STAT 3100: Introduction to Statistical Inference (A01)
Winter 2024
Tentative Course Syllabus

Course Details

Course Title & Number:	Introduction to Statistical Inference (STAT 3100)
Credit Hours:	3
Class Times:	Tuesday & Thursday 1:00 pm – 2:15 pm
Location for Lectures:	RUSSEL 214
Lab Time:	Wednesday 2:30 pm – 3:45 pm
Location for Lab:	ARMES 221
Pre-Requisites:	STAT 2150 and STAT 2400.
Pre- or Co-Requisites:	One of MATH 2150, MATH 2151, MATH 2720, MATH 2721, or the former MATH 2750.
Calendar Description:	(Lab Required) Introduction to Statistical Inference. Overview of the most common approaches to inference associated with point estimation, confidence intervals and hypothesis testing, including likelihood, least-squares and moment-based methods, as well as large sample approximations. May not be held with the former STAT 3600 or the former STAT 3800.

Instructor Contact Information

Instructor:	Ismaïla Ba
Preferred Form of Address:	I'll answer to just about anything
Office:	368 Machray Hall
Office Hours & Availability:	TBA
E-mail:	ismaila.ba@umanitoba.ca (**Note**: I will only respond to e-mail from UM Net ID's)
Contact:	I prefer contact by e-mail or during class time

Teaching Assistant Contact Information

Instructor:	Marcus Hlady
Office:	323 Machray Hall
Office Hours & Availability:	TBA
E-mail:	hladym@myumanitoba.ca

Topics

Brief list of possible topics to be covered:

- Preliminaries: Continuous Random Variables; Expectation; Variance; Joint Distributions; Conditional Distributions; Independence.
- Statistics and Sampling Distributions; Statistical Models; Estimators; Bias; Mean Square Error; Evaluation of Estimators; Sufficiency.
- Methods of Estimation: Method of Moments; Likelihoods and the Maximum Likelihood Estimator (MLE); Properties of the MLE; Least Squares Estimation.
- Large Sample Properties: CLT; Asymptotic Normality; Delta Method; Linearization.
- Confidence Intervals: General Principles; Pivots; Impact of Bias; Asymptotic Methods.
- Hypothesis Testing: General principles; Likelihood Ratio Tests; Asymptotic Methods; Connections to Confidence Intervals.
- Other topics as time permits.

Course Materials

Lecture Notes: Lecture notes will be provided. These are copyrighted and should not be published or shared with other websites or persons. Two versions of the lecture notes will be available: presentation version and printable version.

Supplementary Material: *Modern Mathematical Statistics with Applications, 2nd Edition*. Jay L Devore & Kenneth N. Berk. Springer Texts in Statistics. Springer: New York (2012/2018). [Available free as a SpringerLink e-Book through the library].

Additional Resource: *A Modern Introduction to Probability and Statistics: Understanding Why and How*. F.M. Dekking, C. Kraaikamp, H.P. Lopuhaä & L.E. Meester. Springer-Verlag: London (2005). [Available free as a SpringerLink e-Book through the library].

Course Technology

Course web-page: Course materials will be made available through the University of Manitoba's UM Learn system (`umanitoba.ca/d2l`).

Other Technology: It is the 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 and/or University of Manitoba Accessibility Services for educational purposes only.

Course Work, Examinations & Grading

Assignments: There will be four assignments for this course in total. You are free and encouraged to discuss questions with peer students but not the answers. You must submit the written work individually. 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). Assignment due dates will be specified as soon as questions are released (via Crowdmark). **No late submission will be accepted.**

Midterm Tests: There will be 2 IN CLASS midterm tests scheduled during lecture time (not LAB time). These tests will account for 40% of the final grade (each worth 20%). The tentative dates are January 25, and February 29, 2024.

Note: There will not be any makeup (deferred) midterm tests for this course. If you miss one or more midterm tests, **with a valid excuse**, and **notify me within 24 hours of the scheduled test(s)**, your final exam will be re-weighted as follows: **If you miss test #1 or test #2, your final exam weight is 60%; if you miss both tests, your final exam is worth 80%**. See also the Faculty of Science Schedule A for information on absences (on the UMLearn page for this course).

Lab: Once a week, starting January 17, there will be a compulsory lab (Wednesdays @ 2:30 pm – 3:45 pm). Generally, a teaching assistant will be solving selected problems (taken from the list of supplementary problems) and answering other questions that you might have.

Final exam: This three-hour test is going to be held in person and will cover all topics.

Grading Scheme:

Item	Percent	
4 Assignments	20%	(each worth 5%)
2 Midterm Tests	40%	(each worth 20%)
Final Exam	40%	
Total	100%	

Grading Cutoffs: I normally use the following guidelines when assigning letter grades with the caveat that one or more of these thresholds may be adjusted slightly up or down depending on the circumstances.

Grade/100 $\in$:	$[0, 50)$	$[50, 60)$	$[60, 65)$	$[65, 70)$	$[70, 75)$	$[75, 80)$	$[80, 90)$	$[90, 100]$
Letter Grade:	F	D	C	C+	B	B+	A	A+

Important Dates

Midterm test dates are tentative and subject to change at the discretion of the instructor and/or based on the learning needs of the students, but such changes are subject to the current ROASS Procedures as well as any addendums/modifications passed by the Senate.

Date	Information
Jan. 9	First instructional day
Jan. 19	Last day to drop this course with a refund
Jan. 22	Last day to add this course
Jan. 25	Midterm Test #1 (tentative)
Feb. 19-23	No class (Winter Term Break)
Feb. 29	Midterm Test #2 (tentative)
Mar. 20	Voluntary Withdrawal (VW) deadline
Apr. 10	Last instructional day
Apr. 12-26	Examination and test dates

Using Copyrighted Material

Please respect copyright. We will use copyrighted content in this course. University guidelines state that 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. Since it is illegal, do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the Copyright Act applies or written permission has been confirmed. For more information, see the University's Copyright Office website or contact `um_copyright@umanitoba.ca`.

Recording Class Lectures

No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of the instructor. Course materials (both paper and digital) are for the participant's private study and research.

Class Communication

The University requires all students to activate an official University email account.

Please note that all communication between myself (and teaching assistant(s)) and you as a student must comply with the University of Manitoba Electronic Communication with Student Policy . You are required to obtain and use your U of M email account for all communication between yourself and the University, including for this class.

Academic Integrity

The University has a number of resources centred around academic integrity, some of which can be found on the University Academic Integrity page. It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Please familiarize yourself with the information in the above link as well as the information contained in the Academic Calendar (2023-2024) relating to academic integrity and the student discipline bylaws. The Faculty of Science home page also contains links regarding academic and disciplinary matters as does the University of Manitoba Governing Documents for Students .

Additional Documents

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 will be posted to the Department of Statistics Courses and Programs page.

Faculty of Science Appendix: The Faculty of Science has prepared a Schedule A Appendix to be included in our course syllabi. This Appendix contains a lot of useful information including: suggestions and tips to study, information about the many useful services available to students, Academic Integrity, etc. This Appendix is available in the UMLearn page for the course.

Fire Safety Orientation

In the case of fire alarm:

- **Remain calm**
  - if it is safe, evacuate the classroom or lab
  - go to the closest fire exit
  - do not use the elevators
- **If you need assistance to evacuate the building, inform your professor or instructor immediately.**
- **If you need to report an incident or a person left behind during a building evacuation, report it to a fire warden or call security services 204-474-9341.**
  - **Do not** reenter the building until the **"all clear"** is declared by a fire warden, security services or the fire department.
- **Important: only those trained in the use of a fire extinguisher should attempt to operate one!**

Index to Web Links

For those of you who cannot see or make use of the hyperlinks in this document, here is a list of websites referenced herein along with their `url`'s:

UM Learn:	https://www.umanitoba.ca/d2l
ROASS Procedures:	https://umanitoba.ca/governance/governing-documents-academic#responsibilities-of-academic-staff-with-regard-to-students
University's Copyright Office website:	https://umanitoba.ca/copyright/
University of Manitoba Electronic Communication with Student Policy:	https://umanitoba.ca/governance/governing-documents-students
University Academic Integrity:	https://umanitoba.ca/student-supports/academic-supports/academic-integrity
Academic Calendar (2023-2024):	https://umanitoba.ca/registrar/academic-calendar
Faculty of Science:	https://www.sci.umanitoba.ca/
University of Manitoba Governing Documents for Students:	https://umanitoba.ca/governance/governing-documents-students
Department of Statistics Courses and Programs:	https://www.sci.umanitoba.ca/statistics/courses-and-programs/outlines/