

SS4864A/9864A Course Outline for Fall 2024

1. Course Information

Course Information

Course Name:	Advanced Statistical Computing
Course Number:	SS4864A/SS9864A
Academic Term:	Fall, 2024
Lecture Hours:	MWF 10:30 – 11:30 AM.
Lecture Room:	UCC-54B

List of Prerequisites

Undergraduate Students

A minimum of 60% in SS2864 and SS3859.

Graduate Students

Enrolled in the graduate program in the Department of Statistics and Actuarial Sciences at Western (Statistics, Actuarial Science, Financial Modelling, Biostatistics) and have taken a first course in mathematical statistics using calculus and linear algebra. Good understanding of Statistical inferences and Modeling. A previous course in computing programming is preferred.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may be removed from this course and it will be deleted from your record. 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.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Hao Yu	hyu@uwo.ca	WSC 217	519-661-3622 (x83622)	TBA
TA Info				
Hongjun Sim	hsim22@uwo.ca			
Zhaoqi Yang	zyang633@uwo.ca			

Students must use their Western (@uwo.ca) email addresses when contacting their instructors or TAs.

3. Course Syllabus, Schedule, Delivery Mode

This course introduces students to ways of implementing various statistical procedures in R. For computation intensive procedures, C programming and R to C interface will be introduced. The aim is to gain a good understanding of how to efficiently use packages to perform data analysis. The approach will be research-orientated and therefore students will learn in detail how various statistical procedures are implemented. If time permits, SAS macro programming will be discussed. Topics covered though not restrict to those will include:

- Data preprocessing
- MLE, Inference including hypothesis tests, bootstrap, and MCMC
- Regression (simple, multiple, glm, smoothing, etc)
- Statistical Monte Carlo simulation
- Data mining and modelling overfitting/underfitting
- Statistical parallel computing
- SAS macro programming (time permits).

Learning Outcomes

- Upon successful completion of this course, students will be able to use R efficiently to work with advanced statistical computing problems.
- Break down a big and/or complex computing problem into many small and easy to handle tasks.
- Interactive with other languages such as C to speed up computation time.

Classes begin: September 5, 2024

Fall Reading Week: October 12 – 20, 2024

Classes end: December 6, 2024

Exam period: December 9 – 22, 2024

4. Course Materials

There is no required textbook. The main reference book is

Modern Applied Statistics with S. 4th edition, Springer by Venables, W.N. and Ripley, B.D. (2002).

Software needed: A personal computer that has R and RStudio installed (Windows, Mac, Linux) is highly recommended since they are required to complete all assignments. Most of the course will be in R while there might be SAS coding involved in the later part of the course if time permits. If needed, <https://myvlab.uwo.ca> will be used to run SAS codes.

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

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

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments (5)	25%
Midterm	35%
Oral Presentation	10%
Final Project	30%

Assignments: There are about 5 assignments, given out roughly one every two weeks. All assignments must be done electronically (all assignments must be prepared using RStudio Markdown/Notebook (PDF)) and be submitted to owl before deadline.

For graduate students, per SPGS requirements, there is **an extra question** to work on in each assignment.

Each student has two coupons that can be used for handling assignments after passing the deadline. Each coupon allows up to 24 hours after deadline. That is, if an assignment is due on Oct 28, 11:55 pm, you can handle in your assignment before Oct 29, 11:55 pm with one coupon used. You can stack two coupons together so that you can handle in your assignment on Oct 30, 11:55 pm.

Late Submissions if two coupons are already used up.

- Assignments that are submitted late will be subject to a 20% penalty per day or portion thereof, including weekends and holidays.
- Assignments that are submitted 5 or more days late will not be graded.

Midterm: There will be a 2-hour closed book and in-person midterm, tentatively setting on October 29, 7:00 pm to 9:00pm. It will be booked and confirmed through the Exam Central. Exam room info will be posted once it is available.

Final project including oral presentation: There will be a course project with oral presentation involved. The maximum number of students in each group will be 2. The oral presentation will contribute 10% toward the final grade. 30% will be graded based on your written project. Be aware that each member in a group must contribute equally to your project in terms of preparation, coding, debugging, running, writing slide/project (so that you will be given the same grade). Otherwise, different grade is given based on the amount of work you contribute to.

Presentation Slides Due: Nov 27, 11:55 pm. To be submitted through OWL (pdf or PowerPoint).

Last three or four lectures are reserved for your oral presentations. Each group will have about 15 minutes to present including Q & A.

Written Project Due: Dec 20 11:55 pm. To be submitted through OWL with dataset if applicable.

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.

General information about missed coursework

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.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

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.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Midterm and final project including oral presentation.

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

Assignments: Further accommodation beyond late coupons and late penalty must be approved via the Dean’s Office/ Academic Counselling unit of your Home Faculty. Students who obtain appropriate accommodation will have the weight of the missed assignment distributed to further assessments.

Midterm: No makeup midterm is given. If you miss a midterm, you must request accommodation from Academic Counselling in your Faculty’s Dean’s Office. The weight may be redistributed to other categories by the instructor.

6. 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.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

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.

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/>.

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

This course is supported by the Science Student Donation Fund. If you are a student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Advising site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at ssc@uwo.ca.