

The University of Western Ontario
Department of Statistical and Actuarial Sciences
STATISTICAL SCIENCE 2035 – 2021-22

Instructor	Sec	Day/Time	Location	email	Office/Phone (519-661-2111)
Mr. Joe Raaymakers	001	MWF 9:30-10:30	SEB 1059	jraaymak@uwo.ca	WSC 107
Mr. Steve Kopp	002	MWF 1:30-2:30	Nat Sci 1	kopp@stats.uwo.ca	WSC 284 x86288

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” (3rd 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 = \$104

3. Textbook Website – “WileyPlus”

The 3rd 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 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

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

a) Midterm Exams (2.5 hour exams)

1. Exam 1: **Friday, November 19, 2021 -- 7 pm to 9:30 pm** (Topics TBA)
2. Exam 2: **Friday, February 4, 2022 -- 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

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) In-class Quizzes

There will be 8 (4 per term) short written answer question quizzes that will be given at the very start of class on the following **MONDAYS:**

1	October 4, 2021	5	January 24, 2022
2	October 25, 2021	6	February 14, 2022
3	November 15, 2021	7	March 7, 2022
4	December 6, 2021	8	March 21, 2022

- Quizzes will start right at the **start** 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 be DIFFERENT for each section of the course (they are not common quizzes, so you MUST go to the classroom of your official section on the day of the quiz)**
- The quizzes will consist of 2 questions (or perhaps 1 question with multiple parts) that will be based on material covered over the past 2-3 weeks of classes
- You will show ALL your work in solving the question (as part marks will be available)
- The quizzes will be out of 8 marks – you will get 2 out of 8 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 quiz paper will receive a minimum mark of 2)
- If you miss a quiz, you will need to use an SRA (self-report) in order to avoid getting a mark of ZERO
- **If you miss a quiz due to an SRA, health reason, or due to a COVID-19 quarantine, that quiz will not count and your quiz grade will be based on the quizzes that you actually wrote/completed**

d). Adaptive Learning Question Sets

These are to be completed through the Wiley-Plus TEXTBOOK website (a link is provided on the course OWL page). There is one set for each of the first 13 chapters of the textbook.

What Are They?

- They are multiple choice questions taking 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 the student's responses to each question, the difficulty of the question, and the student's history in responding to each learning objective and its adjacent objectives.
- There is no specific number of questions that the student must get right to complete an assignment. The number of questions ensures that students must see some items of every section in the assignment for completion. Progress can increase and decrease while a student is working on an assignment, the assignment is complete when the student's progress reaches 100%.
- The goal of the Adaptive Learning Question Sets 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	Available until Sun, Sept 26 (10:00 pm)
Question set on Chapter 2	Available until Sun, Sept 26 (10:00 pm)
Question set on Chapter 3	Available until Sat, Oct 9 (10:00 pm)
Question set on Chapter 4	Available until Sun, Oct 24 (10:00 pm)
Question set on Chapter 5	Available until Sun, Nov 14 (10:00 pm)
Question set on Chapter 6	Available until Sun, Dec 5 (10:00 pm)
Question set on Chapter 7	Available until Sun, Dec 5 (10:00 pm)
2021	
Question set on Chapter 8	Available until Sun, Jan 16 (10:00 pm)
Question set on Chapter 9	Available until Sun, Jan 30 (10:00 pm)
Question set on Chapter 10	Available until Sun, Feb 13 (10:00 pm)
Question set on Chapter 11	Available until Sun, Mar 6 (10:00 pm)
Question set on Chapter 12	Available until Sun, Mar 20 (10:00 pm)
Question set on Chapter 13	Available until Sun, Mar 27 (10:00 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.

e). **Clicker Participation**

Clickers (or 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 pressing the appropriate button on your respective clicker. 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, about three weeks into 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 OWL site (under the “iClicker” folder) OR through the iClicker website**
- **Information on how to set up an account is given on the course OWL 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 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 perhaps 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.**

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 (13 of them)	6%	6%	6%	6%
Clicker Questions	5%	5%	5%	5%
Quizzes (8 of them)	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 OWL Web Page

The web page will contain various things throughout the year:

1. A copy of this course outline
2. Copies of tests and exams from the previous year (with solutions)
3. Solutions to the exercises in the 3rd edition of the textbook (as pdf files)
4. Weekly updates and information about the course that you need to know
5. **For some sections, daily class notes will be available (which will be incomplete – to be filled in during the classes).**
6. Marks of quizzes and tests as they are marked.

9. Student Absences

Academic Consideration for Student Absences

Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:
 - an absence must be no more than 48 hours
 - the assessments must be worth no more than 30% of the student's final grade
 - no more than two SRAs may be submitted during the Fall/Winter term
- (ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.
- (iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.

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. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

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

and for the Student Medical Certificate (SMC), see:

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

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

Absences from 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).

10. Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD), 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

11. Academic Policies

The website for Registrarial Services is <http://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 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 the following Web site:

http://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.

12. Support Services

Please visit the Social Science Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://counselling.ssc.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 (519) 661-2147 if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.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.

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

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