

## AS4824 (9824) A –Course Outline

### 1. Course Information

**Title:** Short-term Actuarial Mathematics II

**Lecture hours:** Tuesday 10:30am-11:30am; Thursday 10:30am-12:30pm

This course will be offered in person at WSC 240

**Office hours:** Conducted through ZOOM. Tuesdays 12:30pm-2:00pm, Friday 12:30-2:00pm.

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
September 8	Oct 31 – Nov 6	December 8	December 9	December 10 - 22

\* November 12, 2022: Last day to drop a first-term half course or a first-term full course without penalty (extended to Nov. 14 as Nov. 12 falls on a weekend).

**Course Description:** Pricing and Reserving for Short-Term Insurance Coverages, Selection, calibration, and validation of parametric models for insurance losses; credibility theory.

#### List of Prerequisites

SS3858A/B A minimum mark of 60% in Statistical Sciences 3858A/B. Restricted to students enrolled in any Actuarial Science module, or those registered in the Honours Specialization module in Statistics or the Honours Specialization in Financial Modelling module.

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

Instructors	Email	Office	Phone	Office Hours
Dr. Jiandong Ren	<a href="mailto:Jren6@uwo.ca">Jren6@uwo.ca</a>	WSC219	88209	Tue, Fri 12:30-2pm

Students must use their Western (@uwo.ca) email addresses when contacting their instructors.

### **3. University Accreditation Program – Canadian Institute of Actuaries (CIA)**

#### **Honours Specialization Program in Actuarial Science**

##### If you are in 2<sup>nd</sup> or 3<sup>rd</sup> year

If you graduate from 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). This is under the new **CIA program accreditation program**. 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. You would then be eligible for the CIA Capstone Exam. Taking and passing this exam, along with an online module and a practice education course, would make you eligible to become an ACIA (associate of the Canadian Institute of Actuaries).

##### If you are in 4<sup>th</sup> year

This course is accredited under the Canadian Institute of Actuaries (CIA) University Course Accreditation Program (UAP) for the 2022-23 academic year. Achievement of the established exemption grade in this course may qualify a student from exemptions from writing certain preliminary exams. **This is the last year of the CIA course accreditation program.**

This course along with Actuarial Science 3424B (both courses with a minimum mark of 80%) can give you an exemption for the FAM-S and ASTAM exams for the purpose of CIA course accreditation program.

#### **Major in Actuarial Science**

If you are a student in a major in Actuarial Science, the CIA program accreditation program will not apply to you. If your plan is to become a fully qualified actuary, you will need to continue to write and pass the preliminary exams of the SOA. However, for 2022-23 this course is still accredited under the Canadian Institute of Actuaries (CIA) University Course Accreditation Program (UAP) for the 2022-23 academic year. Achievement of the established exemption grade in this course may qualify a student from exemptions from writing certain preliminary exams. **This is the last year of the CIA course accreditation program.**

Please see the following link for full details:

<http://www.cia-ica.ca/membership/university-accreditation-program---home>

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**.

<https://www.cia-ica.ca/docs/default-source/2020/220065e.pdf>

## 4. Course Materials

### Textbook

- Klugman, S.A., Panjer, H.H. and Willmot, G.E. (2019). Loss Models: From Data to Decisions, 5th edition, Wiley.
- Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance (4th Edition), 2015, by Brown and Lennox, ACTEX
- Other publicly available resources that will be posted on OWL.

### Topics covered

Chapters 2-5 of Textbook (2) and Chapters 10-13 and 15-19 the textbook (1). Specific topics are:

#### A. Introduction to Short-Term Insurance

1. Short-Term Insurance Coverages
2. Loss Reserving
3. Ratemaking
4. Reinsurance

#### B. Construction and Selection of Parametric Models

1. Estimate the parameters of failure time and loss distributions using:
  - a) Maximum likelihood
  - b) Method of moments
  - c) Percentile matching
  - d) Bayesian procedures
2. Estimate the variance of estimators and the confidence intervals for the parameters and functions of parameters of failure time and loss distributions.
3. Determine the acceptability of a fitted model and/or compare models using:
  - a) Graphical procedures
  - b) Kolmogorov-Smirnov test
  - c) Anderson-Darling test
  - d) Chi-square goodness-of-fit test

- e) Likelihood ratio test
- f) Schwarz Bayesian Criterion

### C. Credibility

1. Apply limited fluctuation (classical) credibility including criteria for both full and partial credibility.
2. Perform Bayesian analysis using both discrete and continuous models.
3. Apply Bühlmann and Bühlmann-Straub models and understand the relationship of these to the Bayesian model.
4. Apply conjugate priors in Bayesian analysis and in particular the Poisson-gamma model.
5. Apply empirical Bayesian methods in the nonparametric and semiparametric cases.

### Course Website

Students are responsible for checking 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.

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.

### Technical Requirements

Student's access to Microsoft Excel and R Programming language is needed.

### 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, affected 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.

## 5. Methods of Evaluation

### Assignments

Some practice questions will be assigned in class to help students understand the material. These questions are important in the preparation for the midterms and the final exam.

### Loss Reserving/ Pricing Project

In this project, students are required to implement several approaches to estimate loss reserves for P/C insurance policies using Excel. A project report should be submitted before the due date. The report will be marked and counts for 5% of the course grade.

### **Midterms or Tests**

One midterm test will be given on **October 20** during regular class time.

### **Final Exam**

The date and time for the 3-hour final exam will be announced by the registrar's office, usually near the first part of November. Students are required to wait until the final exam schedule is posted before making arrangements for travel over the Christmas period. Exams will NOT be moved to accommodate students who ignore this requirement.

Both the midterm and the final exams are closed-book exams. The overall course grade will be calculated as listed below:

Midterm Exam	40%
Loss Reserving/Pricing Project	5%
Final Exam	55%

Non-programmable calculators are allowed on the midterm tests and the final exam. However, SOA approved calculators are strongly recommended.

## **6. Student Absences**

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

**Missed Project report:** Late project reports are not accepted.

### **Assessments worth 10% or more of the overall course grade:**

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf).

The Student Medical Certificate is available at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf).

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.

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).

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](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

### **Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under [Special Examinations](#)).

**Note:** missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

## **6. Accommodation and Accessibility**

### **Religious Accommodation**

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

### **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).

## 7. Academic Policies

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

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.

Non-programmable calculators are allowed on the midterm tests and the final exam. However, SOA approved calculators are strongly recommended.

**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](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

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>).

## 8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling 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://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<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.

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/>.

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