The University of Western Ontario   Department of Statistical & Actuarial Sciences
STATISTICAL SCIENCE 2035
Statistics for Business and Social Science
Online/Distance Studies – Summer 2020

Instructor	Office	Phone (work)	Phone (Home)	email
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Office Hours	**Time**			
Weekdays/weekends	Use discussion board on OWL			

- Email me if you have questions/problems OR post a question on the OWL discussion board

Prerequisite(s):
You need one full course in first year University level math. Such as: Applied Mathematics 1201B, 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.

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 <u>any time</u> if they lack the prerequisite or have taken an anti-requisite course.

Textbook
"Business Statistics for Contemporary Decision Making" (2nd Canadian edition) by Black, Chakrapani, Castillo (Wiley)

You can order the textbook through the UWO bookstore:
- Binder ready, 3-hole punched, shrink-wrapped (includes access to Wiley Plus)
OR
- Wiley Plus access only with e-book

I have also provided information on the course OWL site of how to access the Wiley Plus site, which gives you the option of purchasing access to the e-book and Wiley Plus site without going through the bookstore.

Textbook Website – "WileyPlus"
The 2nd 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 quizzes AND online adaptive learning question sets posted on this website during the duration of the course
- 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.

OWL Course webpage

This is an online course. Here is what you will find on the OWL course web site:

1. Weekly announcements and other things of interest related to the course
2. Class notes/helpful hints for each Unit
3. VIDEO clips made by the professor that will demonstrate how to solve various examples (these examples will be part of the Class Notes for each unit, but they will not have the solutions shown; instead the solutions will be shown on the video clips)
4. Suggested exercises for each chapter of the textbook
5. Solutions manual for the suggested exercises of the textbook
6. Copies of old exams, with solutions will be made available a week or two before the midterm and final. These old exams will give you a good idea of the type of questions that will be on the mid-term and final exams for this course
7. Formula sheets for the midterm and final exam
8. Your marks in the course
9. A link to the textbook "WileyPlus" web site

What is expected of the student/What student can expect of me

If you have questions about text exercises, the class notes, the video clips, or any other general questions about the course, you should use the **discussion board** on the OWL site.

You can post your questions for all students to see. I am expecting other students to respond to these questions. HOWEVER, I will check the web site every day and will respond to questions within 48 hours if no one else has responded. Be sure to check the course web site a few times every week.

If you prefer to be a bit more private, you can always email me your questions/comments using my Western email account (kopp@stats.uwo.ca)

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.

Course Outline:

	Chapter	Topics
<u>**Unit 1**</u> **May 4-10**	**1 – Introduction** **2 – Charts and Graphs** **3 – Descriptive Statistics**	Concepts(1.1/1.2); Variables (1.3); Types of Data (1.4) Frequency Distributions (2.1); Graphs (2.2); Categorical Data Graphs (2.3); Graphs for 2 Variables (2.4) Measures of Centre (3.1); Measures of Spread (3.2); Grouped Data (3.3); Measures of Shape (3.4) [skip 3.5]
<u>**Unit 2**</u> **May 11-17**	**4 – Probability**	Intro (4.1/4.2); Sample Space and Events (4.3); Probability Rules (4.4/4.5); Conditional Probability and Independence (4.6/4.7); Bayes Theorem (4.8)
<u>**Unit 3**</u> **May 18-24**	**5 – Discrete Distributions**	Intro (5.1); Discrete Distributions (5.2); Special distributions: Binomial (5.3); Poisson (5.4); Hypergeometric (5.5)
<u>**Unit 4**</u> **May 25-31**	**6 – Continuous Distributions**	Uniform (6.1); Normal/Standard Normal (6.2); Using Normal to approximate the Binomial (6.3); Exponential (6.4)
<u>**Unit 5**</u> **June 1-7**	**7 – Sampling and Sampling Distributions**	Sampling methods (7.1); Distribution of the Sample Mean (7.2); Distribution of the Sample Proportion (7.3)
<u>**Unit 6**</u> **June 8-16**	**8 – Confidence Intervals single populations**	Confidence intervals for the mean: variance known (8.1) and variance unknown (8.2); Confidence Intervals for population proportion (8.3); Confidence Intervals for the population variance (8.4); Determining the sample size (8.5)

	Chapter	Topics
<u>**Unit 7**</u> **June 22–28**	**9 – Hypothesis Testing for single populations**	Tests about the mean, variance known (9.2); Tests about the mean, variance unknown (9.3); Type I and II errors (9.1); Tests about a proportion (9.4); Tests about a variance (9.5); [skip section 9.6]
<u>**Unit 8**</u> **June 29 to July 5**	**10 – Inference about Two Populations**	Comparing two means, variances known (10.1); Comparing two means, variance unknown – pooled and non-pooled (10.2); Paired data (10.3); Comparing two proportions (10.4); Tests about two population variances (10.5)
<u>**Unit 9**</u> **July 6-12**	**11 – Analysis of Variance**	Basic Concepts (11.1); One-way ANOVA (11.2); Multiple Comparison Tests (11.3); Randomized Block Design (11.4); [skip section 11.5]
<u>**Unit 10**</u> **July 13-19**	**12 – Linear Regression**	Correlation Coefficient (12.1); Linear Regression model (12.2/12.3); Residual Analysis (12.4); Standard error and Coefficient of Determination (12.5/12.6); Hypothesis Testing of slope (12.7); Confidence and Prediction Intervals (12.8); Interpreting the output (12.10) [skip section 12.9]
<u>**Unit 11**</u> **July 20-26**	**13 – Multiple Regression** **14.2 – Dummy Variables**	The Model (13.1); Overall F-test/Testing Significance of each regression coefficient (13.2); Standard error/R^2/ Adjusted R^2 (13.3); Interpreting computer output (13.4) Dummy Variables (14.2) [skip sections 13.5 and all the rest of chapter 14]
<u>**Unit 12**</u> **July 27-31**	**16 – Chi-square Tests**	Goodness of Fit Tests (16.1); Test of Independence (16.2)

What You Will Be Marked On

1. <u>Assignments</u> – There will be FOUR written answer assignments. They will consist of several questions from the previous week's units/textbook chapters. Some questions may require some graphing where you can use Excel (or some other software) to help you create the graphs. Most of the other questions will require some calculations and some ability to state conclusions and interpret your results. Due dates (times are given as Eastern Daylight Time):

Assignment 1	Units 1, 2, 3 (chapters 1, 2, 3, 4, 5)	Friday, May 22 (4:00 pm)
Assignment 2	Units 4, 5, 6 (chapters 6, 7, 8)	Wednesday, June 17 (4:00 pm)
Assignment 3	Units 7, 8 (chapter 9, 10)	Wednesday, July 8 (4:00 pm)
Assignment 4	Units 9, 10 (chapter 11, 12)	Wednesday, July 22 (4:00 pm)

The assignments will be available on the course OWL site.

However, you will not submit your solutions to OWL. Instead we will be using GRADESCOPE for you to submit your assignments. (I will send out information about how to upload your solutions to Gradescope through an announcement on OWL as we get closer to the date an assignment is due).

Assignments can be written out by hand or typed up. If your solutions are hand written, you must make a <u>pdf version</u> of your solutions (including any graphs created by Excel or some software). It will be that pdf version that you will upload to Gradescope. (again, I will have information about how to make a pdf copy of your solutions on OWL).

<u>LATE</u> penalties: I have tried to space out the dates that things are due in this course so that you have time to get things done and not feel overwhelmed. You are expected to get things done ON TIME. If you are late with your assignments, there will be a 20% penalty PER DAY late (thus, if you get it in at 4:01 pm on the due date, that is consider one day late and will be subject to the 20% penalty)

2. <u>Adaptive Learning Question Sets</u> – These are to be completed through the 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 study material that I have posted for each chapter/section).
    *   They are available on the textbook website (thus, you need access to the textbook website)
    *   You need to attempt at least 30 questions from each chapter (you can attempt more if you want)
    *   As you attempt each question, you will be asked to choose how confident you are in your answer
    *   As you move to the next question, the system chooses the next question based on how well you are doing in the questions you have answered
    *   The first 20 questions for each chapter is to give the system a chance to see how well you are doing; You then have to answer at least 10 more questions (you can answer more than that if you want to keep going) before you finish a question set
    *   Your "final" mark on a question is based on a combination of things: how many questions you got correct, how confident you were in your answers to each question, and the difficulty level of each question
    *   If you do not have time to finish at least 30 questions for a chapter, you can stop and continue later. You do not have to finish all of the questions at one time. You just have to make sure you answer at least 30 questions (to your satisfaction) by the due dates given below.

- 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:
    - If you successfully complete 20% to 39.9% of the questions, you get 5 out of 10
    - If you successfully complete 40% to 59.9% of the questions, you get 7.5 out of 10
    - If you successfully complete 60% or more of the assigned questions, you get 10 out of 10

By the way, saying "completing 60% of the questions" does not mean you just have to answer 60% of 30 = 18 questions. You still have to answer ALL 30 (or more) of the questions. It is the adaptive learning system that tells you how successful you have been. And you need to be 60% successful (or more) to get a 10 out of 10 on a question set.

Due Dates

Question set on Chapter 1	
Question set on Chapter 2	Sunday, May 10 by 11:45 pm
Question set on Chapter 3	
Question set on Chapter 4	**Saturday**, May 16 by 11:45 pm (there is a quiz on chapters 1, 2, 3, 4 this weekend)
Question set on Chapter 5	Sunday, May 24 by 11:45 pm
Question set on Chapter 6	**Saturday**, May 30 by 11:45 pm (there is a quiz on chapters 5 and 6 this weekend)
Question set on Chapter 7	Sunday, June 7 by 11:45 pm
Question set on Chapter 8	**Saturday**, June 13 by 11:45 pm (there is a quiz on chapters 7 and 8 this weekend
Question set on Chapter 9	Sunday, June 28 by 11:45 pm
Question set on Chapter 10	**Saturday**, July 4 by 11:45 pm (there is a quiz on chapters 9 and 10 this weekend)
Question set on Chapter 11	Sunday, July 12 by 11:45 pm
Question set on Chapter 12	**Saturday**, July 18 by 11:45 pm (there is a quiz on chapters 11 and 12 this weekend)
Question set on Chapter 13	Sunday, July 26 by 11:45 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. And if you are going away on a weekend that also has a quiz scheduled, you really need to be organized and make sure you complete everything before you go away (although, being an online course, as long as you have your computer with you, you can complete this work at any time, as long as you meet the deadlines)

3. **Web Tests (Online Quizzes)**
There will be 6 web-based tests. They will be written roughly every two weeks. They are designed to keep you from falling behind in the material. The best 5 out of the 6 tests will count.

You will be given a 72-hour window to write the test on-line. **The test will consist of 14 multiple-choice questions,** randomly selected from a bank of questions (No two tests will be the same). **You will get 75 minutes to write the test**. You will be able to write the test twice (although, the 2nd test will have completely different questions). Your final mark will be the **average** of the two tests. You may write a test only once if you want.

The online tests (quizzes) will be available on the **"WileyPlus" web site that is available using the access code that comes with the textbook.** As mentioned, the link to the "WileyPlus" site is available on the OWL course website

Test 1 – Units 1 and 2	Fri-Sun, May 15-17	Chapter 1, 2, 3, 4
Test 2 – Units 3 and 4	Fri-Sun, May 29-31	Chapter 5, 6
Test 3 – Units 5 and 6	Fri-Sun, June 12-14	Chapter 7, 8
Test 4 – Units 7 and 8	Fri-Sun, July 3-5	Chapter 9, 10
Test 5 – Units 9 and 10	Fri-Sun, July 17-19	Chapter 11, 12
Test 6 – Units 11 and 12	Fri-Sun, July 31-Aug 1	Chapter 13, 14.2, 16

4. **Mid Term Exam**
Saturday, June 20, 10 am to 1 pm (Eastern Daylight Time)

This will be a three-hour exam covering chapters 1 to 8 of the textbook (Units 1 to 6). It will be a multiple-choice exam with the exam available on the course OWL site. You will be given a page of relevant formulas with the exam (which will be made available on OWL prior to the exam for you to look at).

ALL students MUST write the exam at this time. For example, if you live in Beijing, China, then the exam will take place from 10 pm to 1 am. If you live in Vancouver, BC, then the exam will take place from 7 am to 10 am.

If you are NOT able or willing to write the midterm exam during these three hours, then PLEASE do not take this course

5. **Final Exam**
To be announced (Sometime during the week of August 4 to August 7 – to be confirmed).

This will be a three-hour exam covering chapters 9 to 13, 14.2, 16.1, 16.2 of the textbook (Units 7 to 12). It will be a multiple-choice exam with the exam available on the course OWL site. You will be given a page of relevant formulas with the exam (which will be made available on OWL prior to the exam for you to look at).

ALL students MUST write the exam at whatever time the exam is set for, taking into account the time zone that they live in. The time of the exam will be set based on Eastern Daylight Time.

You will need a pocket calculator for all on-line quizzes, midterm/final exams.

Policy on Exams -- We may be using REMOTE PROCTORING for them

Details have not been finalized for how the midterm and final exams will be administered. There is a tentative plan to use a remote proctoring service for them. More details will be communicated to you as they become available to me. Nothing has been finalized yet. We may use the Proctortrack remote proctoring service. I will provide details on how to get signed up for these as they become available. As such, it should be possible to have remotely proctored exams this summer.

Therefore, completion of this course will require you to have a device that meets the requirements at

https://www.proctortrack.com/tech-requirements/.

By taking this course, you are consenting to the use of this software and to be monitored during tests and examinations. Furthermore, you are declaring that you have a reliable internet connection with sufficient capacity to support video proctoring.

Evaluation:

Adaptive Learning Question Sets (13 of them)	6%
Assignments (4 of them)	12%
On-line Quizzes (best 5 of 6)	15%
Mid Term Exam	33.5%
Final Exam	33.5%

Suggested Weekly Timetable (all TIMES are Eastern Daylight Time)

Week	Chapter	Sections
1. May 4, 5	Chapter 1 – Intro and types of data	1, 2, 3, 4
May 6, 7	Chapter 2 -- Graphs	1, 2, 3, 4
May 8, 9, 10	Chapter 3 – Descriptive Statistics	1, 2, 3, 4
Adaptive Learning problem set for Chapter 1, for Chapter 2, for Chapter 3 – must complete all three by Sunday, May 10 at 11:45 pm		
2. May 11 to 17	Chapter 4 - Probability	1, 2, 3, 4, 5, 6, 7, 8
Adaptive Learning problem set for Chapter 4 – due by Saturday, May 16 at 11:45 pm		
Online Quiz 1 – Friday to Sunday, May 15-17 (chapters 1, 2, 3, 4)		
3. May 18 to 24	Chapter 5 – Discrete Distributions	1, 2, 3, 4, 5
Adaptive Learning problem set for Chapter 5 – due by Sunday, May 24 at 11:45 pm		
ASSIGNMENT 1 – due Friday, May 22 by 4:00 pm		
4. May 25 to 31	Chapter 6 – Continuous Distributions (note: do NOT use table A.5; instead use table that will be posted on OWL, it is much easier)	1, 2, 3, 4
Adaptive Learning problem set for Chapter 6 – due by Saturday, May 30 at 11:45 pm		
Online Quiz 2 – Friday to Sunday, May 29-31 (chapters 5, 6)		
5. June 1 to 7	Chapter 7 – Sampling Distributions	1, 2, 3
Adaptive Learning problem set for Chapter 7 – due by Sunday, June 7 at 11:45 pm		
6. June 8 to 14	Chapter 8 – Confidence Intervals	1, 2, 3, 4, 5
Adaptive Learning problem set for Chapter 8 – due by Saturday, June 13 at 11:45 pm		
Online Quiz 3 – Friday to Sunday, June 12-14 (chapters 7, 8)		
7. June 15 to 19	REVIEW chapters 1 to 8 + practice exams	
ASSIGNMENT 2 – due Wednesday, June 17 by 4:00 pm		
Mid Term Exam – Saturday, June 20 – 10:00 am to 1:00 pm		
8. June 22 to 28	Chapter 9 – Hypothesis Testing	1, 2, 3, 4, 5 (not 6)
Adaptive Learning problem set for Chapter 9 – due by Sunday, June 28 at 11:45 pm		

9. June 29 to July 5	Chapter 10 – Comparing Two Populations	1, 2, 3, 4, 5
Adaptive Learning problem set for Chapter 10 – due by Saturday, July 4 at 11:45 pm		
Online Quiz 4 – Friday to Sunday, July 3-5 (chapters 9, 10)		
10. July 6 to 12	Chapter 11 – Analysis of Variance	1, 2, 3, 4 (not 5)
ASSIGNMENT 3 – due Wednesday, July 8 by 4:00 pm		
Adaptive Learning problem set for Chapter 11 – due by Sunday, July 12 at 11:45 pm		
11. July 13 to 19	Chapter 12 – Regression and Correlation	1, 2, 3, 4, 5, 6, 7, 8, 10
ASSIGNMENT 4 – due Wednesday, July 22 by 4:00 pm		
Adaptive Learning problem set for Chapter 12 – due by Saturday, July 18 at 11:45 pm		
Online Quiz 5 – Friday to Sunday, July 17-19 (chapters 11, 12)		
12. July 20-24	Chapter 13 – Multiple Regression	1, 2, 3, 4 (not 5)
July 25-26	Chapter 14 – Dummy Variables	2
Adaptive Learning problem set for Chapter 13/14.2 – due by Sunday, July 26 at 11:45 pm		
13. July 27-31	Chapter 16 – Chi-square Tests	1, 2
Online Quiz 6 – Friday to Sunday, July 31-Aug 2 (chapters 13, 14.2, 16)		
REVIEW – Chapters 9, 10, 11, 12, 13, 14.2, 16 – August 3, 4, 5, 6		
Final Exam – To Be Announced (Either August 4, 5, 6 or 7)		

What Do You Do if You Miss a Course Requirement Due to Illness or Special Circumstances?

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. During the COVID-19 pandemic, medical notes are not required. Medical absence can be reported through the Student Illness Reporting Tool at

https://www.registrar.uwo.ca/academics/academic_considerations/index.html.

If this portal is not available (i.e., if the COVID-19 pandemic has lifted before the end of the course), or if you have missed (or will be missing coursework) for a non-medical reason beyond your control, approval can be granted either through a Self-reported Absence (if the portal is available; NOTE: students are allowed only ONE self-reported absence for the summer term, no matter how many summer courses you are taking) or via the Dean's Office/Academic Counselling unit of your home Faculty. Non-medical reasons must be accompanied by supporting documentation. If you are a Science student, contact information for the Academic Counselling Office for the Faculty of Science is available at

https://counselling.ssc.uwo.ca

In all cases, you must contact your instructor as soon as possible, and no later than 24 hours after the period covered, to clarify how you will be expected to fulfil the academic expectations you have missed (unless other instructions are indicated in this Course Outline). For further information, please consult the University's policy on academic consideration for student absences:

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

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).