**Department of Statistical and Actuarial Sciences**

 **FM3613B Course Outline**

**1. Course Information**

**Course Information**

 Course Name: Mathematics of Financial Options (FM 3613B)

 Lecture Hours: Monday, Wednesday, Friday, 2:30 – 3:30 PM, in-person Room WSC240.

**List of Prerequisites**

Applied Mathematics 2402A or the former Differential Equations 2402A; or Statistical Sciences 2503A/B (or the former Applied Mathematics 2503A/B).

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**

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| **Instructors** | **Email** | **Office** | **Office Hours** |
| Dr. Marcos Escobar-Anel | Marcos.escobar@uwo.ca | WSC282 | In-person, Wednesday 8-10 am. |
| TA: TBA |  |  |  |

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

**3. Course Syllabus, Schedule, Delivery Mode**

An introduction to modern financial mathematics using a differential equations approach. Stochastic differential equations and their related partial differential equations. The Fokker-Planck and Kolmogorov PDEs. No-arbitrage pricing, the Black-Scholes equation and its solutions. American options. Exotic options.

**Learning Outcomes.** Upon successful completion of this course, students will be able to:

* Intuition about uncertainty and risk.
* The classical approach to decision making under uncertainty.
* Repaying loans over time.
* Bond pricing with default: using difference equations.
* Tranching and collateralized debt obligations.
* Mean-variance portfolio optimization.
* Capital Asset Pricing Model.
* Basic Stochastic Calculus.
* Black-Scholes equation.

**Table of Contents and Schedule:**

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| **Week** | **Dates** | **Topic** | **Instructor** |
| 1 | Jan 6 - 10  | Probability, Risk and Uncertainty. | M. Escobar-Anel |
| 2 | Jan 13 - 17  | Repaying loans over time. | M. Escobar-Anel |
| 3 | Jan 20 - 24 | Bond Pricing with Default. | M. Escobar-Anel |
| 4 | Jan 27 – 31 | CDO and Tranching. (Test 1) | M. Escobar-Anel |
| 5 | Feb 3 - 7  | CDO and Tranching.  | M. Escobar-Anel |
| 6 | Feb 10 -14  | Mean Variance Portfolio. | M. Escobar-Anel |
| 7 | Feb 17 - 21  | Reading Week | N/A |
| 8 | Feb 24 – 28  |  Mean Variance Portfolio. (Test 2) | M. Escobar-Anel |
| 9 | Mar 3 - 7  | Capital Asset Pricing Model. | M. Escobar-Anel |
| 10 | Mar 10 - 14 | Basic Stochastic Calculus. | M. Escobar-Anel |
| 11 | Mar 17 – 21 | Basic Stochastic Calculus. (Test 3) | M. Escobar-Anel |
| 12 | Mar 24 – 28 | Black-Scholes Formula. | M. Escobar-Anel |
| 13 | Mar 31 - Ap 6 | Black-Scholes Formula. | M. Escobar-Anel |

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Classes begin: September 5, 2024; January 6, 2025

Fall Reading Week: October 12 – 20

Spring Reading Week: February 17 – 21, 2025

Classes end: December 6, 2024; April 4, 2025

Exam period: December 9 – 22, 2024; April 7 – 30, 2025

**Contingency plan**

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

**4. Course Materials**

Textbook (required): Quantitative Finance: A Simulation-Based Introduction Using Excel. Matt Davison. 978-1439871683

Supplemental: Instructor’s course notes.

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.

**5. Methods of Evaluation**

The overall course grade will be calculated as listed below:

Midterm Exam 1: 15 % (week of 27/Jan)

Midterm Exam 2: 15 % (week of 24/Feb)

Midterm Exam 3: 15 % (week of 17/ March)

Final Exam 55 %

**Midterm Tests:**

There will be 3 tests during class, closed book, each containing two parts (multiple choice and short answer). Students will have 50 minutes to complete the test. Chapters and topics for the tests will be announced in advance through OWL.

**Final Exam:**

The final exam will be a three-hour cumulative examination. It will be scheduled by the Registrar’s office (Examination period April 11 - 30, 2024).

**Accommodated Evaluations**

* NO makeup test for Midterms. If you miss a test (with a valid reason), the weight of the test(s) will be moved to the remaining exams.
* If the make-up for the final is missed, the student will receive an INC and complete the task the next time the course is offered.

**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**

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

**Assessments worth 10% or more of the overall course grade:**

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Advising Office of your Faculty of Registration as soon as possible. For further information, please consult the University’s medical illness policy at

<https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf>.

The Student Medical Certificate is available at

<https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf>.

The grade of the missing exam will be reweighted among the remaining exams.

Recognizing that formal documentation may not be available in some extenuating circumstances, the university allows students to make one Academic Consideration request without supporting documentation in this course.

**Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Advising office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (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” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under [Special Examinations](https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#SubHeading_70)).

**7. Accommodation and Accessibility**

**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 an accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Advising office of their Faculty of Registration. Please visit the Diversity Calendars posted on our university’s EDID website for the recognized religious holidays:

[https://www.edi.uwo.ca](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](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf).

**8. Academic Policies**

The website for Registrarial 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.

Students are allowed to use a non-programmable calculator on quizzes, midterms, and the final exam.

**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>.

**9. 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.

Learning-skills counsellors at Learning Development and Success ([https://learning.uwo.ca](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.