

The University of Western Ontario – Department of Statistical and Actuarial Sciences
ACTUARIAL SCIENCE 2053
Mathematics for Financial Analysis -- 2020-21



Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>.

Technical Requirements:



Stable internet connection



Laptop or computer



Working microphone



Working webcam

Instructor	Sec	Day/Time	Location	email	Office/Phone
Mr..Steve Kopp	001	MWF– 11:30- 12:20	Synchronous Online	kopp@stats.uwo.ca	WSC 284/x86288
Mr. Joe Raaymakers	002		Online	jraaymak@uwo.ca	WSC 107

Prerequisites:

Grade 12U calculus (or equivalent), PLUS one full university level course (or 2 half courses) from Mathematics, Applied Mathematics, Calculus, or Linear Algebra

Anti-requisites:

Actuarial Science 2553A

Students are advised that they are responsible to ensure that they possess the necessary prerequisites (or have written special permission) and that de-registration may occur at any time if they lack the prerequisite or have taken an anti-requisite course.

Textbooks

1. “Mathematics of Finance”, 8th Edition, by Brown-Kopp
 - An online version of the textbook can be ordered (cost: \$89) or a hard copy (cost: \$91.75) through the UWO bookstore by clicking on the link:
https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2020&courses%5B0%5D=001_UW/ASC2053
2. Study note package (\$???) -- this is still being worked on

Course Outline

Text	Chapter	Topic
1. Textbook	1	Simple Interest
	2	Compound Interest (skip section 2.10)
	3	Simple Annuities
	4	General Annuities
	5	Repaying A Debt
	6	Bonds (skip Serial Bonds of section 6.7)
2. Study Note Package	7	Business Decisions, Capital Budgeting, Depreciation
	8	Fixed Income Investments
	9	Probability and Life Tables
	10	Life Annuities
	11	Life Insurance
	12	Life Insurance Expenses

Intellectual Property Statement

Course material (i.e. course content (including lecture notes), videos, solutions, practice questions and other supplementary material posted on OWL) is the intellectual property of your instructors and course developers and is made available to you for your personal use in this course. *Sharing, posting, selling or using this material outside your personal use in this course is considered to be an infringement of intellectual property rights.*

Classes

For section 001, classes will be held live on ZOOM during the scheduled class time (Monday, Wednesday and Friday from 11:30 am to 12:20 pm EASTERN time zone). The class notes will be available on the course OWL site several days before the scheduled class time. The lectures will be recorded and posted on the course OWL site. This way, students who are not able to attend a lecture will be able to view the lecture in its entirety after the class.

All of the remote learning sessions for this course will be recorded.

The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

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

Online Participation and Engagement



- Students are expected to participate and engage with content as much as possible
- Students can participate during the live class sessions by raising your hand on ZOOM or using the chat option to post a question. I plan to stop every once in a while during the live classes to check to see if any student has posted a question or has raised their hand. Students can also post any questions they might have on OWL after watching the recording after it has been posted on OWL.
- Students can also participate by interacting in the forums with their peers and instructors

[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](#).

Mid Term Exam 1

Saturday, November 14, 2020 – 10:00 am to 1:00 pm (all students will be writing at the same time during these hours)

- Chapters 1, 2, 3, and possibly part of 4; A formula page will be provided.

Mid Term Exam 2

Saturday, February 27, 2021 – 10:00 am to 1:00 pm (all students will be writing at the same time during these hours)

- It will cover material since midterm 1 (likely the rest of chapter 4, 5, 6, 7, 8); A formula page will be provided

Final Exam

Scheduled for the final exam period.

- The final exam will be a 3-hour multiple choice exam covering material since midterm 2. A formula page will be provided.

You will also need a pocket calculator for the tests and the exams.

For both the midterm and final exams, it is expected that:

- An online proctoring system will be used (such as ProctorTrack)
- We plan to make the exams available using OWL
- We hope to give the exam synchronously to all students at the exact same time

For midterm 1 and midterm 2, it will be open-book. You are encouraged to make use of lecture slides and the text when writing the exam. However, you must work independently. Before you begin each test, you will agree to an Honour Statement. I will be conducting response and cheating analysis after each quiz. Please honour the Honour Statement.

Policy on tests and examinations

Tests and examinations in this course may be conducted using the remote proctoring service, **Proctortrack**. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link:

<https://www.proctortrack.com/tech-requirements/>

Online Quizzes

There will be 11 online quizzes, one for each of the first 11 chapters of the textbook/study note package (there will be no online quiz for chapter 12).

- The quizzes will be given through the course OWL page
- There will be a 24-hour window in which a student can begin the quiz (from 6:00 pm Saturday to 6:00 pm Sunday local London Ontario time)
- Each quiz will consist of 12 multiple choice questions, randomly chosen from a large bank of questions, so that every student will, in theory, get a different (but similar) quiz. The answer choices will also be randomized.
- The quizzes will be set up to be linear, which means a student CANNOT go back to a previous question and redo it; Students must submit an answer to a question before they move on to the next question (cannot go back and view any previously done or skipped question)
- Once a student begins a quiz, they will have 72 minutes to complete the quiz and submit their answers (that is an average of 6 minutes of time spent per question)
- Each student only gets one attempt at each quiz
- The best 10 out of 11 quizzes will count in your final mark
- The quizzes have been arranged so that there is one approximately every two weeks
- There will be no online proctoring for the quizzes; they are open book (although it would probably be best if you made up a quick formula page and had it handy when you attempt a quiz)

	2020 (6 pm to 6 pm)		2021 (6 pm to 6 pm)
1	Sat, Sept 26—Sun, Sept 27	6	Sat, Jan 9—Sun, Jan 10
2	*Fri, Oct 9—Sat, Oct 10	7	Sat, Jan 23—Sun, Jan 24
3	Sat, Oct 31—Sun, Nov 1	8	Sat, Feb 6—Sun, Feb 7
4	Sat, Nov 21—Sun, Nov 22	9	Sat, Mar 6—Sun, Mar 7
5	Sat, Nov 28—Sun, Nov 29	10	Sat, Mar 20—Sun, Mar 21
		11	Sat, Apr 3—Sun, Apr 4

The quizzes are open-book. You are encouraged to make use of lecture slides and the text when writing the quizzes. However, you must work independently. Before you begin each test, you will agree to an Honour Statement. I will be conducting response and cheating analysis after each quiz. Please honour the Honour Statement.

NOTE: There will be NO make-ups for any of the online quizzes. You are allowed to miss one quiz and it will not count towards your final mark. If you miss more than one quiz (with a valid reason), the weight will be reassigned to the test and exam components.

Assignments

There will be 4 assignments. These will consist of about 6 questions that will require written answer solutions and showing all of your work in obtaining the solution. There may be 1 to 2 questions on each assignment that require a spreadsheet (such as Excel). Instructions on how to use Excel will be provided with the first assignment.

The assignments will be available on the course OWL page approximately one week before they are due. It is expected that students will upload their solutions (as a PDF) to Gradescope, although that may change (we will let you know). Instructions will be provided on how to upload assignments to Gradescope and how to scan your solutions and put them into a PDF format.

The expected due dates are (deadline is by 5:00 pm on the given dates):

Assignment 1	Wednesday, October 21, 2020
Assignment 2	Wednesday, December 2, 2020
Assignment 3	Wednesday, January 27, 2021
Assignment 4	Wednesday, March 24, 2021

Evaluation

Assessment	Percentage of Final Mark
Assignments – total mark of 4	10%
Quizzes (best 10 out of 11) – each quiz is worth 3%	30%
Midterm 1	20%
Midterm 2	20%
Final Exam	20%

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.

Course OWL Web Page

The web page will contain:

1. A copy of this course outline
2. Copies of exams from the previous year (with solutions)
3. Solutions to the exercises in the 8th edition of the textbook (as pdf files)
4. Weekly updates and information about the course that you need to know
5. **Daily class notes (which will be incomplete – to be filled in during the classes)** and other things that are relevant to the course.
6. Assignments, about one week before the due dates
7. Online quizzes
8. Marks of quizzes, assignments, and exams as they are marked.

Course Objectives

This course is not intended to make you financial geniuses or to suggest what investments or insurance products you should be buying.

Instead, the objective of this course is to show you how you can do many useful financial calculations yourself, either using a calculator, pen and paper OR using a computer spreadsheet.

Some of the calculations you will be able to do by the end of the course include:

1. Accumulating & discounting a single sum of money using either simple or compound interest
2. Accumulating & discounting a series of payments made at equal time intervals using compound interest
3. Calculating loan payments, including mortgage payments
4. Depreciating physical assets
5. Determining the rate of return on an investment
6. Determining the price of a bond or the rate of return on a bond
7. Understanding the yield curve and the risks involved with a fixed income investment

In the last part of the course you will be introduced to the fundamentals of financial calculations involving life contingencies. You will be able to:

1. Perform calculations involving probabilities of living or dying within a certain period of time
2. Calculate how much money you need at a certain age to purchase an annuity paying you a certain amount of money every year or every month for the rest of your life
3. Calculate the premium to be paid for a certain type of life insurance policy

Your ability to do all the above (and more) will be evaluated through written answer questions on the in-class quizzes and through a combination multiple choice/written answer questions on two tests and two exams.

APPROXIMATE Weekly Course Outline:

Week – 2020	Section	
Sept 9-11	Accumulating/discounting simple interest (sect 1.1-1.2)	
Sept 14-18, 21	Equations of value, partial payments, simple discount (section 1.3 to 1.5)	
Sept 23-25	Accumulating/discounting with compound interest, equivalent rates, fractional periods (section 2.1-2.4)	
Online Quiz #1 – Sat, Sep 26 to Sun, Sep 27 (6pm to 6pm) – Chapter 1		
Sept 28-Oct 2 Oct 5-8	Determining the time and interest rate, equations of value, changing rates, other applications (section 2.5 to 2.10)	
Online Quiz #2 – Fri, Oct 9 to Sat, Oct 10 (6pm to 6pm) – Chapter 2		
Oct 9, 13-16	Ordinary annuities – accumulated/present values (section 3.1, 3.2, 3.3)	
Oct 19-23	Ordinary annuities – other annuities, determining rate/time (section 3.4, 3.5, 3.6)	
Oct 26-30	General annuities, mortgages, Perpetuities, (section 4.1-4.2-4.3)	
Online Quiz #3 – Sat, Oct 31 to Sun, Nov 1 (6pm to 6pm) – Chapter 3		
Nov 2-6	FALL READING WEEK	
Nov 9-11	Varying annuities (section 4.4)	
MIDTERM 1 – Saturday, November 14 -- 10:00 am to 12:30 pm		
Nov 13, 16-20	Amortization Method, Outstanding balance, Refinancing, Sum of digits (section 5.1, 5.2, 5.3, 5.4)	
Online Quiz #4 – Sat, Nov 21 to Sun, Nov 22 (6pm to 6pm) – Chapter 4		
Nov 23-25	Sinking Funds (sect 5.5/5.6/5.7)	
Online Quiz #5 – Sat, Nov 28 to Sun, Nov 29 (6pm to 6pm) – Chapter 5		
Nov 27,30, Dec 1-4	Bonds – Purchase price and callable bonds (sections 6.1/6.2/6.4)	
Dec 7,9	Premium and Discount, (section 6.3); REVIEW	
NO midterm/December exam		
Week – 2021		
Jan 4-8	Price between dates, rate of return, other bonds (section 6.5, 6.6, 6.7)	
Online Quiz #6 – Sat, Jan 9 to Sun, Jan 10 (6pm to 6pm) – Chapter 6		
Jan 11-15	Net present value, internal rate of return, capitalized cost (sects 7.1-7.3)	
Jan 18-22	Depreciation (section 7.4); Fixed income investments, yield curve, forward interest rates (sections 8.1, 8.2),	
Online Quiz #7 – Sat, Jan 23 to Sun, Jan 24 (6pm to 6pm) – Chapter 7		
Jan 25-29	Types of risks (section 8.3); Duration, convexity (sections 8.4 to 8.7)	
Feb 1-5	Probability, life tables probabilities (section 9.1 to 9.5)	
Online Quiz #8 – Sat, Feb 6 to Sun, Feb 7 (6pm to 6pm) – Chapter 8		
Feb 8-12	Expectation of life, select mortality (section 9.6 and 9.7)	
Feb 15-19	WINTER READING WEEK	
Feb 22-26	Life Annuities, Pure endowments (section 10.1/10.2/10.3)	
MIDTERM 2 – Saturday, February 27 – 10:00 am to 12:30 pm		
Mar 1-5	Whole life, temporary and deferred life annuities, (section 10.4-10.6)	
Online Quiz #9 – Sat, Feb 27 to Sun, Feb 28 (6pm to 6pm) – Chapter 9		
Mar 8-12	Varying annuities, life annuities payable more than once a year, whole life insurance (section 10.7, 10.8, 11.1)	
Mar 15-19	Whole life insurance (section 11.2, 11.3), Net Annual Premiums (11.4)	
Online Quiz #10 – Sat, Mar 20 to Sun, Mar 21 (6pm to 6pm) – Chapter 10		
Mar 22-26, 29	Term, endowment, deferred, varying insurance (11.5 to 11.8)	
Mar 31, Apr 1,2	Expenses; Types of life insurance expenses (section 12.1, 12.2)	
Online Quiz #11 – Sat, Apr 3 to Sun, Apr 4 (6pm to 6pm) – Chapter 11		
Apr 5	Review	
Final Exam – To be scheduled in final exam period		

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 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)

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

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 policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

[https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Consideration for absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

and for the Student Medical Certificate (SMC), see:

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

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, 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.

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Professionalism & Privacy

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:



- Students are expected to follow online etiquette expectations provided on OWL
- 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
- Students will be expected to take an academic integrity pledge before some assessments
- All recorded sessions will remain within the course site or unlisted if streamed

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 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 during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

Support Services

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 519-661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

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.

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/>.

What Do You Do if You Miss a Course Requirement Due to Illness or Special Circumstances?

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. If you are a Social Science student, the Academic Counselling Office of the **Faculty of Social Science is located in SSC Room 2105**, or can be contacted at ssaco@uwo.ca. If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at scibmsac@uwo.ca.

For further information about absences, including the **self-reporting procedure** and requirements, please click on the following link (look at Section 3 on page 3):

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf

You may also be eligible to write a Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

If you require academic accommodation due to illness, you should use the Student Medical Certificate when visiting an off-campus medical facility. The form can be found here:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

The website for Registrarial Services is <http://www.registrar.uwo.ca>.