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STAT 1000 Section D01
Basic Statistical Analysis 1
Winter 2021

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CRN	51177
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Web Pages	UM Learn: `http://umanitoba.ca/umlearn` Statistics: `http://umanitoba.ca/statistics`
Office Hours:	Mondays 11:00 a.m. – 12:00 p.m. Thursdays 10:30 a.m. – 11:30 a.m. (or by appointment)

Office hours will be conducted over Zoom at the following link:
`https://zoom.us/j/98850429953?pwd=MnNrQ09qYjE2RGVEOGVVcVNvVlUrdz09`
You do not need an appointment to talk to me during my office hours; just join the Zoom meeting. If the above times are not convenient for you, please contact me to arrange an alternate time to meet. I will do my best to return all email or telephone messages within 24 hours.

Calendar Description

This course is not recommended for students in certain programs (see the description of STAT 1150). An introduction to the basic principles of statistics and procedures used for data analysis. Topics to be covered include: gathering data, displaying and summarizing data, examining relationships between variables, sampling distributions, estimation and significance tests, inference for means. May not be held with STAT 1001, STAT 1150, STAT 2220. Prerequisite: Any grade 12 or 40S Mathematics, or equivalent.

Teaching Philosophy and Goals

It is the desire of the Department of Statistics to present this course in a manner that emphasizes and illustrates the statistical analysis arising from "real-world" applications. Whenever possible, we will attempt to bring real-life examples and data into the classroom. Upon completion of this course students can proceed in many directions: to further intensive study of statistics, to one or more additional courses in statistics, to the use of statistical methods in other fields of study, or to being a consumer of statistical information in daily life. It is our objective to serve all of these diverse directions.

The course is designed to include basic topics deemed crucial for problem formulation and understanding of the foundations of statistical thinking and reasoning. The concepts of statistical analysis will be stressed. The course will place an emphasis on the development of critical thinking skills.

Software will be used in this course to aid in the analysis of data. The computer program that has been selected for this course, Microsoft Excel, is easy to use and is available free for use with Mac or Windows systems. The program also has many advanced statistical features that you will find useful in subsequent courses.

We are interested in feedback from you. If you can think of ways in which this course could be improved, please let us know.

Evaluation

Assignments (6)	25%
Midterm Test	30%
Final Examination	45%

All assignments and exams will be done in UM Learn. All marks will be posted on the UM Learn gradebook.

Subject to the caveat in the paragraph below, 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 in the course: **to obtain a grade of C or better, you must obtain at least 50% on the final examination**.

Exam Information

The midterm test will be held **Wednesday, March 10, from 5:30 p.m. to 7:30 p.m.** It will cover Units 1 – 5 in the course outline and will consist of only multiple-choice questions. Students missing the midterm test for a valid reason will be permitted to write a deferred midterm at a later date.

The final exam will be 3 hours in duration and will be scheduled by the Registrar's Office. It will cover Units 1 – 11, with emphasis on Units 6 – 11. The final examination will contain both multiple-choice questions and a written component, in an approximate 75:25 ratio.

The midterm test and the final exam in this course require the use of LockDown Browser and a webcam (using a program called Respondus Monitor). The webcam can be built into your computer or can be the type that plugs in with a USB cable. More detail about the use of LockDown Browser and Respondus Monitor will be given by your instructor.

The midterm test and the final exam are **closed book**. You cannot use the course notes or access any websites, books or any other resources while writing. However, you will be permitted to prepare **two** pages of notes writing only on **one** side of the page (or one double-sided page). You can write notes, formulas, or anything else you want on this page. The notes you write must be prepared by you – you are not permitted to use notes written for you by another student or anyone else.

You are also permitted to use a non-programmable scientific calculator, and any statistical tables provided by your instructor.

Academic Dishonesty

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. The following link describes various types of academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation), and offers several resources to help students understand and avoid academic dishonesty:

`http://umanitoba.ca/student-supports/academic-supports/academic-integrity`

The Student Discipline Bylaw, which describes the potential consequences of academic dishonesty, can be found at the following link:

`http://umanitoba.ca/admin/governance/media/Student_Discipline_Bylaw_-_2018-09-01.pdf`

An academic integrity and student conduct tutorial can be found at the following link. For this course, it is recommended in particular that you view the parts on Tests & Exams and Inappropriate Collaboration.

`http://umanitoba.ca/student/resource/accessibility/files/AI-Student-Conduct-Tutorial/story_html5.html`

All students are required to complete a short Academic Integrity quiz in UM Learn. If you receive a score of 100% on this quiz, you will receive a 1% bonus towards your final grade in the class. The quiz must be completed by **Wednesday February 3 at noon**.

For any student that creates a Telegram chat group (or any other chat group), we ask that you disable the room during exam times. We also ask that any student joining a chat group uses their real name.

Practice Questions and Assignments

Numerous practice questions (with solutions) will be posted for each unit. Students are strongly encouraged to try these practice questions on a regular basis.

There will be 6 assignments in this course, which students will access via UM Learn. See the "Assignments" folder for the material covered on each assignment. The due dates are listed in the "Course Schedule" folder on UM Learn. Assignments submitted past the due date will not be accepted and there will be no make-up assignments. If you miss Assignments 1, 2 or 3 (with a valid reason), the weight will be transferred to your midterm. If you miss Assignments 4, 5 or 6 (with a valid reason), the weight will be transferred to your final exam.

Assignments must be completed on your own. You can discuss assignment problems with me, but any discussion with your classmates must be limited to questions such as "Are there similar problems in the notes or practice questions to Question #1?", and NOT questions such as "What did you get for Question #1?". You are not permitted to copy down or take pictures of the questions. Use of online tutoring websites such as chegg.com is strictly forbidden and would constitute academic dishonesty.

Technology Requirements

You will require the following minimum technological requirements for this course:

- A computing device where one can create and edit documents

- An internet connection capable of streaming videos and downloading software

- Access to a webcam and microphone

Software Download

If you already have an older version of Microsoft Excel on your computer, you don't need to download it again.

To download Excel, go to `http://portal.office.com`, log in with your university email credentials, click on your initials in the top right corner, select View Account, then select "Office Apps" in the left panel, and then click Install Office.

Supplementary Resources

The course notes completely cover all topics in this course. Supplementary online resources will be provided throughout the course and posted on UM Learn.

Online resources are provided only as an extra resource. They do not comprehensively cover the material needed for the course and they may cover topics differently than the course notes. **Where there are any discrepancies between the way topics are covered, please refer to the course notes.**

Voluntary Withdrawal

The voluntary withdrawal date is **March 31** (by which time you will have received your marks for the first four assignments and the midterm test).

Copyrighted Material

All course notes, assignments, tests, exams, practice exams and solutions are the intellectual property of your instructor or the Department of Statistics. Reproduction or distribution of these materials is strictly forbidden without their consent.

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.

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-supports/accessibility`

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 Outline

Unit 1 − Examining Distributions

- types of variables: quantitative, categorical, nominal, ordinal
- graphs: bar charts, pie charts, histograms, time plots
- examining distributions, dealing with outliers
- describing distributions with numbers: mean, weighted mean, median, quartiles, percentiles, interquartile range, range, variance and standard deviation
- five-number summary and boxplots
- the $1.5 \times$ IQR rule for suspected outliers, outlier boxplots
- resistant measures

Unit 2 − Scatterplots, Correlation and Regression

- association, response variable, explanatory variable
- examining scatterplots
- correlation
- least-squares criterion and least squares regression line
- r^2
- residuals, outliers, influential observations
- association vs. causation, lurking variables
- extrapolation

Unit 3 − Sampling Design

- populations and samples
- voluntary response sample
- convenience sample
- simple random sample
- census
- stratified random sample
- multistage sample
- undercoverage, nonresponse

Unit 4 – Design of Experiments

- observations vs. experiment
- factors, factor levels, treatments
- placebo effect, control group, bias
- principles of experimental design
- completely randomized design
- randomized block design
- matched pairs design

Unit 5 – Density Curves and Normal Distributions

- continuous random variables, density curves
- normal distributions
- 68–95–99.7 rule
- standardizing observations (z-scores)
- normal distribution calculations

The midterm test covers material from Units 1 – 5.
The test is on **Wednesday March 10, 2021** from 5:30 p.m. to 7:30 p.m.

Unit 6 – Randomness and Probability

- randomness, the language of probability
- probability models, sample space, events, unions, intersections
- some probability rules, independence, general addition rule
- discrete random variables
- binomial setting and binomial distribution

Unit 7 – Sampling Distributions

- sampling distribution of a sample mean
- bias and variability
- Central Limit Theorem
- sampling distributions for proportions

Unit 8 – Confidence Intervals for a Population Mean (σ known)

- estimating with confidence
- margin of error
- effect of sample size, confidence level, standard deviation
- effect of population size
- assumptions
- choosing the sample size

Unit 9 – Tests of Significance

- tests for a population mean (σ known)
- hypotheses, test statistic, P-value, statistical significance
- two-sided tests and confidence intervals

Unit 10 – Inference for One Population Mean (σ unknown)

- one-sample t procedures — confidence intervals and tests

Unit 11 – Inference for a Population Proportion

- confidence intervals and tests for a population proportion
- choosing the sample size

The final examination covers material from Units 1 – 11, with emphasis on Units 6 – 11. The exam is 3 hours in duration and will be scheduled by the Registrar's Office.