STAT 4520: Sampling Techniques I, Winter 2020 (A01)
Tentative Course Outline

Course Details

Course Title & Number:	Sampling Techniques I (STAT 4520)
Credit Hours:	3
Class Times:	Tuesday & Thursdays 8:30 a.m. – 9:45 a.m.
Location for Lectures:	316 Machray Hall
Pre-Requisites:	STAT 3480 (C) & STAT 3800 (C) or consent of instructor
Course Description:	A development of sampling theory for use in sample survey problems, in regression estimates, in systematic sampling, sources of errors in surveys.

Instructor Contact Information

Instructor:	Brad Johnson
Preferred From of Address:	I'll answer to just about anything.
Office:	375 Machray Hall
Office Hours & Availability:	Open door policy — if my door is open, I am available for questions.
Office Phone Number:	(204) 474-8162
E-mail:	brad_johnson@umanitoba.ca (**Note**: I will only respond to e-mail from UMNet ID's)
Contact:	I prefer contact by e-mail or in person contact.

Textbook, Readings, Materials

Textbook:	There is no textbook for this course. I will make lecture notes available through the UM Learn system (see below).
Other Resources:	Not required. Available from the Science Library
	Model Assisted Survey Sampling. C. E. Särndal, B. Swensson & J. Wretman. Springer: New York (2003).
	Sampling Techniques (3rd Ed.). W. G. Cochran. Wiley: New York (1977).
	Sampling: Design and Analysis. S. L. Lohr. Duxbury Press: Toronto (1999).
Readings:	In order to prepare for class, I will normally ask you to read about the topics to be covered prior 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.

Topics

This is a tentative list of topics to be covered.

- Introduction
- Basic principles for probability samples: definitions; sample statistics; inclusion probabilities; Hansen-Hurwitz and Horvitz-Thompson estimation; improved Hansen-Hurwitz estimator.
- Basic element sampling designs: simple random sampling with and without replacement; Bernoulli sampling; Poisson sampling with and without replacement; multinomial sampling; domain estimation; sampling for proportions.
- Functions of several study variables: basic results and definitions; Taylor linearization; estimating ratios; domain estimation.
- Ratio estimator: ratio estimator in element sampling designs; unbiased ratio estimation; gains in efficiency.
- Regression estimation: the difference estimator; generalized regression estimator; regression estimation under the ratio, simple linear regression and common mean models.
- Stratified sampling: basic results; choosing strata; optimal allocation; ratio and regression estimation in stratified designs; gains in efficiency.
- Single stage cluster sampling: basic results; ratio estimators; systematic sampling.

Course Technology

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

Software: We will also be making use of the software package R. 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. A number of datasets will be made available through the UM Learn system (`umanitoba.ca/d2l`) in the form of an R package.

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.

Important Dates

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
Jan 6	Classes Begin - Course Overview
Feb 11	**Review Class**
Feb 13	**Midterm Test**
Feb 17-21	Winter Break
Mar 18	Last day for VW
Apr 2	End of Material
Apr 7	**Review Class**

Course Work, Examinations & Grading

Midterm Exams: There will be 1 in-class mid-term exam, worth 35% of your final grade. The tentative date is February 13, 2020.

Note: There will not be a makeup (deferred) mid-term exam for this course. If you miss a mid-term exam, **have a valid excuse**, and **notify me within 48 hours of the scheduled exam**, your final exam will be re-weighted to account for an additional 35% of your final grade per test.

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 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 UM Learn system (`umanitoba.ca/d2l`).

Project: During the term you will be required to complete a group project worth 15% of your final grade. The groups and topics will be determined by myself and more information will be given early in the term.

Grading Scheme:

Item	Percent
Mid-term Test	35%
Project	15%
Final Exam	50%
Total	100%

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 UniversityÕs Copyright Office website at `http://umanitoba.ca/copyright/` 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 participantÕs private study and research.

Class Communication

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`

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_com munication_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.

Academic Integrity

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 also contains links regarding academic and disciplinary matters.

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 web page under "Courses" and to the UM Learn system.