g., mental illness, learning, medical, hearing, injury-related, visual) are encouraged to contact Student Accessibility Services to arrange a confidential consultation. Instructors are notified by Student Accessibility Services what accommodations their registered students require, which will help the instructor determine fair, feasible and reasonable academic accommodations without compromising academic standards. This takes time and planning, so reach out at the start of term.

SAS students can write their exams and tests in spaces organized by the SAS Exam Centre; however, they must register with the SAS Exam Centre a few weeks in advance. Please be sure to do so to receive the accommodations.

Student Accessibility Services

<http://umanitoba.ca/student-supports/accessibility>

520 University Centre

204-474-7423

Student.accessibility@umanitoba.ca

Medical Notes and Other Documentation

The Self-Declaration for Brief and Temporary Absences Procedure and Policy will be effective on September 1, 2022 and therefore students will not be required to present medical or other documentation for absences due to extenuating circumstances of 72 hours or less; however, you must complete the form at the following link:

<https://umanitoba.ca/governance/sites/governance/files/2022-06/self-declaration-for-brief-and-temporary-student-absences-fillable-form-final-for-website.pdf>

You must submit the form to your instructor in lieu of any medical or other documentation. Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than 72 hours. You only need to submit this form if you miss an assessment. You do **not** need to fill out this form if you are missing a lecture or a tutorial. Note that personal vacations or work obligations are **not** considered valid excuses to miss assessments.

Final Exams

If you have conflicting scheduled final exams, or if you miss a final exam due to illness or some other valid reason, **you must contact an academic advisor in your home faculty** (<http://umanitoba.ca/academic-advisors/>) as soon as possible to apply for a deferred exam. Deferred final exams are **not** arranged through your instructor or the department. Note that the granting of a deferred exam is not necessarily guaranteed.

Health and Safety

The University of Manitoba is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to the COVID-19 pandemic or other campus-wide emergency, it is possible that this course will move to a fully remote delivery format. Should the instructor be required to stay at home for an extended period and an alternate instructor not be available, the course may move temporarily to a remote delivery format.

Mask Wearing

In a face-to-face environment, our commitment to safety requires students to observe all COVID guidelines set by the University (<https://umanitoba.ca/coronavirus>). While on campus and in class, you must wear masks as stipulated in current University policies, procedures, and guidelines. The University highly recommends the use of KN-95 masks; the minimum requirement is a ATSM Level 2 Medical mask. Both mask types are available at many locations on campus. Students who fail to comply are subject to disciplinary action in accordance with the Student Discipline Bylaw and the Non-Academic Misconduct and Concerning Behaviour Procedure. If you do not follow masking requirements, you will be asked to leave the learning space and may only return to the class already in progress when you have complied with this requirement. Repeated issues will result in disciplinary action as previously noted. **Students should not eat or drink during class time.**

Illness

Remember: **STAY HOME IF YOU HAVE SYMPTOMS OR ARE ILL.** If you received a positive COVID test result, or if you have symptoms without testing, you must follow the instructions at <https://umanitoba.ca/covid-19/health-safety>. Specifically,

- You should **isolate for 5 days** after your symptoms started and until you have no fever and your other symptoms have improved over the past 24 hours.
- If you don't have symptoms and test positive, you should **isolate for 5 days** after your test date.

If you become ill while at the university, you should leave the classroom, lab, or workspace immediately. Once at home, complete the MB self-assessment and follow the directions that are provided. Please remain off-campus until cleared to return in accordance with self-assessment, testing results, and UM recommended isolation procedures.

Mental Health Support

For 24/7 mental health support, you can contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling.

Student Counselling Centre: <http://umanitoba.ca/student/counselling/index.html>

474 University Centre or S207 Medical Services

204-474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on- and off-campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

Student Support Intake Assistant: <http://umanitoba.ca/student/case-manager/index.html>

520 University Centre, Fort Garry Campus

204-474-7423

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.

University Health Service: <http://umanitoba.ca/student/health/>

104 University Centre, Fort Garry Campus

204-474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact the university's Health and Wellness Educator if you are interested in peer support from Healthy U or information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.

Health and Wellness Educator:

<https://umanitoba.ca/student/health-wellness/welcome-about.html>

britt.harvey@umanitoba.ca

469 University Centre, Fort Garry Campus

204-295-9032

Live Well @ UofM

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site: <http://umanitoba.ca/student/livewell/index.html>.

Your Rights and Responsibilities

As a student of the University of Manitoba, you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The Academic Calendar (<https://umanitoba.ca/registrar/academic-calendar>) is one important source of information. View the sections of University Policies and Procedures and General Academic Regulations. While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final grade appeals. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form: <http://umanitoba.ca/registrar/>.
- You are expected to view the General Academic Regulation section within the Academic Calendar, and specifically read the **Academic Integrity** regulations. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/>. View the **Student Academic Misconduct** procedure for more information.
- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected to conduct yourself in an appropriate respectful manner.

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an Academic Advisor within **your** registered faculty/college or school for questions about your academic program and regulations.

Contact **Student Advocacy** if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204-474-7423

student_advocacy@umanitoba.ca