



## Department of Statistical and Actuarial Sciences STATS 3858B: Mathematical Statistics

### Course outline for Winter 2021



Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>.

### Technical Requirements and Important Dates:



Stable internet connection



Laptop or computer



Working microphone



Working webcam



Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
January 11	February 13 – 21	April 12	April 13	April 14 – April 30

\* March 15, 2021: Last day to drop a second-term half course without penalty

**Note: All times listed are local to London, Ontario.**

### 1. Course Information

#### Lectures

Mondays, Wednesdays, and Fridays 11:30am-12:30pm

Synchronous lectures will be conducted via Zoom and the link is provided on OWL. The lectures on Mondays and Wednesdays will operate as drop-in sessions when you can ask questions about the course material or assessments. The Friday lecture will involve your active participation and attendance is required.

#### Tutorial

Wednesdays 5:30-6:30pm

Tutorials will be conducted via Zoom and the link is provided on OWL.

## 2. List of Prerequisite(s)

A minimum mark of 60% in Statistical Sciences 3657A/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. You can be deregistered at any time even after writing the final exam. 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

## 3. Instructor Information

Dr. Simon Bonner



Office: WSC 276

Phone: 519-661-2111 ext. 88205

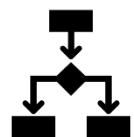
E-mail: [simon.bonner@uwo.ca](mailto:simon.bonner@uwo.ca)

Office hours: By appointment

I will not be on campus regularly this semester, and so e-mail is the best way to get in touch. Please use your Western (@uwo.ca) email addresses when sending a message. I do my best to respond to e-mail within one business day. If you would like to talk face-to-face but are unable to make my office hours then please send me an e-mail and we can arrange another time to meet.

## 4. Course Syllabus, Schedule, and Delivery Mode

### Course Description



The official course description says that this course is about: Point estimation (sufficiency, completeness, consistency, unbiasedness, Cramer-Rao inequality, Rao-Blackwell theorem) Hypotheses tests (uniformly most powerful tests, likelihood ratio tests). If that didn't make you excited about the course, then... I'm not really surprised. I'm also not sure why interval estimation isn't included. The construction of interval estimates (i.e., confidence intervals or credible intervals) is just as important as point estimation and hypothesis testing, and we will discuss this too.

The course is really about how we develop statistical procedures and the mathematical procedures that we can apply to evaluate and compare different methods for solving the same problem. We will look at some general methods for finding estimators or constructing tests and look at ways that we might prove that these quantities are optimal – and what that may even mean.

## Method of Delivery

The move to online teaching brings new opportunities and new pitfalls. I will try to take advantage the opportunities and avoid as many of the pitfalls as I can. Please be patient as there are certain to be bumps along the way. I will try to do the same. The best way to make sure that we avoid problems is to communicate. Please let me know as soon as possible if you have any issues with the course or if you spot any errors.

The course will be offered through a combination of recorded lectures and live sessions. Each week I will post recordings combining short lectures that summarize or expand on the material in the textbook chapters and also go into detail on several worked examples. I have chosen to make these asynchronous to help students who may be in different time zones.

Friday lectures will require active participation and attendance will be mandatory.

## Table of Contents and Schedule

Tentative course outline.

Week	Dates	Content
1	Jan 11 - 15	How to Read and Do Proofs
2	Jan 18 -- 22	4.1 Statistics
3	Jan 25 -- 29	4.2 Sufficient Statistics
4	Feb 1 -- 5	4.3 Minimum Variance Unbiased Estimators 4.4 Case Study -- The Order Statistics
5	Feb 8 -- 12	5.1 Maximum Likelihood Estimation
6	Feb 22 -- 26	5.2 Bayesian Estimation
7	Mar 1 -- 5	5.3 Interval Estimation 5.4 Case Study -- Modeling Obsidian Rind Thickness
8	Mar 8 -- 12	6.1 Components of a Hypothesis Test 6.2 Most Powerful Tests
9	Mar 15 -- 19	6.3 Uniformly Most Powerful Tests
10	Mar 22 -- 26	6.4 Generalized Likelihood Ratio Tests
11	Mar 29 -- Apr 2	6.5 Large Sample Tests 6.6 Case Study -- Modeling Survival of the Titanic Passengers
12	Apr 5 -- 9	TBD

## 5. Course Materials

### Textbook

The required text for this course is:

Rossi, Richard J (2018) Mathematical Statistics: An Introduction to Likelihood Based Inference. Wiley. ISBN: 978-1-118-77104-4

You may access a free electronic copy of this book in PDF format through Western Libraries by following [this link](#). You may also purchase a hardcopy from the university bookstore. Chapters 1 through 3 provide background on probability that you should be familiar with already. I will assume that you know this material. We will cover the content in Chapters 4 through 6.



Other materials may also be provided. Students should pay attention to announcements posted on OWL. This is the primary method I will use to communicate with the class. Students are responsible for checking OWL on a regular basis.

If you need assistance then you can seek support on the [OWL Help page](#). Alternatively, contact the [Western Technology Services Helpdesk](#). They can also be contacted by phone at 519-661-3800 or ext. 83800.

[Google Chrome](#) or [Mozilla Firefox](#) are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click [here](#).

## 6. Methods of Evaluation

Your overall course grade will be calculated as listed below:

Active learning	10%
Assignments (3 or 4)	20%
Midterm Exam	31%
Final Exam	39%

The midterm exam is tentatively scheduled for between February 22 and 26 and will cover all of the content in the course up to the reading break. The exact date and time will be decided by the registrar's office. I will let you know as soon as I can.

The final exam will be cumulative and will cover the material from all lectures and assigned textbook readings. The date of the final exam will be scheduled by the registrar's office.

Exams will be conducted through ProctorTrack. Please speak with me as soon as possible if this will be a problem.

The active learning component of the course students will be conducted in groups using Zoom breakout rooms. Student will take turns solving exercises and presenting their solutions to the other members of the group each week. Grades will be based on peer evaluation of your presentations as well as your participation in the group. Further details will be provided in the first week of the course.

## Late or Missed Evaluations

- Assignments:
  - Late assignments without illness self-reports or other accommodation will be subject to a late penalty 20%/day
  - Late assignments with illness self-reports or other accommodation should be submitted within 24 hours of the end of the accommodation period. Assignments submitted any later will be subject to a late penalty of 20%/day.
  - Assignments that are more than 5 days late will not be accepted, even with accommodation.
  - If you are granted extended accommodation that covers the entire period for 5 days after the due date of an assignment then the remaining assignments will be reweighted to make up 20% of your final grade.
- Midterm examinations:
  - If an examination is administered only through the Tests and Quizzes tool on OWL then submissions will not be accepted after the exam closes.
  - If an examination requires submission through Gradescope then late submissions will be subject to a penalty of 1% per minute for the first 10 minutes and 5% per minute thereafter.
  - If a student misses the midterm examination then the weight of the midterm will be moved to the final exam.

## Rounding of Marks Statement

Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark “bumping” will be denied.

## 7. 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 Academic Accommodation for Students with Disabilities policy can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

If you are a student with a disability and require extra time accommodation, please ensure your accommodations are active on the Accommodated Exams website <https://studentservices.uwo.ca/Accommodatedexamssignup/> for this course **at least 10 days before any timed assessment** (i.e., midterm or final examinations). Any accommodations posted there will be applied to your assessment.

### Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an online portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

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

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

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

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

## **Religious Accommodation**

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

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

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](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

## **8. Academic Policies**

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.

Only non-programmable calculators may be used on the midterm and final examinations. **No other electronic devices are permitted to be used** except as required by the exam format (e.g., to connect to ProctorTrack or submit solutions to Gradescope).

**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](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

Tests and examinations in this course will be conducted using the remote proctoring service, such as Proctortrack. 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>

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/>

## **Professionalism & Privacy**

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:



- Students are expected to follow online etiquette expectations provided on OWL
- All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
- Recordings are not permitted (audio or video) without explicit permission
- Permitted recordings are not to be distributed
- Students will be expected to take an academic integrity pledge before some assessments
- All recorded sessions will remain within the course site or unlisted if streamed

### **Copyright Statement**

Please be aware that all course materials created by the instructor(s) are copyrighted and cannot be **sold/shared**. Those include materials used in tests/quizzes, midterms, and finals. Any posting/sharing of such materials in part or whole without owner's consent is considered as violation of the Copyright Act and will be considered as a scholastic offence.

In addition, online services such as Chegg are actively monitored. Any questions that are coming out during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

## **9. Support Services**

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

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 Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

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/mental\\_health](http://www.health.uwo.ca/mental_health)) for a complete list of options about how to obtain help.

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