

The University of Western Ontario
Department of Statistical and Actuarial Sciences
STATISTICAL SCIENCE 2858 – Summer 2021
Probability and Statistics II

Instructor: Joseph Raaymakers, M.Sc.
Contact: jraaymak@uwo.ca or via forums in OWL
Office Hours: Online via Zoom (by appointment)
Lectures: Online via Zoom on Tuesday to Friday, 9:00 AM-11:00 AM

Prerequisite(s)

A minimum mark of 60% in Statistical Sciences 2857A/B (or the former Statistical Sciences 2657A/B).

Anti-requisite(s)

All other courses in Introductory Statistics (except Statistical Sciences 1023A/B and Statistical Sciences 1024A/B): Biology 2244A/B, Economics 2122A/B, Economics 2222A/B, Geography 2210A/B, Health Sciences 3801A/B, MOS 2242A/B, Psychology 2810, Psychology 2820E, Psychology 2830A/B, Psychology 2850A/B, Psychology 2851A/B, Social Work 2207A/B, Sociology 2205A/B, Statistical Sciences 2035, Statistical Sciences 2141A/B, Statistical Sciences 2143A/B, Statistical Sciences 2244A/B, Statistical Sciences 2037A/B if taken prior to Fall 2010, former Psychology 2885 (Brescia), former Statistical Sciences 2122A/B, former Social Work 2205.

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.

Text Book

Modern Mathematical Statistics with Applications, 2nd ed., by JL Devore and KN Berk.

You may access a free electronic copy of this book in PDF or EPUB format through Western Libraries by following this link

<https://login.proxy1.lib.uwo.ca/login?url=https://link.springer.com%2fbook%2f10.1007%252F978-1-4614-0391-3>

to Springer Link. From there you can also purchase a softcover copy of the book for 25 USD (approximately 34 CAD).

Course Description

An introduction to the theory of statistics with strong links to data as well as its probabilistic underpinnings. Topics covered include estimation and hypothesis testing, sampling distributions, linear regression, experimental design, law of large numbers and central limit theorem.

It's actually more interesting than it sounds.

Course Objectives

The field of probability provides a language with which we can talk and reason about uncertainty in the world, and forms the underpinnings of all statistical methods. In this class you will learn probability with a focus on real world examples in order that you can understand and apply the statistical methods presented in the follow-up course (SS2858).

Course Outline

Chapter	Topics
7 – Point Estimation	Point estimates and their properties, Construction of parameter estimates
8/9 – Inferences Based on a Single Sample	One Sample Hypothesis Testing and Confidence Intervals for Means (variance known and unknown), Proportions and Variances
10 – Inferences Based on Two Samples	Two Sample Hypothesis Testing and Confidence Intervals for Means (independent and paired samples), Proportions and Variances
11 – Analysis of Variance (ANOVA)	Single factor ANOVA; Randomized block design; Multiple comparison tests
12 – Regression and Correlation	Regression, Inferences About Slope, Prediction Intervals, Coefficient of Determination, Residual Analysis, Correlation Analysis
13 – Goodness-of-Fit Tests and Categorical Data Analysis	Goodness of Fit Tests, Two-Way Contingency Tables

Course Schedule - Topics and Assessments

A detailed weekly timetable is included on the last page of this syllabus.

Calculator requirements

You will need a pocket (non-programmable) calculator for all assessments. Any such calculator is fine, including statistical calculators.

Course OWL Web Page

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. Extra readings (for some topics) that will supplement your class notes
4. Daily lecture notes and other things that are relevant to the course
5. Recordings of online lectures
6. Sample/past exams/tests and solutions
7. Marks of assignments and tests as they are marked

Quizzes

There will be 4 short online multiple-choice quizzes that will be given on the following dates:

Quiz 1: **Friday, July 16, 2021** (Topics TBA)

Quiz 2: **Friday, July 23, 2021** (Topics TBA)

Quiz 3: **Friday, August 6, 2021** (Topics TBA)

Quiz 2: **Friday, August 13, 2021** (Topics TBA)

The quizzes are open-book. You are encouraged to make use of my lecture slides and the text when writing the quizzes. However, you must work independently. Before you begin each assessment, you will agree to an Honour Statement. I will be conducting response and cheating analysis after each quiz. Please honour the Honour Statement.

NOTE: There will be NO make-ups for any of the online quizzes. If you miss a quiz (with a valid reason), the weight will be reassigned to the test and exam components.

Midterm Test

There will be a two-hour online test scheduled on the following date:

Midterm Test: **Friday, July 30, 2021** (Topics TBA)

All the same rules apply for the test as with the quizzes. The test is open-book, but you are required to work independently.

NOTE: There will be NO make-up test for any missed tests. If you miss the test (with a valid reason), the weight will be reassigned to the final exam. However, if you have also missed one or more quizzes, you may be required to make up the missed work.

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 may either be multiple-choice questions OR a combination of multiple choice and short written answer questions. It will be scheduled by the Registrar's office.

Evaluation

Your final course grade will be determined as follows;

	Original
Quizzes (4 x 5%)	20%
Midterm	32%
Final Exam	48%

Intellectual Property Statement

Course material (i.e. course content (including lecture notes), videos, solutions, practice questions and other supplementary material posted on OWL) is the intellectual property of your instructors and course developers and is made available to you for your personal use in this course. *Sharing, posting, selling or using this material outside your personal use in this course is considered to be an infringement of intellectual property rights.*

Policy on tests and examinations

Tests and examinations in this course may be conducted using a remote proctoring service, such as Proctortrack or Zoom. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

and the Remote Proctoring at Western website at

<https://remoteproctoring.uwo.ca>.

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link:

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

Assessments in this course may also be set up in a linear format with NO return to previous questions. This means that for each question on the assessment, you will not be able to return to the previous question once you click "Next".

Use of remote proctoring and other anti-cheating measures in this course are a means for validating that students have met the learning outcomes of the course. It also assures students that they can write assessments on equal terms with their classmates and signals to prospective employers, graduate supervisors, and professional schools that, despite the COVID-19 pandemic, Western has endeavoured to maintain the high standards that are at the core of our degrees.

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. Regular engagement with the online course materials and in online tutorials is strongly encouraged. Students are advised that excessive absenteeism may result in being debarred from the final examination (see Western Academic Calendar).

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>].

Although these were developed with a lecture-based course in mind, the spirit of the expectations applies to this course as well. In summary the policies developed are under the premise that all interactions between student and faculty should be governed by the principles of courtesy, respect and honesty.

Students are encouraged to ask questions on the appropriate forums. Do not use course-related OWL Forums for social conversation unrelated to the course. Keep postings to the OWL Forums positive and productive – the OWL Forums are an important component of our learning environment. Inappropriate or disrespectful postings will not be tolerated.

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. 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) 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://www.uwo.ca/sci/counselling/>.

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/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 http://www.registrar.uwo.ca/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 Quizzes: There will be NO make-ups for any of the online quizzes. If you miss a quiz (with a valid reason), the weight will be reassigned to the test and exam components.

Academic Policy

The website for Registrarial Services is <http://www.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: 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.

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

APPROXIMATE Weekly Course Calendar

Lectures – 2021	Section	
Jul 5-9	Point estimation, Confidence intervals for a single sample (sections 7.1 - 7.4, 8.1 – 8.3)	
Jul 12-16	Confidence intervals and hypothesis tests for a single sample (sections 8.3 – 8.5, 9.1 – 9.4)	
Jul 16	Quiz 1	
Jul 19-23	Hypothesis tests for a single sample, Confidence intervals and hypothesis tests for two samples (sections 9.4 – 9.5, 10.1 – 10.3)	
Jul 23	Quiz 2 and Tutorial/Class	
Jul 26-30	Confidence intervals and hypothesis tests for two samples, Analysis of variance (sections 10.3 – 10.6, 11.1 – 11.2)	
Jul 30	Midterm Test	
Aug 2-6	Analysis of variance, Regression and correlation (sections 11.2 – 11.5, 12.1 – 12.3)	
Aug 6	Quiz 3	
Aug 9-13	Regression and correlation (sections 12.3 – 12.7)	
Aug 13	Quiz 4	
Final Exam – To be scheduled by the Registrar's office (3 hours)		