

# **AS2553A Mathematics of Finance**

## **Fall 2024**

### **Course Outline**

## **1. Course Information**

<b>Course name</b>	AS2553A – Mathematics of Finance
<b>Academic term</b>	Fall 2024
<b>Lecture hours</b>	Monday, Wednesday, Friday 3:30 – 4:30 PM BGSB-0165
<b>Tutorial hours</b>	Monday, 5:30 – 6:30 PM, WSC-55 No tutorials for the first few weeks. An announcement will be posted on OWL once the tutorials commence.

### **Prerequisites:**

A minimum mark of 60% in one of Calculus 1501A/B, Numerical and Mathematical Methods 1414A/B, the former Applied Mathematics 1414A/B, the former Applied Mathematics 1413, or a minimum mark of 85% in Calculus 1301A/B. Integrated Science 1001X with a minimum mark of 60% can be used in place of Calculus 1301A/B.

### **Anti-requisites:**

Actuarial Science 2053

Priority to students enrolled in a module offered by the Department of Mathematics, and the Department of Statistical and Actuarial Sciences.

Unless you meet the requisites and the anti-requisites requirements for this course or have written special permission 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 meet the prerequisites or the anti-requisites requirements

## 2. Instructor Information

Instructors	Email	Office	Office Hours
Dr. Yang Miao (Course Coordinator)	ymiao42@uwo.ca	WSC190	Tuesdays 2:00 – 5:00 PM
Vaneh Azarian (Teaching Assistant)	vazarian@uwo.ca		TBD

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

## 3. Course Syllabus, Schedule, Delivery Mode

### Course Description:

Time value of money, accumulation and discount functions, effective rates of interest and discount and present values, as applied to annuities and other financial products, and/or applications including loan repayment schedules and methods.

### Topics

A tentative weekly schedule will be posted on OWL.

- **Chapter 1 – The Time Value of Money (2 weeks)**  
Accumulation and amount functions; effective rate of interest; accumulating and discounting with simple and compound interest; time periods; rate of discount; nominal rates of interest and discount; force of interest and discount; varying interest
- **Chapter 2 – Equivalence Equations (1 week)**  
Equations of value; determining the length of time or rate of interest for an investment; treasury bills; real rate of interest
- **Chapter 3 – Simple Annuities (2 weeks)**  
Annuity immediate; annuity-due; deferred and forborne annuities; determining the length of an annuity; determining the rate of return
- **Chapter 4 – Other Types of Annuities (2 weeks)**  
Annuities payable more or less frequently than interest is compounded; perpetuities; continuous annuities; varying annuities
- **Chapter 5 – Repayment of Debts (2 weeks)**  
Amortization schedules; determining the outstanding balance of a debt; sinking fund method of repaying a loan; refinancing a loan
- **Chapter 6 – Bonds (1.5 weeks)**  
Bond prices on and between coupon dates; amortization of a bond, callable bonds, determining the rate of return
- **Chapter 7 – Rates of Return (1.5 weeks)**  
Internal rate of return; net present value; dollar-weighted and time-weighted rates of interest; dividend discount model

- **Chapter 8 – Yield Curves (1 week)**  
Term structure of interest rates; spot rates; forward rates; the yield curve
- **Chapter 9 – Asset-Liability Management (if time permits)**  
Duration; modified duration; convexity; immunization

#### **Key Sessional Dates**

September 5, 2024	Classes begin
September 30, 2024	National Day for Truth and Reconciliation
October 12 – 20, 2024	Fall Reading Week
December 6, 2024	Classes end
December 9 – 22, 2024	Exam period

## **4. Course Materials**

### **Textbook**

*Financial Mathematics – Theory and Practice*, 2<sup>nd</sup> Edition, by Robert Brown and Steve Kopp. Available digitally.

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.

### **Calculator**

A non-programmable calculator is required for lectures, assignments, midterms, and the final exam.

Actuarial science students are strongly recommended to use an SOA-approved calculator. Only the following models of Texas Instruments calculators are approved for SOA exams:

- BA-35
- BA II Plus
- BA II Plus Professional
- TI – 30Xa or TI – 30XA, same model just different casing, both approved.
- TI-30X II (IIS solar or IIB battery)
- TI-30XS MultiView (or XB battery)

## 5. Methods of Evaluation

### University Accreditation Program – Canadian Institute of Actuaries (CIA)

#### Honours Specialization in Actuarial Science

If you graduate from Western with an HSP in Actuarial Science, this course will be one of the courses that you will take in your program that will allow you to be exempt from the preliminary exams of the Society of Actuaries (SOA). If your plan is to become a fully qualified actuary working in Canada, then all you would need to do is graduate from your HSP in actuarial science and you would then be eligible for the CIA Capstone Exam. Taking and passing this exam, along with completing two online modules and a practice education course, would make you eligible to become an ACIA (Associate of the Canadian Institute of Actuaries).

#### Major in Actuarial Science

If you graduate from Western with a major in Actuarial Science, the CIA accreditation program will not apply to you. If your plan is to become a fully qualified actuary, then you will need to continue to write and pass the preliminary exams of the SOA.

Please see the following link for full details:

<https://www.cia-ica.ca/starting-your-journey/actuarial-education-in-canada/>

In addition to the university's internal policies on conduct, including academic misconduct, candidates pursuing credits for writing professional examinations shall also be subject to the **Code of Conduct and Ethics for Candidates in the CIA Education System**.

<https://www.cia-ica.ca/publications/223159e/>

### **Grading Scheme and Assessment Dates**

The overall course grade will be calculated as listed below:

Assignments (3)	9%
Midterm 1	20%
Midterm 2	20%
Final Exam	51%

### **Tentative Schedule of Assignments and Midterms\***

Assessment	Date	Topics	Format
Assignment 1	Post: September 25 Due: October 2	Chapter 1 and 2	3 -- 5 calculation-based questions
Midterm 1	October 11 during the lecture	Chapter 1 -- 3	1-hour closed-book test. Mixture of multiple-choice questions (around 8) and calculations (around 3)

Assignment 2	Post: November 8 Due: November 15	Chapter 4 and 5	3 -- 5 calculation-based questions
Midterm 2	November 18 during the tutorial session	Chapter 4 -- 6	1-hour closed-book test. Mixture of multiple-choice questions (around 8) and calculations (around 3)
Assignment 3	Post: November 29 Due: December 6	Chapter 7 and 8	3 -- 5 calculation-based questions
Final	Scheduled by the Office of the Registrar	Chapter 1 – 8, possibly Chapter 9 depending on the actual progress	3-hour closed-book test. Mixture of multiple-choice questions (around 15) and calculations (around 4).

*\*The format and/or the exact topics covered in each assessment are subject to changes. Any material deviation from this tentative schedule will be communicated via OWL.*

### 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](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/](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:

- The final exam

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**

### **Policy for using a self-reported absence (SRA)**

- You may use your SRA for any **ONE** of the two midterms and the three assignments.
- You may do so only **ONCE**. Any missed subsequent assessment would require a formal approval, or you will receive 0% for that assessment.
- An absence from the final exam **ALWAYS** requires a formal approval.
- You may not use your SRA retrospectively for attempted or completed works. For example, you may not use your SRA halfway through a midterm or after the grades have been released.

### **Missed assignments**

If you miss an assignment with proper approval, the weight of the missed assignment will be redistributed among the remaining assignments. If you miss all three assignments with proper approvals, their combined weight will be allocated to the final exam.

### **Missed midterms**

No make-up midterms will be offered. If you miss a midterm with proper documentation, the weight of the missed midterm will be reassigned to the final exam. Please note that only the Dean's Office or Academic Counseling unit can approve such accommodations.

For instance, if you miss one midterm with proper approval, the final exam's weight will increase to 71%. If you miss two midterms with proper approval, the final exam's weight will rise to 91%. However, if you miss any midterm without appropriate approval, you will receive a zero for that midterm.

### **Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Counselling 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](#)).

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

### **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](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](mailto: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](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.