

The University of Western Ontario
Department of Statistical and Actuarial Sciences
STATISTICAL SCIENCE 2035 – 2024-25

Instructor	Sec	Day/Time	Location	email	Office
Dr. Holly Steeves	001	MWF 9:30-10:30	WSC 55	holly.steeves@uwo.ca	Room 233, WSC
Mr. Steve Kopp	002	MWF 1:30-2:30	Nat Sci 1	kopp@uwo.ca	Room 284, WSC

1. Prerequisite(s):

You need one full course in first year University level math. Such as: Applied Mathematics 1413, Statistical Sciences 1024A/B, Calculus 1000A/B or 1100A/B, Calculus 1301A/B or 1501A/B, Mathematics 1600A/B or the former Linear Algebra 1600A/B, Mathematics 1225A/B, 1228A/B, 1229A/B,

Anti-requisite(s):

All other courses or half courses in Introductory Statistics except Statistical Sciences 1023A/B and Statistical Sciences 1024A/B. (This means that you can take Stats 2035 if you took Stats 1024A/B in a prior year, BUT you cannot take Stats 2035 and 1024A/B at the SAME time)

Students are advised that they are responsible to ensure that they possess the necessary prerequisites (or have written special permission) and that de-registration may occur at any time if they lack the prerequisite or have taken an anti-requisite course.

2. Textbook

“Business Statistics for Contemporary Decision Making” (4th Canadian edition) by Black, Bayley, Castillo (Wiley)

- Binder ready, 3-hole punched, shrink-wrapped = \$152 (includes access to Wiley Plus)
- Wiley Plus access only with e-book = \$109 (both available through the UWO bookstore)

3. Textbook Website – “WileyPlus”

The 4th edition of the textbook comes with an access code that gives you access to a companion website.

- Access to this “WileyPlus” website **IS A REQUIREMENT** for the course as there will be online adaptive learning question sets posted on this website during the duration of the course (see Section 6c and 6d below)
- You are also encouraged to visit the website as it will provide you with practice problems to help test your knowledge of material
- It will also contain an e-book version of the text for quick reference and other visual aids to help in your understanding of the material.

4. Course Objectives

The course is designed to give some basic statistical tools to help you understand the concept of “data variability”. These tools will allow you to analyze this variability so that you can draw conclusions from your data. The course will also give some insight into:

- What statistical methods and tests should be used in analyzing data
- How to use those methods and tests and where do they come from
- What are the underlying assumptions of your chosen statistical test and what happens if those assumptions are not correct

In addition to using statistical methods and tests to analyze data, the first one-third of the course will also discuss the concepts of probability and how probability can be used to model certain phenomena that occur in the sciences, social sciences and business world. The course will discuss different types of probability models (discrete and continuous) and show you how they can be used to predict future events.

5. Course Outline (with “approximate” length of time for each chapter):

Chapter	Topics
1 – Introduction (1 week)	Sections 1.1 to 1.5 – Statistical concepts; variables and data; data measurement; introduction to big data and business analytics
2 – Charts and Graphs (1 week)	Sections 2.1 to 2.4 – Frequency distributions; graphing categorical data; graphing measurement data; charts and graphs for two variables (we are not covering section 2.5)
3 – Descriptive Statistics (1.5 weeks)	Sections 3.1 to 3.4 – measures of centre and spread; shapes of distributions; boxplots; business analytics using descriptive statistics
4 – Probability (2.5 weeks)	Sections 4.1 to 4.7 – introduction; unions and intersections; addition and multiplication laws; conditional probability; Bayes rule
5 – Discrete Distributions (2 weeks)	Sections 5.1 to 5.5 – General discrete distributions; Binomial, Poisson and Hypergeometric distributions
6 – Continuous Distributions (2 weeks)	Sections 6.1 to 6.4 – General continuous distributions; uniform and exponential distributions; Normal distribution; normal approximation to the binomial
7 – Sampling and Sampling Distributions (1 week)	Sections 7.1 to 7.3 – Sampling techniques; sampling distributions of the sample mean and of the sample proportion
8 – Inference: Estimation for Single Populations (2 weeks)	Sections 8.1 to 8.5 – Confidence intervals for a population mean, a population proportion and a population variance; estimating the sample size
9 – Inference: Hypothesis Testing for Single Populations (2 weeks)	Sections 9.1 to 9.5 (we are not covering section 9.6) – Hypothesis testing about a population mean, a population proportion and a population variance; Type I and II errors
10 – Inference About Two Populations (2 weeks)	Sections 10.1 to 10.5 – Confidence intervals and Hypothesis testing about two populations means, proportions or population variances
11 – ANOVA and Design of Experiments (1 week)	Sections 11.1 to 11.4 (we are not covering section 11.5) – One factor ANOVA; Randomized block design; Multiple comparison tests
12 – Correlation and Simple Regression Analysis (2 weeks)	Sections 12.1 to 12.8, and 12.10 (we are not covering section 12.9) – Correlation and Simple Regression topics
13 – Multiple Regression Analysis (1.5 weeks)	Sections 13.1 to 13.4 (may do parts of section 13.5) – Multiple regression models and topics
14 – Building Multiple Regression Models (0.5 week)	Only cover section 14.2 – bringing in categorical variables into a multiple regression model
16 – Analysis of Categorical Data (1 week)	Sections 16.1 and 16.2 – Goodness of fit tests; Tests of independence of two categorical variables

NOTE

- There will be no class on Monday, September 30 (Truth and Reconciliation day)
- **Fall reading week:** October 14 to 18, 2024 (no classes)
- **Winter reading week:** February 17 to 21 (no classes)

6. What Are Your Going to Be Graded On? (6 things)

a) Midterm Exams (2.5 hour exams)

1. Exam 1: **Friday, November 15, 2024 -- 7 pm to 9:30 pm** (Topics TBA)
2. Exam 2: **Friday, February 7, 2025 -- 7 pm to 9:30 pm** (Topics TBA)

Each exam will cover only material since the start of classes (for Exam 1) or since the first exam (for Exam 2). Each exam will only consist of multiple choice questions and will be CLOSED BOOK. A formula page will be provided with each exam.

NOTE: There will be NO exam scheduled during the December exam period

NOTE: If you miss either midterm exam with a valid excuse (which is approved by the Dean's Office), you will be required to write the make up exam. The dates of the make up exams have not yet been set, but will likely be in the evening of the following Thursday.

b) Final Exam

Scheduled for the final exam period. The final exam will be a 2.5-hour closed book exam covering material ONLY since Midterm Exam #2. It will NOT cover the whole year, but only the last one third of the material. It will consist of multiple-choice questions. A formula page will be provided.

Cellular phones, iPods, and other similar technology are *not* permitted in the exam room. This means that cellular phones, iPods, and other similar technology **cannot** be used as a timekeeper/clock, calculator, or for any other purpose

You will also need a non-programmable calculator for all exams/in-class tests.

c). On-line Quizzes

There will be 8 (4 per term) multiple choice online quizzes

- They will be available through the Wiley-Plus textbook website (a link will be provided through the course Brightspace site)
- You will have a 24-hour period to complete each quiz, beginning at 12:01 am to 11:59 pm on the Sundays given below:

1	September 29, 2024	5	January 19, 2025
2	October 27, 2024	6	February 2, 2025
3	November 10, 2024	7	March 9, 2025
4	December 1, 2024	8	March 23, 2025

- Quizzes will consist of 14 questions randomly chosen from a bank of questions (so each student will get a different set of questions) and will cover certain chapters of the textbook (I will let you know which chapters prior to the date of the quiz)
- You will have 70 minutes to complete each quiz once you start it
- Only your best 7 of 8 quizzes will count towards your final mark. **That means you can miss one quiz for any reason (no need to get a medical exemption or use an SRA)**

d). Adaptive Learning Assignments (11 of them in total)

These are to be completed through the Wiley-Plus TEXTBOOK website (link is provided on the course Brightspace page). They cover the first 13 chapters of the textbook.

What Are They?

- They are multiple choice questions taken from the material covered in each chapter of the textbook (and by extension, the course material that has been posted for each section).
- They are available on the textbook website (you need access to the textbook website)
- Student progress takes into account your responses to each question, the difficulty of the question, and your history in responding to each learning objective.
- There is no specific number of questions that the student must get right to complete an assignment, but you **MUST ATTEMPT AT LEAST 30** questions. The number of questions ensures that students must see some items of every section in the assignment for completion.
- The goal of the Adaptive Learning Assignments is to help keep you up to date with the material (so you do not fall behind) and to let you see what areas of a chapter you are understanding and what areas you may be having some trouble with and may need to brush up on – this should better prepare you for the online quizzes (which tend to be written **AFTER** the adaptive learning questions sets have been completed) and hopefully this will lead you to be better prepared for the midterm and final exams, and thus will be able to perform better on these exams.
- Marking Scheme for EACH question set:
 - o If you successfully complete 20% to 59.9% of the questions, you get 2 out of 10
 - o If you successfully complete 60% to 79.9% of the questions, you get 6 out of 10
 - o If you successfully complete 80% or more of the questions, you get 10 out of 10

Due Dates

Question set on Chapter 1 and Chapter 2	Available until Sun, Sept 29 (11:00 pm)
Question set on Chapter 3	Available until Sun, Oct 6 (11:00 pm)
Question set on Chapter 4	Available until Sun, Oct 27 (11:00 pm)
Question set on Chapter 5	Available until Sun, Nov 10 (11:00 pm)
Question set on Chapter 6 and Chapter 7	Available until Sun, Dec 1 (11:00 pm)
2025	
Question set on Chapter 8	Available until Sun, Jan 19 (11:00 pm)
Question set on Chapter 9	Available until Sun, Feb 2 (11:00 pm)
Question set on Chapter 10	Available until Sun, Mar 2 (11:00 pm)
Question set on Chapter 11	Available until Sun, Mar 16 (11:00 pm)
Question set on Chapter 12	Available until Sun, Mar 23 (11:00 pm)
Question set on Chapter 13	Available until Sun, Mar 30 (11:00 pm)

If you are going to be away on a weekend, you should plan to complete studying the material **AND** completing the adaptive question sets before you go away.

Only your best 10 of 11 assignments will count towards your final mark. **That means you can miss one assignment for any reason (no need to get a medical exemption or use an SRA)**

e). **Clicker Participation**

Clickers (clicker technology on your smart phone/tablet/lap top) will be used frequently in lectures; be sure to bring yours to every class.

- In class, I may ask a variety of structured questions to which you may respond by choosing the appropriate answer on your device. Individual responses are collected and displayed as a graph at the front of the room which can lead to further discussion. These responses may also be saved for future analysis. In this course, clickers will be used primarily to promote engagement during lecture. They will also provide you with credit and feedback on your lecture preparation and/or participation.
- We will not be using clickers for the first two weeks of classes in order for everyone to get settled in the course.
- That will be followed by a week of “practice” questions using the clicker technology. (These questions will not count towards your final mark, but instead it will be a chance for all of us to see if the clicker technology is working properly and to iron out any “bugs” in the system).
- Then, in the 4th week of the course, any clicker question given in class will count towards your final mark (see “Clicker MARKS” section for more detail)

The information below provides further details.

Clickers

- **Use your smart phone, tablet or lap top.**
- **You will have to sign up for an account; this can be done either through the course Brightspace site (under the “iClicker” folder) OR through the iClicker website**
- **Information on how to set up an account is given on the course Brightspace site under the “iClicker” folder.**

Clicker Responsibility

It is your responsibility to ensure that your cell phone/tablet/lap top system is functioning properly.

- If you have problems with the clicker system during a class, you may need to consult with the ITS Help Desk at some point after class. It is NOT the duty of your instructor to fix any problems with your clicker.
- Note that students attending the same lecture simultaneously cannot effectively share a clicker; only one student’s UserID will be recognized by the clicker software on a given day, and only that student will receive the record of participation.

Clicker MARKS

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.

Clicker questions will be asked during most (but not all) lectures. You need only to answer 80% of the total clicker questions asked during the entire course to obtain a 5 (out of 5) on the clicker portion of your final mark. For any percentage (y) less than 80%, your clicker mark will decrease linearly using the formula:

$$\text{Clicker mark} = 6.25(y)$$

Examples: If you only answer 68% of all clicker questions, clicker mark = $6.25(0.68) = 4.25$ (out of 5). If you only answer 44% of all clicker questions, clicker mark = $6.67(0.44) = 2.75$.

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 20% 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.**

Can a student attempt clicker questions in both sections 001 and 002 on the SAME day?

NO!! This will not be allowed. You need to answer clicker questions only in the section that you are officially registered in and they will only be recorded as being answered in your section.

Research

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.

7. Evaluation

	Original	If you do poorly on one test		
Adaptive Learning Sets (best 10 of 11)	6%	6%	6%	6%
Clicker Questions	5%	5%	5%	5%
Quizzes (best 7 of 8)	11%	11%	11%	11%
Mid Term 1	26%	16%	31%	31%
Mid Term 2	26%	31%	16%	31%
Final Exam	26%	31%	31%	16%

The marking scheme that gives a student the higher final mark will be the one used.

8. Course Brightspace Web Page

The web page will contain various things throughout the year:

1. A copy of this course outline
2. Copies of midterms and final exams from the previous year (with solutions)
3. Solutions to the exercises in the 4th edition of the textbook (as pdf files)
4. Periodic announcements and information about the course that you need to know
5. **Daily class notes will be available (which will be incomplete – to be filled in during the classes).**
6. Marks of assignments, quizzes and exams as they are marked.

9. General information about missed coursework

If a student misses a major exam (midterm 1, midterm 2 or final exam), they need to provide documentation as to why they missed the exam and submit it to academic counselling in their faculty for approval. The Student Medical Certificate is available at

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered.

Students should also note that individual instructors are **not** permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons.

This year students are allowed to submit what is referred to as an SRA (self-reporting absence), which allows the student to miss one piece of coursework per semester (but not for the final exam) for any reason, without having to submit any documentation.

However, course instructors are allowed to designate one exam per semester where a student cannot use an SRA. To this end, it has been decided to allow students to use an SRA for one of the two midterms in this course, but not for both. **Keep in mind that it is NOT a requirement for students to use any SRA's. It is advisable for students to write the exams on the date and time they are scheduled unless you really are sick and unable to write.**

With this in mind, here is information about what to do if you miss any of the required work in this course:

a) Final Exam

- Students cannot use an SRA
- If the exam is missed for a valid reason, the student must provide documentation to academic counselling in their faculty.
- If approved, the student will write the make up exam (which is usually held during the second Thursday in May)

b) Midterm 1

- Students may use an SRA
- OR they can provide documentation to academic counselling
- Those using an SRA, or those with academic counselling approval, will write the make up exam, normally held on the Thursday following the date of the exam (the weight of midterm 1 will NOT be transferred to other parts of the grading scheme)

c) Midterm 2

- Students may use an SRA, but **ONLY** if they have not used an SRA for midterm 1
- Otherwise they must provide documentation to academic counselling
- Those using an SRA, or those with academic counselling approval, will write the make up exam, normally held on the Thursday following the date of the exam (the weight of midterm 2 will NOT be transferred to other parts of the grading scheme)

d) Online Quizzes

- Since the quizzes are set up so that only the best 7 of 8 count towards your final mark, using an SRA for any missed quizzes will not be allowed (each quiz is only worth 1.57% of your final grade)
- Also, since students are given a full 24-hour window to write each quiz, we will not accept any medical reason for missing a second quiz.
- If you are not feeling well on the day of a quiz (and you have already missed one quiz), we are expecting that you can find some time during the 24-hour window where you can spend the maximum of 70 minutes to write the quiz.
- If more than one quiz is missed, they will count as a mark of ZERO (and count as one of the “best 7 out of 8” quizzes)

e) Adaptive Learning Assignments

- Since the assignments are set up so that only the best 10 of 11 count towards your final mark, students cannot use an SRA or a submit a medical reason for any missed assignment
- If a student misses more than one assignment, they will count as a mark of ZERO

f) Clicker questions

- We will not accept any SRA's or medical reasons for missing any clicker questions
- This is because a student only needs to answer 80% of the clicker questions throughout the entire year in order to earn the full 5% participation mark
- If you miss a class that had clicker questions, that will be part of the 20% of the questions that you are allowed to miss and not answer
- If you have already missed 20% of the questions and then miss another class which had clicker questions, they will count as ZERO questions answered that day

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf.

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person. That is, the above information is only good for course work that was MISSED.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation (an SRA)** for the assessments listed above, the request cannot be recalled and reapplied. This privilege is forfeited.

10. Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

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

Academic Policies

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

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

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 their 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 the following Web site:

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

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

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

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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 Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) 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.

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

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (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” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).