

Department of Statistical and Actuarial Sciences
AS 3424/9424 Short Term Actuarial Math I

Course outline for Winter 2021



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 and Important Dates:



Stable internet connection



Laptop or computer



Working microphone



Working webcam



Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
January 11	February 15 - 19	April 12	April 13	April 14 - 30

* March 15, 2021: Last day to drop a second-term half course or a second-term full course without penalty

1. Course Information

Course information

Course Name AS 3424/9424 Short Term Actuarial Math I
 Academic Term Winter 2021
 Lecture Hours Monday, Wednesday, Friday 9:30am – 10:30am

List of Prerequisite(s)

A minimum mark of 60% in Statistical Sciences 3657 A/B

Unless you have either the requisites for this course or written special permission from your Dean 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



Course Coordinator	Contact Information
Shu Li	shu.li@uwo.ca

Course Instructor	Contact Information
Shu Li	shu.li@uwo.ca

Teaching Assistant(s)	Contact Information
Duo Xu	dxu258@uwo.ca
Dechen Gao	dgao28@uwo.ca

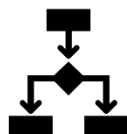
Office Hours	Zoom or MS Teams or in Person	Names
TBD		

Students must use their Western (@uwo.ca) email addresses when contacting their instructors and indicate the course number (AS 3424) in the subject line. We strive to answer all emails within 2 business days.

3. Course Syllabus, Schedule, and Delivery Mode

Course Description

Insurance loss frequency and severity models; aggregate loss models; risk measures; ruin theory; coverage modifications.



Type	Mode	Dates	Time	Frequency
Lecture	Synchronous online	M	9:30am – 10:30am	weekly
Lecture	Asynchronous online	W/F	2 hours	weekly

- Synchronous lectures will NOT be recorded. The lecture notes for Synchronous lectures will be posted after each session.
- Asynchronous lectures will be posted on W/F around 9:30am.

Learning Outcomes

This course material supports the following Learning Objectives/Outcomes from [SOA Short-Term Actuarial Mathematics Exam \(STAM\) Syllabus Topics 1 – 5.](#)

1. Severity models

- a) Calculate the basic distributional quantities: moments, percentiles and generating functions.
- b) Describe how changes in parameters affect the distribution.
- c) Recognize classes of distributions and their relationships.
- d) Apply the following techniques for creating new families of distributions: multiplication by a constant, raising to a power, exponentiation and mixing.
- e) Identify the applications to which each distribution may apply and reasons why.
- f) Apply the distribution, given the parameters.
- g) Calculate various measures of tail weight and interpret the results to compare the tail weights.

2. Frequency models

For the Poisson, mixed Poisson, binomial, negative binomial, geometric distribution and mixtures thereof:

- a) Describe how changes in parameters affect the distribution.
- b) Calculate moments and generating functions.
- c) Identify the applications in which each distribution may apply and reasons why.
- d) Apply the distribution, given the parameters.
- e) Apply the zero-truncated and zero-modified distribution, given the parameters.



3. Aggregate models

- a) Compute relevant parameters and statistics for collective risk models and individual risk models.
- b) Evaluate compound models for aggregate claims.
- c) Compute aggregate claims' distributions.

4. Coverage Modifications

- a) Evaluate the impacts of coverage modifications, in particular, deductibles, limits and coinsurance.
- b) Calculate loss elimination ratios (LER).
- c) Evaluate effects of inflation on loss.

5. Risk measures

- a) Calculate VaR and TVaR and explain their use and limitations.
- b) The desirable properties of a risk measure

6. Continuous-time ruin models (additional notes)

- a) The Poisson process
- b) The classical risk model
- c) The adjustment coefficient and Lundberg's inequality

If time permits, we will cover the topic of simulation.

Table of Contents and Schedule



Week	Dates	Topic
1	Jan 11 – 15	Introduction, Review on Random variable
2	Jan 18 – 22	Distributional Quantities, Coherent risk measure, VaR, TVaR
3	Jan 25 – 29	TVaR, Severity models (non-parametric approach), Creating new distributions
4	Feb 1 – 5	Frailty models, Tails of distribution
5	Feb 8 – 12	Policy adjustments I (Tentative Test 1)
6	Feb 15 – 19	Reading Week
7	Feb 22 – 26	Policy adjustments II, Loss elimination ratio
8	Mar 1 – 5	Basic frequency distributions, (a,b,0) class
9	Mar 8 – 12	(a,b,1) class, Creating new frequency distributions (mixture and compounding)
10	Mar 15 – 19	Compound Poisson distribution (Tentative Test 2)
11	Mar 22 – 26	Effect on frequency from exposure and policy adjustment, Individual risk model, Collective risk model
12	Mar 29 – Apr 2	Distribution of aggregate model, Excess-of-loss and stop-loss insurance, coverage modification on aggregate model
13	Apr 5 – 9	Continuous-time Ruin models
14	Apr 12	(Tentative Test 3)

Online Participation and Engagement



- Students are expected to participate and engage with content as much as possible
- Students can participate during Monday sessions or post on OWL after watching the recording
- Students can also participate by interacting in the forums with their peers and instructors

4. Course Materials

Textbook: *Loss Models: From Data to Decisions*, by Klugmann, S.A., Panjer, H.H., and Willmot, G.E., John Wiley and Sons, Inc., 2012, **Fourth Edition**.
(Or *Loss Models: From Data to Decisions*, by Klugmann, S.A., Panjer, H.H., and Willmot, G.E., John Wiley and Sons, Inc., 2019, **Fifth Edition.)**



Suggested practice questions from the textbook will be posted on OWL. Assistance with solving them may be obtained during the instructor's and TA's office hours. A student solutions manual to accompany *Loss Models* text has been published and this can be purchased online from Amazon.

This course is intended to familiarize the student with a variety of techniques for the analysis of aggregate losses. Following the introductory Chapters 1 and 2 of the textbook, coverage will focus primarily on Chapters 3 through 9.

Students should check OWL (<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. Students are responsible for checking OWL on a regular basis.

All course material will be posted to OWL: <http://owl.uwo.ca>. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, 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.

[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](#).

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Test 1	20%
Test 2	20%
Test 3	20%
Final Exam	40%

Tests: There will be **three 60-minute tests** held during the lecture hour. The exact dates for each test will be scheduled by the Registrar's Office and announced on OWL as soon as possible.

Final Exam: A final exam will be scheduled by the Registrar's Office in the final examination period.

See "[Academic Policies](#)" for more details on online examinations.

Accommodated Evaluations

- For all the tests/exams, late submission policy is as follows:
 - If an examination is administered through the Tests and Quizzes tool on OWL, then submissions will **not** be accepted after the exam closes.
 - If an examination requires submission through OWL/Gradescope, then late submissions will be subject to a penalty of 5% per minute.
- There will be **no make-up exams** for a missed test. For those that do legitimately miss a quiz or test and provide the required supporting documentation, the standard practice will be that the weight of the examination will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.
- **To pass the course, a student must complete the final exam.** If you are unable to attend the final exam, you must seek approval for the special exam and contact your instructor as soon as possible. If a make-up final exam 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. Canadian Institute of Actuaries Actuarial Exam Accreditation

This course is accredited under the Canadian Institute of Actuaries (CIA) [University Accreditation Program](#) (UAP). Achievement of the minimum required grades in accredited courses may provide credit for preliminary exams. Please note that a combination of courses may be required to achieve exam credit. Details of required courses and grades at Western University are [available here](#).

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](#) and the associated [Policy on Conduct and Ethics for Candidates in the CIA Education System](#). For more information, please visit [Obtaining UAP Credits](#) and the [CIA FAQ](#).

7. 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

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

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).

8. 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.

Contingency plan for an in-person class pivoting to 100% online learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

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.

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.

Tests and examinations in this course will be conducted using both Zoom and the remote proctoring service, such as Proctortrack.

When Zoom is used for exam invigilation, you will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session using Zoom will not be recorded.*

Proctortrack will require you to provide personal information (including some biometric data). The session will be recorded. By taking this course, you are consenting to the use of this software.

More information about remote proctoring 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 system and technical requirements for both Zoom and Proctortrack. Information about the system and technical requirements are available at the following links:

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

<https://support.zoom.us/hc/en-us>

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

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.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

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.

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/>.

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.

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