

STAT 3100: Introduction to Statistical Inference (A01)
Winter 2023
Tentative Course Syllabus

Course Details

Course Title & Number:	Introduction to Statistical Inference (STAT 3100)
Credit Hours:	3
Class Times:	Tu/Th 1:00 p.m. – 2:15 p.m.
Location for Lectures:	ARMES 201
Lab Time:	Wednesday 2:30 - 3:45 p.m.
Location for Lab:	EITC E2 330
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:	Brad Johnson (he/him)
Preferred Form of Address:	I'll answer to just about anything
Office:	375 Machray Hall
Office Hours & Availability:	TBA
E-mail:	brad.johnson@umanitoba.ca (Note: I will only respond to e-mail from UManNet ID's)
Contact:	I prefer contact by e-mail or during class time.

Teaching Assistant Contact Information

Instructor:	Jervis Gallanosa
Office:	349 Machray Hall
Office Hours & Availability:	TBA
E-mail:	Jervis.Gallanosa@umanitoba.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 These are copyrighted and should not be published or shared with other websites or persons.

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. Lopuhaa & L.E. Meester. Springer-Verlag: London (2005). [Available free as a SpringerLink e-Book through the library].

Course Delivery

Lecture Delivery: As we are transitioning back to 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 the following.

- Proof of vaccination is no longer required to come to campus.
- The existing masking mandate will continue: masks are required everywhere on campus (except when outside).
- There are two notable exceptions to the above rule:
 1. Instructors may choose to remove their mask when actively teaching, provided a 2m distance can be maintained from students.
 2. Staff may remove their mask when seated at a cubicle-type workspace, provided there is a physical barrier to adjacent workers (e.g., cubicle partition) or a minimum of 2m separation from others.

While KN95 masks are highly recommended, 3-ply medical masks are also acceptable. Masks are available for free to members of the University community in many locations on campus. Please stay at home if you are feeling unwell. I'm also happy to hold individual meetings and office hours virtually via Zoom to accommodate students that are self-isolating.

Course Technology

- Course web-page:** Course materials will be made available through the University of Manitoba's [UM Learn](https://umanitoba.ca/d2l) 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.
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Course Work, Examinations & Grading

- Midterm Tests:** There will be 3 midterm tests scheduled during lab times (Wednesdays @ 2:30 - 3:45 p.m.). These tests will account for 60% of your final grade (25% for the best test out of 3, 20% for the second best and 15% for the remaining test). The tentative dates are: Jan 26, Feb 16 and Mar 16, 2023.

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 48 hours of the scheduled test(s)**, your final exam will be re-weighted as follows: **If you miss 1 test, your final exam weight is 55% (with remaining tests worth 20% and 25%); if you miss 2 tests, your final exam weight is 75% (with remaining test worth 25%); if you miss all 3 tests, your final exam is worth 100%.** See also the Faculty of Science Schedule A for information on absences (on the UMLearn page for this course).

- Assignments:** There will be no *formal* assignments for this course. There are a number of exercises in the supplied lecture notes for you to work on on your own to practice. The midterm tests and final examination will be based, in part, on these or similar problems. You are free (and encouraged) to work in groups on these but you must be able to complete the work individually on tests/examinations. Additional problems may be posted to the course web page

- Lab:** Once a week, starting Feb 2, there will be a compulsory lab held online (Wednesdays @ 2:30 – 3:45 p.m.). Generally, a teaching assistant will be solving selected problems (taken from the list of supplementary problems) and answering other questions that you might have. **The 3 midterm tests are during lab times as well.**

Grading Scheme:

Item	Percent
3 Midterm Tests	60% (25%/20%/15% — see above)
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 19	First Class
Jan 26	Midterm Test #1
Feb 16	Midterm Test #2
Feb 20-26	Winter Break
Mar 16	Midterm Test #3
Mar 22	Last Day to VW
Apr 18	Last Class

Using Copyrighted Material

Please respect copyright. 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. 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

Brad Johnson and the University of Manitoba hold 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, openly or surreptitiously, in whole or in part without permission of Brad Johnson. 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 \(2022-2023\)](#) 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 a 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.

Index to Web Links

For those you 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 (2022-2023): <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/>