

# STAT 4100: Statistical Inference I, Fall 2016 (A01)

## Tentative Course Outline

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### Course Details

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<b>Course Title &amp; Number:</b>	Statistical Inference I (STAT 4100)
<b>Credit Hours:</b>	3
<b>Class Times:</b>	Monday & Wednesday 1:00 p.m. – 2:15 p.m.
<b>Location for Lectures:</b>	316 Machray Hall
<b>Pre-Requisites:</b>	STAT 3800 (or the former STAT 3600 or 005.360)
<b>Course Description:</b>	Introduction to methods of estimation, including asymptotic and Bayesian methods.

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### Instructor Contact Information

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<b>Instructor:</b>	Mohammad Jafari Jozani
<b>Preferred Form of Address:</b>	I'll answer to just about anything.
<b>Office:</b>	365 Machray Hall
<b>Office Hours &amp; Availability:</b>	Monday & Wednesday 10:00–11:00 or by appointment.
<b>Office Phone Number:</b>	(204) 272-1563
<b>E-mail:</b>	m.jafari.jozani@umanitoba.ca ( <b>Note:</b> I will only respond to e-mail from UMNNet ID's)
<b>Contact:</b>	I prefer contact by e-mail or in person contact.

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### Tutorial

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<b>Instructor:</b>	Parisa Azimae
<b>Office:</b>	353 Machray Hall
<b>E-mail:</b>	azimaeep@myumanitoba.ca
<b>Lab:</b>	Fridays 1:00–2:15 p.m..

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### Textbook, Readings, Materials

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<b>Textbook:</b>	There is no textbook for this course. However, I recommend to use the following textbooks for further reading and exercises. I will make lecture notes available through the UM Learn system (see below).
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- Other Resources:** Not required. Available from the Science Library
- Mathematical Statistics (Second Edition)*. Jun Shao. Springer Texts in Statistics (2003). ISBN 0-387-95382-5.
- Probability and Statistical Inference*. Nitis Mukhopadhyay. Marcel Dekker (2000). ISBN 0-8247-0319-0.
- Statistical Inference (Second Edition)*. G. Casella and R.L. Berger. Duxbury/Thomson Learning (2002). ISBN 0-534-24312-6.
- Introduction to Mathematical Inference (Sixth Edition)*. R.V. Hogg, J.W. McKean and A.T. Craig. Pearson/Prentice Hall (2005). ISBN 0-13-008507-3.

**Readings:** In order to prepare for class, I will normally ask you to read about the topics to be covered before the lecture. I am not expecting you to learn the material on your own, only to familiarize yourself with the main ideas and vocabulary so that the lectures are easier to follow. Do not get bogged down in formulae or minute details. If you come across something that is confusing or troubling, don't despair. If your questions are not resolved during the lecture, please ask. As you work on the problem sets, it will be helpful to re-read the material on a more detailed level.

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### Topics

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This is a tentative list of topics to be covered.

- Introduction
- Basic concepts including parametric non-parametric and semi-parametric models.
- Exponential family, location-scale family.
- Introduction to various approaches of statistical inference.
- The Sufficiency Principle (sufficiency, minimal sufficiency, completeness, ancillarity, Information)
- The Equivariance Principle.
- Moments and maximum likelihood methods; EM algorithm. Monte Carlo Method. Taylor expansion.
- Bayesian method; Loss function optimality.
- Mean Square Error; Unbiasedness; Bias reduction techniques.
- Asymptotic evaluation; Minimum variance unbiased estimators; Bootstrap.
- Some preliminary results regarding estimation in linear models.

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### Course Technology

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- Course web-page:** Course materials will be made available through the University of Manitoba's UM Learn system ([umanitoba.ca/d21](http://umanitoba.ca/d21)).
- Software:** We will also be making use of the software package R in a few occasions. It is freely available for Linux, Macintosh and Windows from *The Comprehensive R Archive Network* at <http://cran.r-project.org/>. Please download and install.
- 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. Electronic messaging, e-mail, social networking, gaming, etc. should be avoided during class time. Cell phones should be off. If a student is on call for emergencies, their cell phone should be on vibrate mode and the student should leave the classroom before using it.

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### Important Dates

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These 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 Section 2.8 of the ROASS Procedure.

Date	Information
Sep 12	Classes Begin
Oct 28	<b>Midterm Test</b> Rooms MH 315,316 (12:30–3:30)
Nov 18	Last Day for VW
Dec 7	<b>End of Classes</b>

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### Course Work, Examinations & Grading

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**Midterm and Final Exams:** There will be one mid-term exam, worth 40% of your final grade. The tentative date is October 28th, 2016 in Rooms 315 and 315 Machray Hall (12:30–3:30) but this is **subject to change**. The midterm test and the final examination are closed book. Statistical tables will be provided if required. A non-programmable calculator might be necessary (graphing calculators are not permitted). However, other electronic devices, such as cell phones and MP3, are strictly prohibited.

**Note:** There will not be any makeup (deferred) mid-term exam for this course. If you miss the mid-term exam, you will be assigned a mark of zero for the test, unless you **have a valid excuse**, and you **notify me within 48 hours of the scheduled exam**. Students who miss the term test with legitimate reasons will have the midterm weight added to the final examination. The Final Exam will be held on a date to be selected later by the Department of Statistics and will be 3 hours in duration.

**Assignments:** There will be no *formal* assignments for this course. The distributed lecture notes have a number of exercises and questions, which I may add to. The midterm test 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 UM Learn system ([umanitoba.ca/d21](http://umanitoba.ca/d21)).

**Grading Scheme:** 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%). There is an additional requirement for obtaining a C or a D in the course: to obtain a grade of C or better, you must obtain at least 50% on the final examination; to obtain a D you must obtain at least 40% on the final examination.

Item	Percent
Mid-term Test	40%
Final Exam	60%
Total	100%

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### Using Copyrighted Material

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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 at <http://umanitoba.ca/copyright/> or contact [um\\_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

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### Recording Class Lectures

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Mohammad Jafari Jozani 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 participants private study and research.

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### Class Communication

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The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit: [umanitoba.ca/admin/governance/media/Electronic\\_Communication\\_with\\_Students\\_Policy\\_-\\_2014\\_06\\_05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

Please note that all communication between myself and you as a student must comply with the electronic communication with student policy ([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.

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### Academic Integrity

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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 contained in *Academic Calendar > General Academic Regulations > SECTION 8: Academic Integrity*. (see <http://umanitoba.ca/calendar>) The Faculty of Science home page at [www.umanitoba.ca/science](http://www.umanitoba.ca/science) also contains links regarding academic and disciplinary matters.

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### ROASS Schedule A

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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 web page and to the UM Learn system.