

**The University of Western Ontario – Department of Statistical and Actuarial Sciences**  
**ACTUARIAL SCIENCE 2053**

*Mathematics for Financial Analysis -- 2017-18*

Instructor	Sec	Day/Time	Location	email	Office/Phone
Mr. Steve Kopp	001	MWF – 11:30- 12:20	WSC 55	kopp@stats.uwo.ca	WSC 284/x86288
Mr. Joe Raaymakers	002	Tu – 9:30-11:30 Th – 10:30-11:30	SEB 2200	jraaymakers@stats.uwo.ca	WSC 214A/x88007
Mr. Xing Jiang (Kings College)	570	Tu – 11:00-12:30 Th – 11:00-12:30	LH 103	xjiang32@uwo.ca	LH 205 519-433-3491 x4530
Mr. Xing Jiang (Kings College)	571	Tu – 1:30-3:00 Th – 1:30-3:00	LH 101		

**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 (both are available in the UWO bookstore)**

- “Mathematics of Finance”, NEW 8th Edition, by Brown-Kopp (\$91.75)
- Study note package (about \$25)

**Course Outline (course is divided into 2 terms):**

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. Textbook	7	Business Decisions, Capital Budgeting, Depreciation
3. Study Note Package	8	Fixed Income Investments
	9	Probability and Life Tables
	10	Life Annuities
	11	Life Insurance
	12	Life Insurance Expenses

**Term Tests**

1. Test 1: **Friday, October 27, 2017 -- 7 to 9 pm** – topics to be posted on OWL
2. Test 2: **Friday, March 2, 2018 -- 7 to 9 pm** – topics to be posted on OWL

The format will most likely be multiple-choice questions. A formula page will be provided for both tests.

**NOTE: There is NO makeup test to either Test 1 or Test 2. If you miss either test (with a valid reason), the 18% weight will be moved to the mid term exam (if you miss Test 1) or the final exam (if you miss Test 2). You should think twice (or 3 times) before deciding to miss a test.**

### Mid Term Exam

To be scheduled during the Christmas Exam period

Chapters 1, 2, 3, 4, 5, and part of chapter 6

- The midterm exam will cover all material from the first term, including material that was tested on Test 1. It will be a 3-hour exam that may either be multiple choice questions OR a combination of multiple choice and short written answer questions. A formula page will be provided.

### Final Exam

**Scheduled for the final exam period.**

Rest of Chapter 6, all of chapters 7, 8, 9, 10, 11, 12

- The final exam will be a 3-hour exam that may either be multiple choice questions OR a combination of multiple choice and short written answer questions. A formula page will be provided. It will be based on material covered in class only since the midterm exam but will include material from the 2<sup>nd</sup> term test.

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

### In-class Quizzes

There will be 8 (4 per term) short written answer question quizzes that will be given at the very start of class on the following **Wednesdays (section 001) OR Thursdays (section 002)**:

1	September 27, 2017 (001) September 28, 2017 (002)	5	January 24, 2018 (001) January 25, 2018 (002)
2	October 18, 2017 (001) October 19, 2017 (002)	6	February 14, 2018 (001) February 15, 2018 (002)
3	November 8, 2017 (001) November 9, 2017 (002)	7	March 14, 2018 (001) March 15, 2018 (002)
4	November 29, 2016 (001) November 30, 2016 (002)	8	April 4, 2018 (001) April 5, 2018 (002)

- The quizzes will start right at the start of the class on the above dates and you will have 15 minutes to complete the assigned question(s) – **do NOT be late for class on these dates as you will NOT be given extra time**
- The quizzes will consist of 2 questions (or perhaps 1 question with multiple parts) that will be based on material covered over the past 2-3 weeks of classes
- You will show ALL your work in solving the question (as part marks will be available)
- The quizzes will be out of 8 marks – you will get 2 out of 8 just for signing your name and handing in a blank answer
- Only your best 6 out of 8 quizzes will count in your final mark (so you can miss up to 2 quizzes for any reason and you do not need any medical documentation).

### Evaluation

	<b>Original</b>	<b>If you do poorly on one test</b>	
Quizzes (best 6 out of 8)	10%	10%	10%
Test 1	18%	9%	18%
Mid Term	27%	36%	27%
Test 2	18%	18%	9%
Final Exam	27%	27%	36%

The marking scheme that gives a student the higher final mark will be the one used for that student.

### Course OWL Web Page

The web page will contain:

1. A copy of this course outline
2. Copies of tests and exams from the previous year (with solutions)
3. Solutions to the exercises in the 8<sup>th</sup> 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. Marks of quizzes and tests 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.

### Classroom Environment

We have adopted a “Mutual Expectations” policy governing the classroom environment and all work submitted by students. [The full text of the policy can be found on the Statistical and Actuarial Science departmental web page, [www.stats.uwo.ca](http://www.stats.uwo.ca), by clicking on the “Undergraduate” section]. In summary, all interactions between students and faculty should be governed by the principles of **courtesy, respect and honesty**.

### Attendance

The department of Statistical and Actuarial Sciences views classroom attendance as a very important part of the learning process. You are expected to attend all classes. You are advised that excessive absenteeism may result in being debarred from the final examination.

### **Policy on e-mail communication**

You are welcome to communicate with your instructor by e-mail, but e-mail communication should only be used to provide them with information or to ask a question that requires a brief response. For more lengthy discussions and for discussions on lectures/course material please see your instructor during their scheduled office hours or by appointment. If you do e-mail them, please use your UWO account, as these are often the only emails read (as e-mails sent from other addresses often get spammed).

### **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 provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is your responsibility to make alternative arrangements with your instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: <http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

For in-class quizzes: There are NO make ups to any of the quizzes, so if you miss one (or two) it will be one of the two quizzes that will not count towards your final mark. If you miss a third quiz, it will count as a mark of ZERO. You do not need to get in contact with your Faculty or your instructor if you miss a quiz (or two).

For Tests: If you miss a test for a valid reason, you must go to your Faculty with proof as to why you missed the exam. There are no makeup tests. The weight of the missed test will be moved to either the midterm exam (if Test 1 was missed) or the final exam (if test 2 was missed).

For Midterm/Final Exam: If you miss an exam for a valid reason, you must go to your Faculty with proof as to why you missed the exam. A makeup exam date will be arranged for all students who missed the exam with a valid reason.

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: [https://studentservices.uwo.ca/secure/medical\\_document.pdf](https://studentservices.uwo.ca/secure/medical_document.pdf)

Or, request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

### **Support Services**

Learning-skills counsellors at the Student Development Centre 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: <http://www.sdc.uwo.ca>

Students who are in emotional/mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help: [http://www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_health)

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

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

### Accessibility

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 Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

### APPROXIMATE Weekly Course Outline:

<b>Week – 2017</b>	<b>Section</b>	
Sept 17-15	Accumulating/discounting simple interest (sect 1.1-1.2)	
Sept 18-22	Equations of value, partial payments, simple discount (section 1.3 to 1.5)	
Sept 25-29	Accumulating/discounting with compound interest, equivalent rates, fractional periods (section 2.1-2.4)	
<b>In-class Quiz #1 – Wed/Thurs, September 27/28 at start of class</b>		
Oct 2-6	Determining the time and interest rate, equations of value, changing rates, other applications (section 2.5 to 2.10)	
Oct 9-13	FALL break	
Oct 16-20	Ordinary annuities – accumulated value (section 3.1, 3.2)	
<b>In-class Quiz #2 – Wed/Thurs, October 18/19 at start of class</b>		
Oct 23-27	Ordinary annuities – present value (section 3.3)/ REVIEW	
<b>Test 1 – Friday, October 27 – 7:00 to 9:00 pm (2 hours) – Chapters/Sections TBA</b>		
Oct 30, Nov 1-3	Other Annuities (section 3.4); Determining term/rate (section 3.5, 3.6)	
Nov 6-10	General annuities, mortgages, Perpetuities, (section 4.1-4.2-4.3)	
<b>In-class Quiz #3 –Wed/Thurs, November 8/9 at start of class</b>		
Nov 13-17	Varying annuities (section 4.3), Amortization (section 5.1)	
Nov 20-24	Outstanding balance, Refinancing, Sum of digits (section 5.2, 5.3, 5.4)	
Nov 27-Dec 1	Sinking Funds (sect 5.5/5.6/5.7) Bonds – Purchase price and callable bonds (sections 6.1/6.2/6.4)	
<b>In-class Quiz #4 – Wed/Thurs, November 29/30 at start of class</b>		
Dec 4-8	Premium and Discount, (section 6.3); REVIEW	
<b>Midterm Exam – To be scheduled during the December Exam period (3 hours)</b>		
<b>Week – 2018</b>		
Jan 8-12	Price between dates, rate of return, other bonds (section 6.5, 6.6, 6.7)	
Jan 15-19	Net present value, internal rate of return, capitalized cost (sects 7.1-7.3)	
Jan 22-26	Depreciation (section 7.4); Fixed income investments, yield curve, forward interest rates (sections 8.1, 8.2),	
<b>In-class Quiz #5 – Wed/Thurs, January 24/25 at start of class</b>		
Jan 29-Feb 2	Types of risks (section 8.3); Duration, convexity (sections 8.4 to 8.7)	
Feb 5-9	Probability, life tables probabilities (section 9.1 to 9.5)	
Feb 12-16	Expectation of life, select mortality (section 9.6 and 9.7)	
<b>In-class Quiz #6 – Wed/Thurs, February 14/15 at start of class</b>		
<b>Feb 19-23 – Reading Week</b>		
Feb 26-Mar 2	Pure endowments (section 10.1/10.2/10.3); Review	
<b>Test 2 – Friday, March 2 – 7 pm to 9 pm (2 hours) – Chapters/Sections TBA</b>		
Mar 5-9	Whole life, temporary and deferred, (section 10.4-10.6)	
Mar 12-16	Varying annuities, life annuities payable more than once a year, whole life insurance (section 10.7, 10.8, 11.1)	
<b>In-class Quiz #7 – Wed/Thurs, March 14/15 at start of class</b>		
Mar 19-23	Whole life insurance (section 11.2, 11.3)	
Mar 26-30	Net annual premiums, term and endowment insurance (sect 11.3 to 11.6)	
Apr 2-6	Deferred/varying insurance (section 11.6 to 11.8)	
<b>In-class Quiz #8 – Wed/Thurs, April 4/5 at start of class</b>		
Apr 9-11	Expenses; Types of life insurance expenses (section 12.1, 12.2)/ Review	
<b>Final Exam – To be scheduled in final exam period</b>		