

## COURSE OUTLINES (SYLLABI) FOR AS4824 A/B – LOSS MODELS II

### 1. General Course Information

#### Course Information

**Course name:** Loss Models II

**Course Number:** AS4824/9824 A/B

**Academic Term:** Fall 2017

**Lecture Hours** Tue 10:30 AM-11:30 AM WSC 240; Thu 10:30 AM-12:30 PM WSC 240;

#### Prerequisite Requirements

[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. A minimum mark of 60% in Statistical Sciences 3858B.

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

**Instructor:** Jiandong Ren

**Office:** WSC 219

**Email:** [jren@stats.uwo.ca](mailto:jren@stats.uwo.ca)

**Phone:** 519-661-2111, Ext 88209

**Office hours:** Tue 3-4pm, Thu 2-4pm.

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. Email 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 email them, please use your UWO account, as these are often the only emails read (as emails sent from other addresses often get spammed).

### 3. Course Description/Syllabus

Selection, calibration, and validation of parametric models for insurance losses; credibility

theory; Simulation.

This course, together with AS3424b, forms part of the Exam C exemption under the Canadian Institute of Actuaries "University Accreditation Program".

#### 4. Course Materials

##### Text Book(s)

Klugman, S.A., Panjer, H.H. and Willmot, G.E. (2012). Loss Models: From Data to Decisions, 4th edition, Wiley, Hoboken, NJ.

Chapters 10 through 20 of the "Loss Models" (4th edition) textbook will be covered. Specific topics are listed below:

##### A. Construction of Empirical Models

1. Estimate failure time and loss distributions using

a) Kaplan-Meier estimator

b) Nelson-Åalen estimator

c) Kernel density estimators

2. Estimate the variance of estimators and confidence intervals for failure time and loss distributions

3. Apply the following concepts in estimating failure time and loss distribution

a) Unbiasedness

b) Consistency

c) Mean squared error

##### 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 parameters of failure time and loss distributions with censored and/or truncated data using maximum likelihood.

3. Estimate the variance of estimators and the confidence intervals for the parameters and functions of parameters of failure time and loss distributions.

4. Apply the following concepts in estimating failure time and loss distributions:

a) Unbiasedness

b) Asymptotic unbiasedness

c) Consistency

d) Mean squared error

e) Uniform minimum variance estimator

5. 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.

#### D. Simulation

1. Simulate both discrete and continuous random variables using the inversion method.
2. Estimate the number of simulations needed to obtain an estimate with a given error and a given degree of confidence.
3. Use simulation to determine the p-value for a hypothesis test.
4. Use the bootstrap method to estimate the mean squared error of an estimator.
5. Apply simulation methods within the context of actuarial models.

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.

## 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.

### Midterms or Tests

Two midterm tests will be given. The first midterm is 50 minutes and will be held on October 3 in class. The second midterm is 110 minutes and will be held on November 9 in class.

### 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.

In order to obtain full credit or maximize partial credit on questions, students must outline clearly their approach, showing calculations when necessary.

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

The overall course grade will be calculated as listed below:

Midterm Exam 1	15%
Midterm Exam 2	30%
Final Exam	55%

## **6. 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 WSC 140, and can be contacted at [scibmsac@uwo.ca](mailto: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](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf).

**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.

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)).

## **7. Academic Policies**

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

### **7.1 UWO email account**

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.

### 7.2 Scholastic offences

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this website: [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).

### 7.3 Attendance

Classroom attendance is viewed as an important part of the learning process. Students are advised that excessive absenteeism may result in the student being disbarred from the final exam (see Western Academic Calendar).

### 7.4 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.stats.uwo.ca/mutual\\_expectations.pdf](http://www.stats.uwo.ca/mutual_expectations.pdf).

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.

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

The policy on Accommodation for Students with Disabilities can be found here: [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_disabilities.pdf](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](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](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>.