COURSE OUTLINES (SYLLABI) FOR GRADUATE COURSES

FM9593B Course Outline, 2022

1. Course Information

Course Information

Course Name: Monte Carlo Methods and Financial Applications
Course Number: FM9593B
Academic Term: Winter, 2022
Lecture Hours: MWF 1:00 – 2:00 PM
Lecture Room: WSC 248

Online lecturing: From Jan 10 to Jan 31, all lectures are scheduled online with synchronous Zoom lecturing. Any change will be notified in advance.

List of Prerequisites

A third-year undergraduate understanding of probability and statistics is required for this course. Students should be comfortable with commonly used univariate and multivariate distributions, expectations (including variance and covariance), transformation of variables, linear regression, estimation, and basic statistical tests. The ability to program in a quantitative programming environment such as R is also required. It would be helpful (although not necessary) to have basic knowledge of ordinary and partial differential equations, stochastic processes, stochastic differential equations, and Ito calculus. As most of the examples are from financial applications, some knowledge of finance and derivatives pricing would also be useful.

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. 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@stats.uwo.ca	WSC 217	519-661-3622 (x83622)	TBA
Teaching Assistants				

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

Office hour format: in-person.

3. Course Syllabus, Schedule, Delivery Mode

This course is intended to be an introduction to Monte Carlo simulation methods. Topics to be covered include

1. Random number generation (RNG) for uniform, non-uniform, discrete and continuous Distributions. How to check RNG quality.
2. Simulation of stochastic processes. Introduce some R packages to simulate SDE.
3. Variance reduction techniques. Many techniques are introduced.
4. Special topics as time allows

Learning Outcomes

- Upon successful completion of this course, students will be able to use R to design and conduct Monte Carlo simulation properly.
- Choose a proper random number generator (RNG) and seed.
- Deploy many Monte Carlo techniques such as variance reduction method.

Classes begin: January 10, 2021
Reading Week: February 19–27, 2022
Classes end: April 8, 2022

Contingency plan for an in-person class pivoting to 100% online learning
In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

Course delivery and assessment with respect to the COVID-19 pandemic
Although the intent is for this course to be delivered in-person to the extent possible, the changing COVID-19 landscape may necessitate some or all of the course to be delivered online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience), as deemed most appropriate by the instructor. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

When deemed necessary, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledging that you will be required to provide personal information (including some biometric data) and that the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

4. Course Materials

Reference Book: D.L. McLeish. Monte Carlo Simulation & Finance. HG6024.3.M357 2005

Software needed: A personal computer/laptop that has R and RStudio installed (Windows, Mac, Linux) is highly recommended since it is required to complete assignments.

Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All course material will be posted to OWL: http://owl.uwo.ca.

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

Technical Requirements
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.

For online classes and evaluation, students are required to have

- a laptop or computer
- a working microphone and webcam
- a reliable internet connection.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

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

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.

Late Submissions

- 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.

There will be a 2-hour closed book and in-person midterm, tentatively setting on March 2, 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.

There will be a course project with oral presentation involved. The maximum number of students in each group will be 2 and it might change later depending on the number of students enrolled in this course. 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, codling, 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: March 24, 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: April 28 11:55 pm. To be submitted through OWL with dataset if applicable.

Accommodated Evaluations

No makeup midterm is given. The weight may be redistributed to other categories by the instructor.

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.

6. 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) 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.

(ii) 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, unless otherwise instructed in the course outline

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.

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 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,

8. 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.

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).

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling 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/.

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.

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/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/services.