

## AS2553A Mathematics of Finance Course Outline – Fall 2025

### 1. Course Information

**Lectures:** Mon/Wed/Fri 3:30 – 4:30 pm North Campus Building (NCB) 117

**Tutorials:** Mon 5:30 – 6:30 pm Western Science Centre (WSC) 55

**Prerequisite(s):** 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](#).

Unless you have either the prerequisites for this course or written special permission from the Department of Statistical and Actuarial Sciences to enroll in it, you may be removed from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

**Antirequisite(s):** Actuarial Science 2053

### 2. Instructor Information

Instructor: Dr. Douglas Woolford

Email: [dwoolfor@uwo.ca](mailto:dwoolfor@uwo.ca)

Office: Western Science Centre (WSC) 221

Phone: 519-661-2111 ext. 88326

Office Hours: As announced in class/on OWL and by appointment.

Email is the best way to contact me. Please use your Western (@uwo.ca) email address. Emails will typically be responded to within one business day. If emailing to request an appointment outside of office hours, please suggest a few options that are listed in your order of preference.

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

**Calendar 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.

#### Course-Level Learning Outcomes

This course is intended to give you an introduction to the underlying formulas and theory regarding interest and interest rates and how they are used in financial calculations. On successful completion, students will be able to perform the following calculations and understand the principles behind them:

- Accumulate and discount a single sum of money at either a simple or compound rate of interest or at a rate of discount
- Determine an effective rate of interest, given a rate of interest that is compounded more than once a year allowing you to compare various investments
- Solve equations of value and recognize the time value of money
- Accumulate and discount a series of payments made at regular intervals of time
- Determine the rate of return on an investment
- Determine the length of time that is required to yield a given rate of return
- Accumulate and discount a series of payments where payments are made at regular intervals of time that differ from how frequently interest is compounded
- Accumulate and discount a series of payments where the payments vary
- Determine loan payments
- Determine the outstanding balance of a loan using the amortization and sinking fund methods
- Deal with interest that is compounded continuously and payments that are made continuously
- Using discounted cash flow analysis and calculating internal rates of return to assist in making business decisions
- Determining the rate of return of a fund when deposits and withdrawals are made
- Understanding the spot rate, forward rate and how to calculate the price of a stock using the dividend discount model

If time permits:

- Calculating the duration, modified duration and convexity of a series of cash flows and be able to use it to approximate the change in the value of a financial asset
- Understanding the terminology of cash flow matching and immunization

#### Delivery Mode

**Lectures:** This is an in-person course. You are expected to attend lectures and actively engage in learning the material that is presented.

**Tutorials:** You are expected to attend tutorials, which will be run in an open format—topics and structure may vary from week-to-week. Possible tutorials include open help sessions, data modelling/computing demonstrations, review, etc. Note that tutorial time could be used to make up missed class time if necessary. Tutorial time may also be used for assessments such as quizzes/tests.

## Important Dates

Sept. 4	Classes begin
Sept. 12	Last day to add a Fall/Winter 24-week course or a Fall 12-week course.
Sept. 15	Canada Life Day. (An event for Actuarial Science students.) No classes/tutorials.
Sept. 30	National Day for Truth and Reconciliation (observed at Western). No classes/ tutorials.
Oct. 13	Thanksgiving holiday. No classes/tutorials.
Nov. 3 – 9	Fall Reading Week (Monday to the following Sunday). No classes/tutorials.
Dec. 1	Last day to withdraw from a Fall 12-week course without academic penalty ( <i>extended from Sunday, Nov. 30</i> )
Dec. 9	Last day of classes in the Fall term
Dec. 10	Study Day(s)
Dec. 11 – 22	December Examination period

See <https://www.westerncalendar.uwo.ca/SessionalDates.cfm> for a complete list of sessional dates.

## Tentative Schedule

### Chapter 1 – The Time Value of Money (2 weeks)

1. 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)

2. 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)

3. 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)

4. Annuities payable more or less frequently than interest is compounded; perpetuities; continuous annuities; varying annuities

### Chapter 5 – Repayment of Debts (2 weeks)

5. 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)

6. 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)

7. Internal rate of return; net present value; dollar-weighted and time-weighted rates of interest; dividend discount model

### Chapter 8 – Yield Curves (1 week)

8. Term structure of interest rates; spot rates; forward rates; the yield curve

## 4. Course Materials

### Required Textbook and Other Learning Materials

#### Required Textbook:

Brown, R. & Kopp, S. (2024). *Financial Mathematics: Theory and Practice* (2<sup>nd</sup> Edition). Published by ACTEX Learning.

- Examples and recommended homework will primarily come from this edition. However, the first edition (either new or second hand) should also be sufficient.
- Cost: \$89 for 6-month license-based access to an electronic version, or \$54 if bundled with the required online resource (the Academic GOAL companion website) as described below.

#### Required Online Resource:

ACTEX Learning Academic GOAL v2.0 – UWO (University of Western Ontario) – ActSci 2553 – Exam FM – ACTEX – FALL 2025 companion learning website.

- Some graded assessments may be assigned through this website. Access to it is required.
- Cost: There are two options for purchase:

Option	Details	Cost
1. Standalone	Access to the Academic GOAL companion website	\$24
2. Bundled	A bundled course material package with access to: <ul style="list-style-type: none"><li>- The Academic GOAL companion website</li><li>- An electronic version of the required textbook</li><li>- An electronic version of the solutions manual to the required textbook</li><li>- Virtual flashcards for SOA Exam FM</li><li>- A formula and review sheet for SOA Exam FM</li></ul>	\$54

Both above options come with a 6-month license-based access that lasts until the end of February 2026 for students who wish to have access to such material should they be attempting the February sitting of the SOA's FM exam.

Information on how to register for Academic GOAL and purchase one of the above two options via course-specific access keys will be posted on the course OWL website.

#### Course Website

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 and selected course material 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

## **Intellectual Property Statement**

Course material developed by your instructor is the intellectual property of the instructor and is made available to students enrolled in this course for their personal use in this course. Sharing, posting or selling this material to third parties (i.e., to people outside of those in this course, or to companies, websites, organizations, associations, etc.) is considered an infringement of intellectual property rights.

## **Technical Requirements**

### **Calculators:**

You will require a cordless, non-programmable scientific calculator. No other electronic and/or wireless devices may be in your possession during quizzes, tests and exams except for this simple scientific calculator.

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)

### **Homework:**

A list of suggested homework problems will be posted on the course website and may be updated throughout the term. Students' homework solutions are not to be handed in. However, working on these problems regularly and diligently is essential to success in the course.

This list represents the minimum number of practice problems that should be attempted when studying for this course. It is strongly recommended that students try other problems, especially if one is having difficulty with a specific topic.

Additional practice can be accessed through the Academic GOAL companion website, where students can complete other problems through practice sessions and mock quizzes, which can be personalized by topic and level of difficulty. Detailed solutions to such problems are also provided.

When working on such problems, students are encouraged to use both calculator and spreadsheet based approaches (when appropriate). A working knowledge of spreadsheets is useful since they are widely used in industry. Demonstrations of the use of spreadsheets may occur class and/or tutorials.

## 5. Methods of Evaluation

### Grading Scheme and Tentative Schedule for Assessments

Assessment	Tentative Number and Approximate Timing/Due Date	Weight
Quizzes	<p>There will be four quizzes, scheduled as follows:</p> <ul style="list-style-type: none"> <li>• Quiz 1: Monday, September 22</li> <li>• Quiz 2: Monday, October 6</li> <li>• Quiz 3: Monday, November 10</li> <li>• Quiz 4: Monday, November 24</li> </ul> <p>These quizzes will either be released through the online Academic GOAL companion site as an assignment with a fixed release window and a time limit with no pausing, or they will be held during the tutorial time. This will be announced in advance.</p>	<p>20%</p> <p>(Best 3 out of 4)</p>
Term Tests	<p>There will be two, 50-minute-long closed book tests that will be held during the following tutorial sessions:</p> <ul style="list-style-type: none"> <li>• Term test 1: Monday, October 20</li> <li>• Term test 2: Monday, November 24</li> </ul>	<p>30%</p> <p>(To be calculated using 1/3 of the lowest-grade test score plus 2/3 of the highest-grade test score)</p>
Final Exam	<p>A 3-hour, cumulative closed book exam is to be held during the Exam Period and will be scheduled by the Registrar's Office.</p>	<p>50%</p>
TOTAL		<p>100%</p>

**Generative AI:** The use of generative AI is not permitted for any closed book assessments (e.g., quizzes, tests, exams). However, as an instructor I recognize the pervasive nature of generative AI and further recognize that its use can help support learning and the achievement of course learning outcomes. Consequently, you are permitted to use generative AI for any “open book” assessments (e.g., assignments). However, note that it is not the instructor’s intention for the potential use of generative AI in any such assessments to replace or detract from your learning of key knowledge and skills. Consequently, authentic and alternative assessment techniques will be employed to support your learning and the achievement of learning outcomes. When necessary or applicable, specific instructions on the appropriate use of generative AI for a given learning activity or assessment will be provided. In such situations, students not comfortable with the use of generative AI are welcome to discuss their concerns and possible alternatives with the instructor. Finally, please note that if you choose to use generative AI for any learning activity or assessment, you are expected to do so ethically; you must fully disclose and describe what tool(s) were used, providing proper citations; and, you must ensure that all submitted work is in accordance with the student code of conduct and institutional policies related to academic integrity and scholastic offences because you will be accepting responsibility for its output if included in any submitted work.

## 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/>

## 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, 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 such requests 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 (Defined by policy)

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

Any missed assessment without an approved academic consideration request will be assigned a grade of zero.

For any assessments that are missed due to approved accommodation or academic consideration one of the following will occur: an extension to its due date will be given; or the weight will be reassigned within that given method of evaluation; or a make-up assessment will be offered; or the weight will be shifted to another grade component/components. The decision on how to proceed in such a situation will be on a case-by-case basis and is at the discretion of the instructor. Typical situations and how they will be handled are described below:

- There are no make-up quizzes. The weight of a quiz that was missed due to an approved Academic Consideration request will typically be shifted to the final exam.
- There are no make-up tests. The weight of a term test that was missed due to an approved Academic Consideration request will typically be shifted to the final exam.

If a make-up assessment is missed, a grade of INC may be assigned, and the student may be required to complete the assessment the next time the course is offered.

When a student misses the final exam and their academic consideration has been granted, they will be allowed to write the special examination (the name given by the University to a makeup Final Exam). See the academic calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

## Essential Learning Requirements

Even when academic considerations are granted for missed coursework, the following are deemed essential to earn a passing grade:

- Before the final exam, students are required to have completed assessments whose weight totals at least 30% of their final grade. (In other words, students must have written at least 2 quizzes and one term test, or at least one quiz and both term tests.) Students who do not meet this requirement will be assigned a grade of incomplete and may be given an opportunity to complete this requirement during the next offering of the course.

## Coursework with Assessment Flexibility

By policy, instructors may deny academic consideration requests for the following assessments with built-in flexibility:

### Flexible Completion

**Quizzes:** This course has 4 quizzes, and the 3 quizzes with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for their first missed quiz. Academic consideration requests will be denied for the first missed quiz. Academic consideration requests may be granted when more than 1 quiz is missed, and these additional (2nd, 3rd...) missed quizzes will be reweighted to the final exam.

## 6. Additional Statements

### 6.1 Instructor Policies

**Privacy:** The names of student(s) may be divulged to other members of the class during class activities. Individuals who are concerned about such disclosures should contact the course instructor to identify whether there are any possible alternatives.

**Checking Marked Work:** In the event of a question regarding a mark on an assessment or a final grade, students are responsible for retaining and presenting any graded materials that were returned to the student during the term. In addition, students have one week from the date the graded material was returned (either in-person or released electronically) to report any apparent error in the marking and appeal their grade. No marks will be changed after that time. The instructor reserves the right to remark the entire assessment (e.g., assignment, lab, quiz, test, project, exam, etc.).

**Grades:** Marks will not be disclosed or discussed by email or telephone. This includes final grades. Students who wish to discuss a grade on an assessment or their final grade in the course are welcome to do so during office hours or to contact the instructor to set up an appointment to meet.

### 6.2 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>.

### 6.3 Academic 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).

### 6.4 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

**Use of @uwo.ca email:** 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.

## **Requests for Relief** (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/requests\\_for\\_relief\\_from\\_academic\\_decisions.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf)

Procedures on Request for Relief from Academic Decision (Undergraduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/undergrad\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf)

Procedures on Request for Relief from Academic Decision (Graduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/graduate\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf)

## **6.5 Scholastic Offences**

Policy on Scholastic Offences:

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/scholastic\\_offences.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf)

Procedures on Scholastic Offences (Undergraduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/undergrad\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf)

Procedures on Scholastic Offences (Graduate):

[https://uwo.ca/univsec//pdf/academic\\_policies/appeals/graduate\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec//pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf)

### **Use of Electronic Devices During Assessments**

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

### **Use of Generative AI Tools**

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

## Turnitin

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>).

## 6.6 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://academicssupport.uwo.ca/accessible\\_education/index.html](http://academicssupport.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.

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