

STAT 4520: Sampling Techniques I, Fall 2015 (A01)

Tentative Course Outline

Instructor: Brad Johnson
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Class-time: TTh 8:30 a.m. – 9:45 a.m.

Location: 316 Machray Hall

Office hours: Open door policy — if my door is open, I am available for questions.

Calendar Description: A development of sampling theory for use in sample survey problems, in regression estimates, in systematic sampling, sources of errors in surveys.

Prerequisite(s): STAT 3800 (C) and STAT 3480 (C), or consent of department.

Course web-page: Course materials will be made available through the University of Manitoba's UM Learn system (umanitoba.ca/d21).

Textbook: There is no textbook for this course. I will make lecture notes available through the UM Learn system (see above).

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).

Topics: This is a tentative list of topics we will cover:

- 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.

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/d21) in the form of an R package.

Midterm Exams: There will be 2 in-class mid-term exams, each worth 22.5% of your final grade. The tentative dates are October 8 and November 10 (2015) but these are **subject to change**.

Note: There will not be any makeup (deferred) mid-term exams 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 22.5% 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/d21).

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:	Mid-term Test 1	22.5%
	Mid-term Test 2	22.5%
	Project	15.0%
	Final Exam	40%
	Total	100%

Voluntary Withdrawal: The voluntary withdrawal deadline is **November 18, 2015**.

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.