



COURSE SYLLABUS

STAT 348: Sampling Techniques

MWF 11:30 AM - 12:20 PM, BUILDING 000

General Information

Instructor: TRANG BUI, Assistant Professor, Mathematics and Statistics

Office: BUILDING XXX

Email: tqtbui@usask.ca

Office hours: MWF 1:00 pm - 2:00 pm

Course site: <https://canvas.usask.ca/>

Communication:

- Announcements are given on Canvas, you are therefore responsible for checking Canvas on a regular basis.
- All course-related questions should be asked on the Discussion board on Canvas. I will try to answer your questions as soon as possible, within one week of posting the latest.
- For external inquiries, personal matters, or emergencies, please send me an email. When emailing your instructor, please use your official USask email account and be sure to include the course you are inquiring about in the subject line. It is in your best interest to avoid composing informal, disrespectful, and/or unclear emails to your instructors.

Land Acknowledgement

As we gather here today, we acknowledge that the Saskatoon campus of the University of Saskatchewan is on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another. We recognize that in the course of your studies you will spend time learning in other traditional territories and Métis homelands. We wish you safe, productive and respectful encounters in these places.

Catalogue Description

Theory and applications of sampling from finite populations. Includes: simple random sampling, stratified random sampling, cluster sampling, systematic sampling, probability proportionate to size sampling, and the difference, ratio and regression methods of estimation.

Prerequisite(s): STAT 242 or STAT 245 or STAT 246.

Learning Outcomes

Survey sampling is a fundamental subject in statistics, helping us understand characteristics of the study population. The aim of this course is to introduce the statistical techniques associated with the design and analysis of sample surveys. At the end of the course, you should be able to:

- recognize terminologies and features of complex surveys (e.g., strata, clusters, unequal sampling probabilities)
- enumerate the characteristics of a well-designed survey, with the objective to gain the most information for the least cost;
- identify possible sources of bias;
- compute summary statistics and make population inferences from complex survey;
- use statistical software for survey sampling problems.

Information on literal descriptors for grading at the University of Saskatchewan and more can be found in the Academic Courses Policy on course delivery, examinations and assessment of students learning: <http://students.usask.ca/academics/grading/grading-system.php>

Please note: There are different literal descriptors for undergraduate and graduate students.

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: <https://teaching.usask.ca/about/policies/learning-charter.php>

Course Overview

Chapter	Topics
Chapter 1: Introduction	Populations and Representative Samples, Selection Bias, Measurement Error, Questionnaire Design, Sampling and Non-sampling Errors, Census vs Sample
Chapter 2: Simple Probability Samples	Probability Samples, Simple Random Sampling, Sampling Weights, Confidence Intervals, Sample Sizes, Systematic Sampling
Chapter 3: Stratified Sampling	Stratified Sampling, Stratified Sampling Weights, Allocating Observation to Strata
Chapter 4: Ratio and Regression Estimation	Ratio Estimation in Simple Random Sampling, Regression Estimation in Simple Random Sampling, Estimation in Domains, Post-stratification, Ratio Estimation in Stratified Sampling
Chapter 5: Cluster Sampling with Equal Probabilities	One-stage Cluster Sampling, Two-stage Cluster Sampling, Designing a Cluster Sample
Chapter 6: Sampling with Unequal Probabilities	Sampling with Replacement, Unequal-probability Sampling without Replacement
Chapter 7: Complex Surveys	Assembling Design Components, Sampling Weights, Design Effects
Chapter 9: Variance Estimation in Complex Surveys	Linearization, Resampling Methods, Confidence Intervals

Required Resources

Textbook

Lohr, S.L. (2022). *Sampling: Design and Analysis*, CRC Press.

The textbook is available in USask Bookstore or through library catalogue at this link (allows 3 simultaneous readers at once).

Software

We will use **R** and **Rstudio** interface to apply statistical sampling methods to design and analyze survey data. R is chosen because (i) it is free and (ii) a lot of new statistical techniques are published and maintained as R packages. More information and links to download R and Rstudio can be found at <https://www.rstudio.com/products/rstudio/download/>

Class Schedule (Tentative)

Week	Date	Chapter	Remarks
1	Jan 06 – Jan 09	1	Jan 07: First day of class
2	Jan 12 – Jan 16	1, 2	Jan 18: Bonus Quiz 1 due by 11:59PM.
3	Jan 19 – Jan 23	2	
4	Jan 26 – Jan 30	2, 3	Jan 26: Assignment 1 available on Canvas
5	Feb 02 – Feb 06	3	
6	Feb 09 – Feb 13	4	Feb 13: Assignment 1 due by 11:59PM.
7	Feb 16 – Feb 20		Feb 16: Family day, university closed Winter term break, no class.
8	Feb 23 – Feb 27	4, 5	Feb 25: Midterm 1 (class time) Feb 25: Assignment 2 available on Canvas
9	Mar 02 – Mar 06	5	Mar 08: Bonus Quiz 2 due by 11:59PM
10	Mar 09 – Mar 13	5, 6	Mar 13: Assignment 2 due by 11:59 PM.
11	Mar 16 – Mar 20	6	Mar 16: Assignment 3 available on Canvas
12	Mar 23 – Mar 27	7, 9	Mar 25: Midterm 2 (class time).
13	Mar 30 – Apr 03	9	
14	Apr 06 – Apr 10	9	Apr 06: Last day of class Apr 07: Assignment 3 due by 11:59PM Apr 08: Bonus Quiz 3 due by 11:59PM

Assessment Details

Grading Scheme

Assessments that will contribute to your final grade are:

Bonus Quiz 1	2%
Bonus Quiz 2	2%
Bonus Quiz 3	2%
Assignment 1	15%
Assignment 2	15%
Assignment 3	15%
Midterm 1	10%
Midterm 2	10%
Final exam	35%
Total	100%*

*The maximum grade of the course is 100%, from assignments, midterms and final exams. You may complete Bonus quizzes (explained below) to add up to 6% toward the final grade, making up for the other assessments.

Bonus Quizzes: extra 6%

- These quizzes are held at the beginning, middle, and end of the term on Canvas.
- They include questions regarding yourself and your feedbacks about the course. These are opportunities for me to better understand you and for you to provide feedbacks. I may or may not use these feedbacks to make appropriate modifications to the course to better satisfy students' need.
- The bonus quizzes offer extra credits (maximum 6%) to be added to your final grade.
- The due dates for these quizzes are specified on the class schedule, unless otherwise announced. The due dates are hard deadline, **late submission is not accepted in any circumstances**.

Assignments: 45%

- The assignments give you opportunities to practice what you learned in the course and learn necessary computation and statistical reporting skills. Answers must be shown step-by-step. A simple final answer without work will only get partial or no marks.
- Although you can discuss the assignments with fellow students for some directions/hints, the assignment submission should be worked **by yourself**, using your own understanding of the problem. Any violation to academic integrity will face serious penalties. See **Academic Integrity** section below.
- Submission: PDF file generated from R markdown uploaded on Canvas. Handwritten work can be added to the file as pictures. See <https://guides.instructure.com/m/4212/l/41972-how-do-i-submit-an-online-assignment> for a description of how to upload a file as an assignment submission in Canvas.
- Due date: As indicated in the class schedule, unless otherwise announced.
- Late assignment: Late assignments are accepted only for three (3) days beyond the due date. The penalty for your delay is 10 percentage points per day of lateness from the value of the assignment (including weekends). **Extensions are only granted in rare instances (notably as a result of family or medical emergencies) and upon receipt of adequate documentation**.

Midterms: 20% (2x10%)

- There are two midterms, each of which is a closed-book 50-minute in-person exam, including short-answer questions, problem solving, data analysis and interpretation. A scientific calculator is allowed.
- The dates of the exams are specified in the class schedule, unless otherwise announced. The exams are held in class time and location.
- Students must do midterms completely on their own. Make-up exam will not be given. **If you miss an exam for a legitimate reason (e.g., illness, emergency) and notify me within 48 hours of the scheduled exam**, the weight of the missed exam will be transferred to the final exam.

Final Exam: 35%

- The final exam will be a closed-book, 3-hour in-person exam, covering materials from the entire term, including short-answer questions, problem solving, data analysis and interpretation. A scientific calculator is allowed.
- Final examinations may be scheduled at any time during the examination period (**April 09 – Apr 30**); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of their own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam **may** be given. Students are encouraged to review all examination policies and procedures: <http://students.usask.ca/academics/exams.php>

Criteria That Must Be Met to Pass

Completing the final exam is a required component of the course. Students must complete the final exam in order to be eligible to receive a passing grade in this class.

Attendance Expectations

Attendance is highly correlated with student performance. While a syllabus and textbook are provided, reading the textbook is not an adequate substitute for attending class. While your **attendance is highly recommended**, it is not required and you will not be graded on your attendance.

Recording of the Course

Recording of the lectures will only be allowed in certain circumstances. Please see the instructor for information on how to receive approval. In general, there will be no videos available for in-person lectures. Therefore, **attendance is strongly recommended**.

Copyright

Course material created by your professors and instructors is their intellectual property and **cannot be shared without written permission**. This includes exams, PowerPoint/PDF lecture slides and other course notes. If materials are designated as open education resources (with a creative commons license) you can share and/or use them in alignment with the [CC license](#). Other copyright-protected materials created by textbook publishers and authors may be provided to you based on license terms and educational exceptions in the [Canadian Copyright Act](#).

You are responsible for ensuring that any copying or distribution of materials that you engage in is permitted by the University's "[Use of Materials Protected By Copyright](#)"

Policy. For example, posting others' copyright-protected materials on the open internet is not permitted by this policy unless you have copyright permission or a license to do so. For more copyright information, please visit <https://library.usask.ca/copyright/students/index.php> or contact the University Copyright Coordinator at copyright.coordinator@usask.ca or 306-966-8817.

Student Feedback

You will be provided opportunities throughout the term to provide feedback about the course. This will include the use of the University administered course feedback system, SLEQ, both partway through the class and at the end of term, and less formal methods. I value this feedback and use it to modify and improve the course to best meet student learning needs.

Academic Integrity

Group work is **NOT** permitted on any of the assessments in this course. For the assignments and the project, you can discuss on Canvas about hints/directions, but the final submission should be **worked by yourself** with your own understanding.

Students may use GenAI technology or tools to **edit** content (which must be originally generated by students themselves), including making changes that improve the clarity of writing and change wording or structure. GenAI may also be used to **debug syntax or system errors**, i.e., the codes logic must be originally generated by students themselves. **Other use of GenAI is strictly prohibited.** When unsure, please consult with the instructor by posting a question on the discussion board for clarification.

Students wanting to connect their assessment in this course to assessments they have completed in another course must get explicit permission of the instructor in order to avoid potential academic misconduct of self-plagiarism.

The University of Saskatchewan is committed to the highest standards of academic integrity. <https://academic-integrity.usask.ca/>

Students are urged to read the [Regulations on Academic Misconduct](#) and to avoid any behaviours that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence.

For help developing the skills for meeting academic integrity expectations, see: <https://academic-integrity.usask.ca/students.php>

Students are encouraged to ask their instructors for clarification on academic integrity requirements.

All students are encouraged to be aware of the rules for courses set out in the [Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning](#).

Academic Courses Policy

The USask Academic Courses Policy contains the requirements for course delivery, examinations, and other forms of student assessment. You can view the policy at <https://policies.usask.ca/policies/academic-affairs/academic-courses.php>.

You can also read information on the following policies and procedures at the links below:

- [Academic Misconduct](#)
- [Non-Academic Misconduct](#)
- [Appeals in Academic Matters](#)

Access and Equity Services (AES) for Students

Access and Equity Services (AES) is available to provide support to students who require accommodations due to disability, family status, and religious observances.

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates.

Students who require accommodations for pregnancy or substantial parental/family duties should contact AES to discuss their situations and potentially register with that office.

Students who require accommodations due to religious practices that prohibit the writing of exams on religious holidays should contact AES to self-declare and determine which accommodations are appropriate. In general, students who are unable to write an exam due to a religious conflict do not register with AES but instead submit an exam conflict form through their PAWS account to arrange accommodations.

Any student registered with AES, as well as those who require accommodations on religious grounds, may request alternative arrangements for mid-term and final examinations by submitting a request to AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

For more information or advice, visit <https://students.usask.ca/health/centres/access-equity-services.php>, or contact AES at 306-966-7273 (Voice/TTY 1-306-966-7276) or email aes@usask.ca.

Student Supports

Academic Help – University Library

Visit the [University Library](#) and [Learning Hub](#) to find supports for undergraduate and graduate students with first-year experience, study skills, learning strategies, research, writing, math and statistics. Students can attend [workshops](#), access [online resources and research guides](#), book [1-1 appointments](#) or hire a [subject tutor](#) through the [USask Tutoring Network](#)

Connect with library staff through the [AskUs](#) chat service or visit various [library locations](#) on campus.

Enrolled in an online course? Explore the [Online Learning Readiness Tutorial](#).

Teaching, Learning and Student Experience

Teaching, Learning and Student Experience (TLSE) provides developmental and support services and programs to students and the university community. For more information, see the students' website <http://students.usask.ca>.

College Supports

Students in Arts & Science are encouraged to contact the Undergraduate Student Office and/or the Trish Monture Centre for Success with any questions on how to choose a major; understand program requirements; choose courses; develop strategies to improve grades; understand university policies and procedures; overcome personal barriers; initiate pre-career inquiries; and identify career planning resources. Contact information is available at:

(<http://artsandscience.usask.ca/undergraduate/advising/>)

Financial Support

Any student who faces unexpected challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central <https://students.usask.ca/student-central.php>.

Student Wellness Centre

The Student Wellness Centre offers physical and mental health care to USask students and their dependents. Chiropractic, physiotherapy and massage appointments are available to USask students, staff, and faculty. Visit <https://students.usask.ca/health/centres/wellness-centre.php> for more information.

Gordon Oakes Red Bear Student Centre

The Gordon Oakes Red Bear Student Centre) is dedicated to supporting Indigenous student academic and personal success. The Centre offers personal, social, cultural and some academic supports to Métis, First Nations, and Inuit students. The Centre is an intercultural gathering space that brings Indigenous and non-Indigenous students together to learn from, with and about one another in a respectful, inclusive, and safe environment. Visit <https://students.usask.ca/indigenous/index.php> or students are encouraged to visit the ASC's website <https://students.usask.ca/indigenous/gorbsc.php>

International Student and Study Abroad Centre

The International Student and Study Abroad Centre (ISSAC) supports student success and facilitates international education experiences at USask and abroad. ISSAC is here to assist all international undergraduate, graduate, exchange, and English as a Second Language students in their transition to the University of Saskatchewan and to life in Canada. ISSAC offers advising and support on matters that affect international students and their families and on matters related to studying abroad as University of Saskatchewan students. Visit <https://students.usask.ca/international/issac.php> for more information.