

**Advanced Financial Modelling
FM 4521B/FM 9521B
Winter 2022 Course Outline**

1. Course information:

Instructor	Day/Time	Location	Contact	Office hours
<u>Dr. Amin Hassan Zadeh</u>	Tu: 11:30 am-12:30 pm Th: 11:30 am-1:30 pm	Online. The Zoom link will be announced in OWL. ¹	Use Messages in OWL. (to Instructor's Role)	Mondays 3:30 - 4:30. The Zoom link will be announced in OWL. ²

Calendar description: In this course, you will learn continuous-time models, Brownian motion, stochastic integrals, Ito's lemma, Black--Scholes--Merton model, arbitrage and market completeness, Black--Scholes PDE, risk-neutral pricing and martingale measures. Other topics include greeks and hedging, extensions of Black--Scholes model, implied volatility, American option valuation, Vasicek and Cox--Ingersoll--Ross interest rate models.

Requisites: SS2857A/B, SS3520A/B. A minimum mark of 60% in either Financial Modelling 3520A/B (or the former Statistical Sciences 3520A/B), or Financial Modelling 3613A/B (or the former Applied Mathematics 3613A/B) and a minimum mark of 60% in Statistical Sciences 2857A/B. A minimum mark of 60% in either Statistical Sciences 3520A/B.

Anti-requisites: SS4521F/G The former Statistical Science 4521F/G.

Extra Information: Coding in R or Python is required.

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.

¹ If the course delivery moves to in-person, the location is WSC 240

² If the course delivery moves to in-person, the office hour holds in WSC room 270

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>.

2. Course Objectives and Schedule

As a result of completing this course, students will be able to understand and apply the basics of continuous stochastic models in finance, including:

- Brownian motion and its applications in finance
- Ito's Lemma
- Black Scholes Merton model and Black Scholes extensions
- Stochastic Integrals
- American option valuations
- Modeling interest rate
- Risk neutral and martingale measures

3. Communication

- To communicate with the instructor **always use OWL Messages (to Instructor's Role)**.

You can expect a response to a message to the instructor within **approximately 48 hours** during the work week (during busy times, it may take a little longer). ***Note that messages will not be answered within the 24-hour period before exams or project deadlines***, nor can I guarantee responses over weekends/holidays.

Students should check OWL (<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. Students are responsible for checking OWL on a regular basis.

The Forum tool is enabled on the OWL website. Please use this Forum to post and respond to questions about course content (e.g., lecture, readings, etc). The Forum will be monitored on a regular basis and the instructor or TAs will interject with corrections or responses as necessary. As this is an open Forum, please be respectful of your peers, instructor(s), and TAs. Derogatory, discriminatory, or otherwise inappropriate language or topics will be removed and dealt with at the instructor's discretion.

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.

5. Course Materials

Text Books³ 1- John Hull's (10th ed) Options, Futures, and Other Derivatives, Prentice Hall, New Jersey. [H]
 2- Jaksza Cvitanic and Fernando Zapatero (2004). Introduction to the Economics and Mathematics of Financial Markets. MIT Press, Cambridge, Massachusetts. [CZ]

6. Methods of Evaluation

Component	Weight	Deadlines/Due dates
Assignment 1	5%	Assig. 1 due Feb 04,
Assignment 2	5%	Assig. 2 due Feb 28
Assignment 3	5%	Assig. 3 due March 18
Assignment 4	5%	Assig. 3 due April 08
Midterm	30%	March 07 – 11. to be scheduled by the Registrar's Office.
Final exam (closed book)	55%	During exam period (to be scheduled by the Registrar's Office). Cumulative.

- **Assignments will be available on the course OWL site. However, you will not submit your solutions to OWL. Instead, assignments must be submitted through Gradescope (<https://www.gradescope.com/>)** an on-line collaborative grading system. It is your responsibility to make sure that your assignment is successfully uploaded and legible. Submissions that cannot be read by the grader will receive a grade of zero.
- After receiving the grades from an assignment, **students will have seven days to submit any regrade requests on that assignment.** After this seven-day period, regrade requests will NOT be accepted. Regrade requests must be made using the Gradescope tool "Regrade Request".
- **Students must submit at least 2 out of the 4 assignments to write the final exam.**

³ NOTE: Whilst the materials will be based on H and CZ, the instructor will supplement these with more mathematical materials based on his course/lecture notes. You are responsible for the lecture materials that you miss if you are unable to attend the class.

- **Assignment submissions are due 11:55pm (Eastern Time) on the due date.** No credit will be given for submissions beyond this time unless a valid academic accommodation is obtained (see Section 7 for details on accommodation).
- Solutions to assignments **will not** be posted; however, TAs will provide comments on wrong answers using Gradescope, which will allow students to find out the correct solutions. In addition, students can ask the instructor and TAs for more details on solutions during office hours.

i) Midterm and final exams

- There will be a **2-hour closed-book midterm exam to be scheduled by the Registrar's Office scheduling system.**
- There will be a **3-hour closed-book final exam and its time will be scheduled by the Registrar's Office.**

ii) Rounding of marks

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

- If you are unable to submit an assignment by the due date/time, you must seek approval for the absence as soon as possible and contact your instructor immediately. Approval can be granted either through a self-reporting of absence (SRA) or via the Dean's Office/Academic Counselling unit of your Home Faculty. Those **students obtaining such appropriate accommodation will have to submit their assignment via OWL messages within 48 hours of the end of the accommodation period.** Failure to submit a missed assignment within 48 hours of a valid academic accommodation period will result in a grade of 0%.
- If you miss the Midterm you must request accommodation from Academic Counseling in your Faculty's Dean's Office. Students who obtain appropriate accommodation will have the weight of the midterm redistributed to the final exam.
- If you miss the Final Exam you must request accommodation from Academic Counseling in your Faculty's Dean's Office and contact the instructor immediately.
- 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)

- 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>

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.

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. Approval can be granted either through a self-reporting of absence or via the Dean's Office/Academic Counselling unit of your Home Faculty. For further information, please consult the university's policy on academic consideration for student absences:
<https://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=1&command=showCategory&SelectedCalendar=Live&ArchiveID=>

Participants in this course are not permitted to record lectures and/or labs, except where recording is an approved accommodation, and the participant has the prior written permission of the instructor.

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.

Professionalism & Privacy

Western students are expected to follow the Student Code of Conduct (<https://www.uwo.ca/univsec/pdf/board/code.pdf>). Additionally, the following expectations and professional conduct apply to this course:



- 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

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 assignments, 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 from assignments and are posted to an online service will be searched. Such an activity will be considered a scholastic offence and will result in an 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 661-2147 if you have any questions regarding accommodations.
- 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) 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>.