The University of Western Ontario
Department of Statistical and Actuarial Sciences

AS 3424B/9424B Loss Models I
Course Outline – January 2019

1. Course Information

Course Description: Insurance loss frequency and severity models; aggregate loss models; risk measures; ruin theory.

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

Anti-requisites: The former Actuarial Science 4824 A/B

Warning: 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.

Lecture Hours and Location: Mon, Wed, and Fri. 9:30am – 10:30am, WSC 240

2. Instructor Information

Instructor: Shu Li
Office: WSC 229
Email: shu.li@uwo.ca
Phone: 519-661-2111 ext 85419
Instructor office hours: Monday 10:30am – 12:00pm, Wednesday 10:30am – 12:00pm

Teaching Assistant: Ruixi Zhang
Email: rzhan56@uwo.ca
TA office hours: TBD

3. Course Syllabus and Objectives

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.**

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. More precisely, the following topics are covered:

A. Severity models

1. Calculate the basic distributional quantities: a) moments; b) percentiles; c) generating functions.
2. Describe how changes in parameters affect the distribution.
3. Recognize classes of distributions and their relationships.
4. Apply the following techniques for creating new families of distributions: a) multiplication by a constant; b) raising to a power; c) exponentiation; d) mixing.
5. Identify the applications in which each distribution is used and reasons why.
6. Apply the distribution, given the parameters.
7. Calculate various measures of tail weight and interpret the results to compare the tail weights.

B. Frequency models

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

1. Describe how changes in parameters affect the distribution.
2. Calculate moments and generating functions.
3. Identify the applications for which each distribution is used and reasons why.
4. Apply the distribution, given the parameters.
5. Apply the zero-truncated and zero-modified distribution, given the parameters.

C. Aggregate models

1. Compute relevant parameters and statistics for collective and individual risk models.
2. Evaluate compound models for aggregate claims.
3. Compute aggregate claims' distributions.

D. For severity, frequency and aggregate models:

1. Evaluate the impacts of coverage modifications: a) deductibles; b) limits; c) coinsurance.
2. Calculate loss elimination ratios (LER).
3. Evaluate effects of inflation on loss.

E. Risk measures

1. Calculate VaR and TVaR and explain their use and limitations.
2. The desirable properties of a risk measure

F. Continuous-time ruin models (additional notes)

1. The (homogeneous) Poisson process
2. The classical risk model
3. The adjustment coefficient and Lundberg's inequality

<u>If time permits, we will cover the topic of simulation.</u>

The course material supports the following Learning Objectives/Outcomes from **SOA Short-Term Actuarial Mathematics Exam (STAM)** Syllabus Topics 1 – 5.

4. Course Website Information

Students should check OWL (<u>http://owl.uwo.ca</u>) on a regular basis for lecture notes, announcements 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.

5. Methods of Evaluation

Midterms or Tests: There will be **two midterm tests** held during the lecture hour, on **Friday Feb 8 and March 15.**

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

Graduate student will have one project due on April 10, Wednesday, by 11:59pm.

The overall course grade will be calculated as listed below:

	Test 1	**20%**
	Test 2	**20%**
Undergraduate:	**Final Exam**	**60%**
Graduate:	**Final Exam**	**50% + 10% Project**

Calculators: Any non-programmable calculator may be used in this course.
Practice questions: Suggested practice questions will be posted on OWL. Assistance with solving them may be obtained during the instructor's and TA's office hours.

6. Canadian Institute of Actuaries Actuarial Exam Accreditation

This course is accredited under the Canadian Institute of Actuaries (CIA) University Accreditation Program (UAP) for the 2018-2019 academic year. Achievement of the established exemption grade in this course may qualify a student for exemptions from writing certain preliminary exams. Please note that a combination of courses may be required to achieve a single exemption. See http://www.cia-ica.ca/membership/university-accreditation-program---home/information-for-candidates for full details.

7. Accommodation and Accessibility

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible. 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, please consult the university's medical illness policy at http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam). For those that are approved by their faculty to write a special exam, a "Recommendation of Special Examination Form" will be provided to the student (by their faculty) and the student must then follow-up on the completion of this form directly with their instructor.

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).

Missed Midterm or Test: The policy of the department of Statistical and Actuarial Sciences is that there will be **no make-up exams** for a missed midterm. For those that do legitimately miss a midterm and provide the required supporting documentation, the standard practice will be that the weight of the midterm will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.

8. Email Communication

You are welcome to communicate with your instructor by email, but email communication should only be used to provide them with information or 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. Students must use their Western (@uwo.ca) email addresses when contacting their instructors. Only emails sent from your UWO account will be read (as emails sent from other addresses often get spammed).

9. 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.

Cell phones and all other electronic devices are prohibited during tests, quizzes and exams.

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.

10. 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 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_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.

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

11. Classroom Environment

The Department has adopted a "Mutual Expectations" policy governing the classroom environment and all work submitted by students. The full text of the policy can be found at: http://www.uwo.ca/stats/undergraduate/mutual-expectations.html. In summary, the policy was developed under the premise that all interactions between students and faculty should be governed by the principles of courtesy, respect and honesty.

Computers and other technical devices are to be used only for note taking purposes during class and cell phones should be turned off/on mute.