STAT 2300 Section A01
Fall 2020

Time	12:30 - 1:20 pm MWF
Location	Cisco Web Ex
CRN	19995
Instructor	Jenna G. Tichon Email: jenna.tichon@umanitoba.ca
Office Hours:	Tuesday: 4:00 - 5:00 p.m. During Home Video Lecture Periods
Web Pages	UMLearn: `http://umanitoba.ca/umlearn` Statistics: `https://www.sci.umanitoba.ca/statistics/` R Studio Cloud login: `https://rstudio.cloud`

If the above times are not convenient for you, please email to arrange an alternate time to meet. I will do my best to return all email messages within 24 hours.

Calendar Description

Introduction to the basic principles and foundational aspects of data collection with a focus on the design and basic analysis of observational and experimental studies. Important issues like randomization, blocking and confounding, sampling, stratification, response bias and nonresponse will be covered. May not be held with the former STAT 3480.

Prerequisite: one of STAT 1150, STAT 2000 (B), or STAT 2001 (B

Course Goals

By the end of the course students should be able to:

- create clear and useful surveys.
- select and implement an appropriate sampling method for survey studies.
- recognize and identify strategies to eliminate and/or minimize nonresponse, undercoverage, and non-sampling error.
- create a well designed experiment and collect data using appropriate randomization techniques.
- analyze experimental data for basic designs by hand and using R.
- recognize the limitations of how broadly results can be generalized based on whether they have taken observational studies or experiments.

STAT 2300 is designed to have students thinking early on in their degree about the principles behind good data collection and how we select samples and create well designed experiments. The course is for both Statistics majors as well as students seeking a minor in statistics or any student that requires data collection in their degree program. While we discuss how to analyze data for each sampling and design method discussed, the emphasis is on how a practitioner would handle the data and not on mathematical derivations. The course has an added focus on the clear communication of statistical ideas and outcomes as its recognizes that statisticians work with people, from many disciplines, when they consult in survey and experimental design.

Textbook, Readings, and Course Materials

Required Textbook: *Elementary Survey Sampling* by Schaeffer et al ISBN-13: 9780840053619

The textbook is available as an e-text at `https://www.nelsonbrain.com/shop/ProductDisplay?langId=-1&storeId=10651&catalogId=10052&productId=546013`.

Supplementary Readings: Occasionally I will assign supplementary readings in the form of short articles or website URLs to complement the lecture materials. These will be made available through the course website on UMLearn under the course content for the appropriate unit or on the class discussion forum.

Required Materials: All students will be required to have a scientific calculator.

Using Copyrighted Material

Please be mindful and respect copyright throughout this course. All course notes, assignments, tests, exams, practice exams, and solutions are either my own intellectual property or that of the Department of Statistics. If I use any copyrighted material in my lectures I will properly source and follow copyright guidelines and I expect you to do the same. The copyrighted works are made available for your personal use and study and must not be distributed in any format without express permission.

You do not have permission to upload any course notes, tests, assignments, or handouts to any note sharing websites. Please see the following site for more information: `https://umanitoba.ca/admin/vp_admin/ofp/copyright/media/Note_sharing_Web_sites.pdf`

Recordings of the lectures are available for your own personal use only. You may not upload or edit any of the videos or materials I produce.

Course Technology

Respectful Behaviour in an Online Classroom: All live components of this course will be conducted over Cisco WebEx. It is expected that you conduct yourself professionally and do not distract your fellow students with unnecessary or inappropriate chat messages, sounds, or images if you are ever on web camera. If you appear on web camera it is expected that you will be dressed appropriately for a classroom environment and that your background does not contain distracting or offensive materials.

R Studio: In this class we will be making some use of the statistical software R. You can download R from `http://cran.utstat.utoronto.ca/` and the R Studio program from `https://www.rstudio.com/products/rstudio/download/`. No previous programming experience is required and the required use of R by students will be minimal but I will may make more use of it for demonstrations during lectures or to suggest enrichment practice problems of students that I will not test. Testable material in R will be made very clear.

UMLearn: All course material as well as class reflections for marks will be posted on UMLearn. All important dates can be found on the calendar and I will make class announcements through the news feed on the course website. All grades will be posted in the UMLearn Gradebook

In addition, there will also be discussion forums available. For each class I will open up a discussion forum where I will post the material covered that class, any announcements, and suggestions for preparation for the next class. Please be in the habit of checking it after every class. If you have questions about anything during the lecture or any announcements, you can ask directly on the forum for the relevant class. There will also be a discussion forums opened up for general class/technology questions, for questions on assignments/projects, and a student forum. Your first project has a peer feedback component which will be conducted through the discussion forum.

All discussion will be monitored closely by me. Please be courteous in posing questions and replying to questions on the board. Your best effort should be made to make clear questions in complete English sentences.

Access to the class recordings and the live lectures will be available through UMLearn under Communications > Cisco WebEx.

Crowdmark: The midterms, and the final exam will be marked using the Crowdmark software, an online grading tool. All exams will be written by you on paper and then scanned and uploaded through a link you will be provided over email. While you may take a photo of your paper, due to the high quality of most camera phones, it is recommended that you use the app Cam Scanner (or a similar app) to take the photos of your work. There will be a trial run of the software prior to the first term test. Upon completion of the marking for the midterms, an electronically marked copy of your exam will be emailed to your UManitoba e-mail address. I will send out an email when the marked copies have been sent. Please check your spam folders if you do not see it in your inbox.

Notice Regarding Collection, Use, and Disclosure of Personal Information by the University: Your personal information is being collected under the authority of the *University of Manitoba Act*. It will be used for the purposes of grading papers and providing feedback to students. Personal information will not be used or disclosed for other purposes, unless permitted by *The Freedom of Information and Protection of Privacy Act* (FIPPA). The University of Manitoba has taken steps to ensure that its agreement with Crowdmark, Inc. for services provided by the Crowdmark application in compliance with FIPPA. Please be aware that information held by Crowdmark Inc. may be transmitted to and stored on servers outside of the University of Manitoba, or Canada. The University of Manitoba cannot and does not guarantee protection against the possible disclosure of your data including, without limitation, against possible secret disclosres of data to a foreign authority in accordance with the laws of another jurisdiction. If you have any questions about the collection of personal information, contact the Access and Privacy Office (tel. 204-474-9462), The University of Manitoba, 233 Elizabeth Dafoe Library, Winnipeg, Manitoba, Canada, R3T 2N2.

Expectations: I Expect You To

In my class I expect you to:

- Attend lectures as much as you are able and watch the recordings within 24 hours when you are not.
- Make use of the chat function over Cisco WebEx to ask questions of myself and provide answers to class discussions.
- Behave professionally in our online learning environment.

- Have paper, a writing utensil, a computer/tablet and access to a scanner or cell phone capable of taking photos during the allotted midterm and final exam period.
- Ask questions during my lecture as needed and answer questions asked of you.
- Be mindful of my time outside of class and allow me sufficient time to answer emails or look in to your concerns.
- Make use of the discussion forums as much as you are able for your course questions.
- Follow all policies in the syllabus and consult it as needed.
- Come to me with any constructive feedback that would improve the running of the course.

Academic Dishonesty: It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

`http://www.umanitoba.ca/student/resource/student_advocacy/academicintegrity/students/a-to-i-what-is-academic-integrity.html#cheating-on-exams`

`http://www.umanitoba.ca/student/resource/student_advocacy/academicintegrity/students/student-academic-misconduct-faq.html`

`https://www.sci.umanitoba.ca/students/undergraduate-students/academic-resources/academic-integrity-2/`

While this is a remote learning course, I expect students to hold themselves to the highest standards of academic integrity. Impersonation, cheating for hire websites, and using unauthorized materials are very serious offences and are no less serious in an online environment. I expect you to be honest, conduct yourself with integrity, actively encourage your peers to conduct themselves with integrity, and uphold the value of what a degree from the University of Manitoba means. When you are in doubt, always consult with your instructor. My door is always open for discussions on the boundaries of what is and what is not allowed. Asking is a sign of integrity, not a signal that you might think of cheating. Always bear in mind that what is considered a violation of academic integrity can vary from course to course (even with the same instructor) so it is always important to ask and clarify. Ignorance is not an acceptable excuse for academic misconduct.

Class Communication: The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. Please see

`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.

E-mail: To schedule an appointment outside of office hours or to ask a question that would not be suitable for the discussion forums (it involves personal matters or your private information) you may email me at my university email address. Please note that if your question is answered on the course outline (which will be posted on UMLearn) I will simply direct you to find the answer yourself as I cannot handle the large volume of emails and still productively manage my courses when answering those kinds of emails. The subject line of your emails should contain "STAT 2300". All emails should start with an opening salutation, be written in complete English sentences and be signed with your name and student number. Please note that I will not divulge grades over email. All emails received during the work week will be replied to within 24 hours. While I will generally check my work emails over the weekend in case there is an emergency, you can expect a reply to non-urgent matters received over the weekend by Monday at noon.

Office Hours: My office hours are listed at the top of the course outline. There is one hour of dedicated STAT 2300 office hours that will be scheduled over Cisco WebEx as a drop-in session as well as the lecture period for any days designated for watching videos by yourself. Weeks without a video session I will add an extra office hour and notify the class in advance of its time. You do not need to make an appointment and may just show up to ask any questions that you may have. If you can not make my scheduled office hours, please email me to make an appointment. For private appointments I am open to alternative communication methods such as Skype, FaceTime, or Zoom in lieu of WebEx.

Student Accessibility Services: If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

`http://umanitoba.ca/student/saa/accessibility/` 520 University Centre
204-474-7423
Student_accessibility@umanitoba.ca

Expectations: You Can Expect Me To

As your instructor you can expect me to:

- Treat you with respect inside and outside of the classroom.
- Begin the class video stream 5-10 minutes prior to the start of class and remain for a few minutes afterwards to answer questions after the lecture.
- Come prepared to my lectures.
- Be available during my office hours and make my best attempt to provide sufficient notice if an office hour needs to be moved or canceled.
- Answer your questions thoughtfully and follow up if needed.
- Listen to your feedback/concerns and do my best to take reasonable requests in to account.
- Monitor my markers and ensure assessments are retuned in a reasonable time period.
- Set assessments that are reasonable and contain questions that match the learning objectives for the course.
- Be passionate about my subject and what I teach.
- Be flexible in the face of any technological issues that may arise as we navigate remote learning together.

Course Schedule and Evaluation

Week	Content	Notes	Evaluation
Week 1 Sept 7 -11	Mon: No class Wed: First class (LIVE 1) Fri: Sampling Distributions (LIVE 2)		· Getting to Know You Survey - Due * · Reflection 2 - Due *
Week 2 Sept 14 - 18	Mon: Surveys (LIVE 3) Wed: Surveys (LIVE 4) Fri: SRS (LIVE 5)		· Reflection 3 - Due * · Reflection 4 - Due * · Reflection 5 - Due *
Week 3 Sept 21 - 25	Mon: SRS Estimates (VIDEO 6) Wed: SRS Case Study (LIVE 7) Fri: Capture/Recapture (LIVE 8)	Drop Date Sept 22	· Reflection 7 - Due * · Reflection 8 - Due Sat Sept 26 12:30 p.m. · Project 1 Draft - Due Sun Sept 27 11:59 p.m.
Week 4 Sept 28 - Oct 2	Mon: Stratification (LIVE 9) Wed: Stratification Estimates (VIDEO 10) Fri: Stratification Estimates (VIDEO 11)		· Reflection 9 - Due Tues Sept 29 12:30 p.m. · Project 1 Feedback - Due Sun Oct 4 11:59 p.m.
Week 5 Oct 5 - 9	Mon: Case Study Stratification (LIVE 12) Wed: Other Sampling Schemes (LIVE 13) Fri: Other Estimates (VIDEO 14)		· Reflection 12 - Due Tues Oct 6 12:30 p.m. · Reflection 13 - Due Thurs Oct 8 12:30 p.m. · Project 1 - Due Sun Oct 11 11:59 p.m.
Week 6 Oct 12 - 16	Mon: NO CLASS Wed: Non-random Samples (LIVE 15) Fri: Ratio Estimation (LIVE 16)	Oct 12 Holiday	· Reflection 15 - Due Thurs Oct 15 12:30 p.m. · Reflection 16 - Due Sat Oct 17 12:30 p.m. · Paper 1 - Topic/Sources - Due Sun Oct 18 11:59 p.m.
Week 7 Oct 19 - 23	Mon: Ratio Estimates (VIDEO 17) Wed: Reg. & Difference (LIVE 18) Fri: Regression & Diff. Estimates (VIDEO 19)		· Reflection 17 - Due Thurs Oct 22 12:20 p.m. · Paper 1 Outline - Due Sun Oct 25 11:59 p.m.
Week 8 Oct 26 - 30	MON: Intro to Design (LIVE 20) WED: CRDs (LIVE 21) FRI: Matched Pairs (VIDEO 22)		· Reflection 20 - Due Tues Oct 27 11:59 p.m. · Reflection 21 - Due Thurs Oct 29 11:59 p.m. · Paper 1 - Due Sun Nov 1 11:59 p.m.
Week 9 Nov 2 - 6	MON: Indep. Tests (VIDEO 23) WED: Midterm - NO CLASS FRI: Two - Sample Tests (LIVE 24)		· Midterm 1 - Due Wed Nov 4 11:59 p.m. · Reflection 24 - Due Sat Nov 7 12:30 p.m. · Project 2 Idea - Due Sun Nov 8 11:59 p.m.

Course Schedule and Evaluation

Week	Content	Notes	Evaluation
Week 10 Nov 9 - 13	NO CLASSES	Reading Week	· Project 2 data - Due Sun Nov 15 11:59 p.m.
Week 11 Nov 16 - 20	MON: One-Way ANOVA (LIVE 25) WED: One-Way ANOVA (LIVE 26) FRI: One-Way ANOVA (VIDEO 27)		· Reflection 25 - Due Tues Nov 17 12:30 p.m. · Reflection 26 - Due Thurs Nov 19 12:30 p.m. · Project 2 - Due Sun Nov 22 11:59 p.m.
Week 12 Nov 23 - 27	MON: Blocking (LIVE 28) WED: RBDs (LIVE 29) RBDs (VIDEO 30)	Nov 23 VW Deadline	· Reflection 28 - Due Tues Nov 24 12:30 p.m. · Reflection 29 - Due Thurs Nov 26 12:30 p.m. · Paper 2 Topic/Sources - Due Sun Nov 29 11:59 p.m.
Week 13 Nov 30 - Dec 4	MON: Case Study RBD (LIVE 31) WED: Ethics (LIVE 32) FRI: Midterm - NO CLASS		· Reflection 31 - Due Tues Dec 1 12:30 p.m. · Reflection 32 - Due Thurs Dec 3 12:30 p.m. · Midterm 2 - Due Fri Dec 4 11:59 p.m. Paper 2 Outline - Due Sun Dec 6 11:59 p.m.
Week 14 Dec 7 -11	MON: Hard to Reach Pops (LIVE 33) WED: Limitations (LIVE 34) FRI: Industrial Exps (LIVE 35)		Reflection 33 - Due Tues Dec 8 12:30 p.m. Reflection 34 - Due Thurs Dec 10 12:30 p.m. Reflection 35 - Due Sat Dec 12 12:30 p.m. Paper 2 - Due Sun Dec 13 11:59 p.m.

Please note that dates for live content coverage in these schedules are approximate and subject to minor changes. All classes marked as LIVE will be held live over Cisco WebEx. All classes marked as VIDEO are comprised of videos available through UMLearn that are to be watched on your own time that day.

* All assessments due prior to the Add/Drop date are due Friday, September 25 at 11:59 p.m. However, for all of these assessments, the intention is that you would complete them within 24 hours of the corresponding class.

Grading: The following will be the breakdown of your class mark:

Reflections/Participation	5%
Papers 1 & 2	20% (10% each)
Project 1 & 2	15% (7.5% each)
Midterms	30% (15% each)
Final	30%

Marks will be posted on the gradebook in UMLearn.

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%).

Midterm Info: The midterms will take place over Crowdmark on Wednesday, November 4 and Friday, December 4. At 8:30 a.m. the exam questions will be sent to all students via a Crowdmark email. You will be expected to write your answer to each question on a sheet of paper and then take a picture or scan a copy of your images and upload them to the link from Crowdmark. It is suggested that you use the Cam Scanner app to assure the file size is not too large which can result in delays in your test posting. All image files must by uploaded by 11:59 p.m. The exam itself will be written with the intention that it would take one hour to complete. Crowdmark keeps a record of all page views and upload attempts. If you begin to upload your first photo a few minutes prior to the cut off, I will not accept late submissions. All students should begin uploading photos by 11:30 p.m. at the latest. Note that the midterms are to be completed independently without consultation from other people, websites, or your peers. You may use your submitted formula sheet/study guide, materials that are posted on UMLearn or available in the class textbook. Up until the start of the assessment, you can submit a formula/study guide to a dropbox on UMLearn to receive a bonus 2 marks on your midterm. You may work with a friend on the study guide but you will need to declare the names of anyone you worked with in the comment box when submitting your study guide. A calculator or access to R studio will be required for the midterm to complete the calculations. If you miss a single midterm for a documented reason that midterm will now be worth 10% and the final 35%, and the computational section for that part of the final exam will count as your midterm mark. (i.e. If you miss the sampling midterm, the computational sampling part of the final will count as 10% of your total mark (replacing the midterm) and the whole exam will be worth 35% of your total mark. If you

miss both midterms for a documented reason, the final exam will be worth 50% of your mark and your projects/papers will be proportionally scaled to be worth an additional 10% of your mark. If you miss a midterm due to illness, you are required to fill out the university's delf declaration form before the start of the assessment and email it to me within 48 hours of the due date.

Reflections/Participation: After each live lecture a quiz will be opened in UMLearn for 24 hours*. For the first class this will be a Getting to Know You Survey but following that it will be a prompt for a short 1-2 sentence written response. Each question will be marked out of 2. A score of 0 is for an entirely irrelevant answer. A score of 1 is for an answer that is relevant but incomplete (e.g. it asks for 2 examples and you give 1 or it asks you to explain why and you give a one word answer.) A score of 2 is for any answer that makes a genuine attempt at giving a complete answer to the question (regardless of whether it is correct or not). You may work with up to one other person and submit the same answer but you both must identify in your answer the full name and student ID number of the person you worked with. The answers must be in your own words (the exception being two people working together and identifying that they are submitting the same answer) and direct copying from the notes, text, or the internet is considered plagiarism and will be submitted for academic dishonesty. (*For all assessments due before the add/drop deadline, the deadline will be set as 11:59 p.m. on Friday, September 25th. It is, however, the expectation that students registered in the course will still complete the responses for each class within 24 hours.)

Project Info: For each half of the course (sampling and design) there is a small project component. Both projects are scaffolded over three weeks with each part due at 11:59 p.m. on the Sunday of the week in a UMLearn assignment dropbox. All files must be submitted as word documents or PDFs. You must complete the previous part before the dropbox will appear to submit the next part. Late submissions of intermediary work will not be counted for marks but they still must be submitted in order to submit and receive marks for the later submissions. The penalty for late submissions of the final submission is a subtraction of 15% from the final mark per day it is late. Full instructions will be provided on UMLearn and in class. These projects are individual but, as the projects will be unique, you may ask your peers for feedback or editing suggestions. The marking will be done using a rubric which will be available to students prior to starting the projects. These projects must be written in your own words. If you reference or quote a source, it is important that you cite your source in your project. All images that are not your own that you include in your projects must be cited as well.

Papers Info: For each half of the course there will be 1-2 page paper due. You will select a topic based on a list of interesting historical or current issues in sampling and design respectively. Both papers are scaffolded over three weeks with each part due at 11:59 p.m. on the Sunday of the week in a UMLearn assignment dropbox. All files must be submitted as word documents or PDFs. You must complete the previous part before the dropbox will appear to submit the next part. Late submissions of intermediary work will not be counted for marks but they still must be submitted in order to submit and receive marks for the later submissions. The penalty for late submissions of the final submission is a subtraction of 15% from the final mark per day it is late. Full instructions will be provided on UMLearn and in class. Each paper must have two sources from newspaper or academic journal articles with

citations done in APA formatting. There will zero tolerance for plagiarism from your sources and you are highly encouraged to ask your instructor or a U of M academic writing tutor if you are unsure if you have correctly cited or properly paraphrased without plagiarizing. You may ask a peer for feedback on your paper but you must state who you showed your paper to in the comment box on your UMLearn submission page. The marking will be done using a rubric which will be available to students prior to starting the paper.

Final Exam Info: The final exam will be three hours in length at a time scheduled by the registrar's office. It will be conducted over Crowdmark. The exam will have three sections of approximately equal length: sampling computational, design computational, written response. An additional 30 minutes will be added to the submission deadline in Crowdmark to allow for time spent scanning and uploading. You must have your parts uploaded by the submission deadline. I will not make special consideration for technology issues if there isn't a clear log of you attempting to upload your submissions in the early parts of the 30 minutes prior to the submission deadline. On the final you may access your submitted formula sheet/study guide, any study guides you had submitted prior, any textbooks or any materials that are available on UMLearn. You are not to consult with any other people or outside websites. You will need access to paper, pens, a calculator (or access to R Studio), and a device capable of scanning or taking photos. Up until the start of the assessment, you can submit a formula/study guide to a dropbox on UMLearn to receive a bonus 2 marks on your midterm. You may work with a friend on the study guide but you will need to declare the names of anyone you worked with in the comment box when submitting your study guide. If you miss the final exam, you should fill out the university's self declaration form for illnesses and contact your home Faculty immediately.

Voluntary Withdrawal

The voluntary withdrawal date is **November 23** (by which time you will have received your marks for your first midterm, one project, and one paper).

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. Schedule A will be posted on your instructor's UMLearn page.

Course Topics

Unit 1 – Introduction

- What is statistics?
- Populations vs Samples
- Sampling distributions

Unit 2 – Survey Design and Construction

- Question design
- Sampling frames
- Non-response, response bias, non-sampling error

Unit 3 – Simple Random Samples

- definition
- selection
- estimation and inference
- sample size determination

Unit 4 – Stratified Sampling

- definition
- selection
- optimal allocation and construction
- estimation and inference

Unit 5 – Other Sampling Schemes

- multistage sampling
- cluster sampling
- systematic sampling
- convenience/voluntary sampling
- census

Unit 6 – Ratio, Difference, and Regression Estimators

- ratio estimators and sample size
- regression and difference estimators
- relative efficiency

Unit 7 – Optional Topics in Sampling

- sampling hard-to-reach populations
- capture-recapture

Unit 8 – Introduction to Experimental Design

- terminology
- well designed experiments
- observational studies vs experiments

Unit 9 – Complete Randomized Designs

- approaches to randomization
- matched pairs
- two-sample independent tests
- one-way ANOVA

Unit 10 – Randomized Block Designs & Two-Way ANOVA

- types of blocking
- designing experiments and randomization with blocking
- two-way ANOVA

Unit 11 – Optional Topics in Design

- ethics in experiments
- limitations of studies and conclusions
- designed experiments

Final Examination is comprised of the entire course and is 3-hours in length.
