

The University of Western Ontario
Department of Statistical and Actuarial Sciences
STATISTICAL SCIENCE 1024 – Section 002 – Fall 2019
Introduction to Statistics

Instructor: Ruixi Zhang, Ph.D.

Email: rzhan56@uwo.ca

Office Hours: Mondays and Wednesdays, 11:00 AM – 12:00 noon, WSC 204

Lecture Hours: Mondays, Wednesdays and Fridays, 3:30 PM – 4:30 PM, WSC 55

Prerequisite(s)

Grade 12U Mathematics or Mathematics 0110A/B or Mathematics 1229A/B.

Anti-requisite(s)

All other courses or half courses in Introductory Statistics, except Statistical Sciences 1023A/B and Statistical Sciences 2037A/B. For a full list of Introductory Statistics courses, see <https://www.uwo.ca/stats/undergraduate/taking-intro-stats-courses.html>. You cannot take a listed anti-requisite course concurrently with Statistical Sciences 1024A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Course Description

Statistical inference, experimental design, sampling design, confidence intervals and hypothesis tests for means and proportions, regression and correlation.

Course Objectives

This course provides an introduction to statistics. By the end of the course the students should have a basic understanding of:

- The techniques used in exploring, organizing and describing data;
- Producing data through surveys and experiments;
- General rules of probability;
- Statistical inference; including confidence interval construction and hypothesis tests.

Textbook

The customized version of Basic Practice of Statistics (8th ed.), Moore, Notz, and Fligner. The customized textbook includes a subscription to Sapling. Sapling is an optional online system that can be used as an extra resource as you take this course. This supplement includes resources (i.e., supplementary videos, online applets, tutorials and extra practice problems) that will be particularly useful for any concepts you find challenging.

Recommended Textbook Exercises

A schedule of topics and recommended textbook exercises from the 8th edition of the textbook is provided in this course outline (see below). Student's homework solutions are not to be handed in. However, working on these problems regularly and diligently is essential to success in the

course. In addition to the posted list of homework problems, you are strongly encouraged to attempt additional problems for extra practice.

Course Outline

Chapter	Topics
1 – Picturing Distributions with Graphs (0.5 week)	Sections 1-4, 6 (exclude stemplots): Individuals, variable, pie charts, bar graphs, histograms, interpretation, time plots
2 – Describing Distributions with Numbers (0.5 week)	Sections 1-8: Measuring center, mean, median, quartiles, 5-number summary, boxplots, outliers, standard deviation
3 – The Normal Distributions (1 week)	Sections 1-8: Density curves, normal distributions, 68-95-99.7 rule, standard normal distribution, normal proportions, normal table
4 – Scatterplots and Correlation (1 week)	Sections 1-6: Explanatory & response variables, scatterplots, correlation
5 – Regression (1 week)	Sections 1-2, 4-9: Regression lines, least-squares regression line, residuals, influential observations, cautions
6 – Two-Way Tables (0.5 week)	Sections 1-3: Marginal & conditional distributions, Simpson’s paradox
8 – Producing Data: Sampling (0.5 week)	Sections 1-7 (exclude Table B): Population, sample, simple random sample (SRS), inference, other sampling designs
9 – Producing Data: Experiments (0.5 week)	Sections 1-7: Observation versus experiment, subjects, factors, treatments, experimental designs
10 – Data Ethics (0.5 week)	Sections 1-5: Institutional review boards, informed consent, confidentiality, clinical trials,
12 – Introducing Probability (0.5 week)	Sections 1-8: Randomness, probability models, probability rules, finite, continuous, random variables, personal probability
13 – General Rules of Probability (0.5 week)	Sections 1-5: Addition rule, independence, multiplicative rule, conditional probability
14 – Sampling Distributions (1 week)	Sections 1-6: Parameters, statistics, law of large numbers, sampling distributions, central limit theorem, statistical significance
15 – Confidence Intervals (0.5 week)	Sections 1-4: Statistical estimation, margin of error, confidence intervals for a population mean
16 – Tests of Significance (0.5 week)	Sections 1-5: Hypotheses, P-values, tests for a population mean
17 – Inference in Practice (0.5 week)	Sections 1-5: Conditions, cautions, sample size for confidence intervals, power of a statistical test (definition only)
19 – Inference about a Population Mean (1 week)	Sections 1-4, 6: t -distribution, one-sample t confidence interval, one-sample t test, matched pairs,
20 – Comparing Two Means (0.5 week)	Sections 1-3, 5-8: Two-sample problems, two-sample confidence intervals and hypothesis tests, robustness,
21 – Inference about a Population Proportion (0.5 week)	Time permitting Sections 1-5: Sample proportion, large sample confidence intervals, sample size, significance tests
Note: Chapters 7, 11, & 18 are review chapters.	

Course OWL Web Page

Students should check OWL (<https://owl.uwo.ca/portal>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis. The web page will contain:

1. A copy of this course outline
2. Updates and information about the course that you need to know
3. Daily class notes (which will be incomplete – to be filled in during the classes) and other things that are relevant to the course
4. Marks of quizzes and tests as they are marked

Evaluation

Participation (Clickers)	10%
In-class Quizzes (Best 4 of 5)	10%
Mid Term (Saturday, October 26)	30%
Final Exam	50%

In-class Clickers

Clickers are a tool for active learning and will be used in class for participation assessment. The clickers allow students to answer questions in real time using their smartphone, tablet or laptop. Clickers provide students with instant feedback on their comprehension to help them monitor their understanding of the course content. Detail instructions on how to use clickers along with creating an account will be found at <https://elearningtoolkit.uwo.ca/terms/clickers.html>.

Your clicker use will be recorded in each lecture and will become part of your record. As such, your clicker record will be afforded the same degree of security, confidentiality and transparency that is customary for test marks, etc. There will be a trial period to make sure that your clicker works.

Clicker questions will be asked during most (but perhaps not all) lectures. You need only to answer 90% of the total clicker questions asked during the entire course to obtain a 10 (out of 10) on the clicker portion of your final mark. For any percentage (y) less than 90%, your clicker mark will decrease linearly using the formula:

$$\text{Clicker mark} = 11.11(y)$$

Examples: If you only answer 72% of all clicker questions, clicker mark = $11.11(0.72) = 8$ (out of 10). If you only answer 45% of all clicker questions, clicker mark = $11.11(0.45) = 5$.

Clicker participation only requires that you try; you do not have to get the questions correct to get this part of your course grade. Notice that you can miss up to 10% of the clicker questions (for any reason) without affecting your grade; this ‘buffer’ accounts for any technical problems that may arise as well as days on which you forgot your clicker or were late for class/left early. **Please note that no accommodation will be made for missed clicker participation or incorrectly programmed clicker IDs.**

Your clicker data will not be used for any non-academic or research purpose without your consent. For any research study in which you are invited to participate, you will be provided with a Letter of Information with an opportunity to give or withhold consent. Such research will not replace the usual end of term Course Evaluation given by the University.

Quizzes

There will be 5 short written answer question quizzes that will be given at the very beginning of class on the following dates:

Quiz 1: **Monday, September 16, 2019** (Topics TBA)

Quiz 2: **Monday, September 30, 2019** (Topics TBA)

Quiz 3: **Monday, October 14, 2019** (Topics TBA)

Quiz 4: **Monday, November 11, 2019** (Topics TBA)

Quiz 5: **Monday, November 25, 2019** (Topics TBA)

- Quizzes will start right at the **beginning** of the class and you will have 15 minutes to complete the assigned questions – **do NOT be late for class on these dates; no extra time will be given**
- The quizzes will consist of 1 or 2 questions (or perhaps one question with multiple parts) that will be based on material covered over the past 2-3 weeks of classes
- You should show ALL your work in solving the questions (as part marks will be available)
- The quizzes will be out of 10 marks – you will get 2 out of 10 just for signing your name and handing in a blank answer (this is NOT 2 bonus marks; it just means everyone who shows up and hands in a signed quiz paper will receive a minimum mark of 2).
- Only your best 4 out of 5 quizzes will count in your final mark (so you can miss one quiz for any reason and you do not need any medical documentation).
- **Due to flexibility of the marking scheme, there will be no make-ups for in-class quizzes.**

Midterm Exams (2 hours)

There will be a two-hour test (consisting of multiple-choice questions) scheduled on the following date:

Saturday, October 26, 2019, 2:30 pm to 4:30 pm (Topics TBA)

If you have any conflict, you must check with your instructor as soon as possible (and prior to the exam). If you miss the test for a valid reason, you must provide documentation as to why you missed the test. There are no makeup tests. The weight of the missed test will be moved to the final exam.

Final Exam

The final exam will be a three-hour examination covering all material in the course, with emphasis on material covered since the midterm. The exam will consist of multiple-choice questions. It will be scheduled by the Registrar's office. Do not make travel arrangements until you know your exam schedule. Holding an airline ticket is not an acceptable reason to miss the final exam.

Cellular phones, iPods, and other similar technology are *not* permitted in the exam room.

This means that cellular phones, iPods, Apple watches and other similar technology **cannot** be used as a timekeeper/clock, calculator or for any other purpose.

You will need a non-programmable calculator for all exams/in-class quizzes. It is the best practice to carry a non-programmable calculator with you all times during the term.

Policy on e-mail communication

You are welcome to communicate with your instructor by e-mail, but e-mail communication should only be used to provide them with information or to ask a question that requires a brief response. For more lengthy discussions and for discussions on lectures/course material please see your instructor during their scheduled office hours or by appointment. If you do e-mail them, please use your UWO account, as these are often the only emails read (as e-mails sent from other addresses often get spammed).

Attendance

The Department of Statistical and Actuarial Sciences views classroom attendance as a very important part of the learning process. You are expected to attend all classes. You are advised that excessive absenteeism may result in being debarred from the final examination.

Classroom Environment

The Department of Statistical and Actuarial Sciences has adopted a “Mutual Expectations” policy governing the classroom environment and all work submitted by students. [The full text of the policy can be found at <https://www.uwo.ca/stats/undergraduate/mutual-expectations.html>]. In summary, all interactions between students and faculty should be governed by the principles of **courtesy, respect and honesty**.

Students are encouraged to ask questions in the class. Cell phones should be turned off before class/during class and any unnecessarily loud talking among students is discouraged. The goal is to reduce any behaviour by students that may disrupt other students

Department Policy on Missed Course Requirements and Student Health and Wellness

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible and contact your instructor immediately. Approval can be granted either through a self-reporting of absence or via the Dean’s Office/Academic Counselling unit of your Home Faculty. It is your responsibility to make alternative arrangements with your instructor once the accommodation has been approved and the instructor has been informed.

For further information, please consult the university’s policy on academic consideration for student absences:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf

For Final Exam: If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see https://registrar.uwo.ca/academics/examinations/exam_schedule.html).

For Midterm Exam: The policy of the Department of Statistical and Actuarial Sciences is that there will be no make-up exams for a midterm missed due to illness. If your accommodation is approved, the weight of the missed midterm will be reassigned to the final exam. If your accommodation is not approved, then you will receive a mark of 0 for your midterm.

If you have any conflict that prevents you from writing a midterm, you must check with your instructor as soon as possible (and prior to the exam) so that alternate arrangements can be made.

For in-class clickers and quizzes: There are NO makeups for any of the clicker questions or quizzes, so if you miss 20% of the questions, they will be the ones that will not count towards your final mark. If you have already missed 20% of the questions, each additional question missed will count as a mark of ZERO. You do not need to get in contact with your Faculty or your instructor if you miss a question.

Academic Policy

The website for Registrarial Services is <https://registrar.uwo.ca/>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this website: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Computer-marked, multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Support Services

Learning-skills counsellors at the Student Development Centre are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling: <http://sdc.uwo.ca/>

Students who are in emotional/mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help: <https://www.uwo.ca/health/>

Additional student-run support services are offered by the USC: <https://westernusc.ca/your-services/>.

Accessibility

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

The policy on Accommodation for Students with Disabilities can be found here:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

APPROXIMATE Weekly Course Calendar

Lectures – 2019	Section	
Sep 5 - 13	Picturing and Describing Distributions with Graphs and Numbers (sections 1.1 – 1.4, 2.1 – 2.8)	
Sep 16 - 20	Normal Distributions, Scatterplots and Correlation (sections 3.1 – 3.6, 4.1 – 4.3)	
Sep 23 - 27	Scatterplots and Correlation, Regression (sections 4.3 – 4.6, 5.1 – 5.2, 5.4 – 5.5)	
Sep 30 - Oct 4	Regression, Two-Way Tables, Producing Data: Sampling (sections 5.6 – 5.9, 6.1 – 6.3, 8.1)	
Oct 7 - 11	Producing Data: Sampling, Producing Data: Experiments (sections 8.2 – 8.7, 9.1 – 9.4)	
Oct 14 - 18	Producing Data: Experiments, Data Ethics, Introducing Probability (sections 9.5 – 9.7, 10.1 – 10.5, 12.1 – 12.3)	
Oct 21 - 25	Introducing Probability, General Rules of Probability (sections 12.3 – 12.8, 13.1 – 13.3)	
Midterm Exam – <u>Saturday, Oct 26, 2:30- 4:30 pm (2 hours)</u> – Chapters/Sections TBA		
Oct 28 – Nov 1	General Rules of Probability, Sampling Distributions, Confidence Intervals: The Basics (sections 13.4 – 13.5, 14.1 – 14.6, 15.1)	
Nov 11 - 15	Confidence Intervals: The Basics, Tests of Significance: The Basics (sections 15.2 – 15.4, 16.1 – 16.5)	
Nov 18 - 22	Inference in Practice, Inference About a Population Mean (sections 17.1 – 17.5, 19.1 – 19.4)	
Nov 25 - 29	Inference About a Population Mean, Comparing Two Means (sections 19.5, 20.1 – 20.5, 20.7 – 20.8)	
Dec 2 - 4	Inference About a Population Proportion (sections 21.1 – 21.5)	
Final Exam – To be scheduled by the Registrar's office (3 hours)		

Chapter	Recommended Textbook Exercises
1	1, 5, 11, 13, 15, 17, 28, 29, 38, 40
2	4, 8, 10, 12, 15, 17, 19, 21, 23, 29, 33, 36, 41
3	1, 3, 7, 9, 11, 13, 26, 29, 30, 35, 36, 37, 38
4	1, 3, 8, 11, 13, 21, 23, 31, 36, 39, 44
5	1, 4(a), 5, 7, 9, 16, 30, 31, 34, 35, 37, 43, 48, 52, 55, 59
6	1, 6, 18, 19, 20, 22, 24, 25, 31, 32
7	Students are advised to use as a self-review
8	1, 3, 7, 11, 24, 36, 38, 41, 43, 45, 49
9	1, 2, 4, 10, 11, 15, 16, 19, 26, 27, 28, 35, 37, 46, 47, 48
11	Students are advised to use as a self-review
12	1, 2, 5, 8, 12, 13, 15, 17, 18, 34, 36, 37, 41, 47, 48, 51, 52
13	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 27, 28, 32, 34, 38, 39
14	1, 5, 10, 12, 26, 27, 28, 29, 33, 34, 35
15	1, 5, 7, 9, 11, 12, 13, 19, 22, 23, 26, 28
16	1, 3, 6, 8, 9, 10, 15, 16, 18, 21, 23, 32, 33, 38, 39, 42, 44
17	3, 6, 8, 13, 18, 24, 34, 35, 37
18	Students are advised to use as a self-review
19	1, 2, 3, 4, 6, 7, 8, 9, 21, 23, 24, 25, 26, 31, 33, 39
20	1, 2, 3, 4, 5, 10, 12, 18, 19, 20, 21, 29, 30, 31
21	1, 4, 5, 7, 11, 12, 20, 21, 22, 26, 34, 35, 37, 39