

Fall 2019  
Department of Statistical and Actuarial Sciences

## Actuarial Science 4823A/9004A

### Survival Analysis

- Instructor:** Wenqing He  
**Office:** WSC213  
**Phone:** 661-2111 x 86982  
**E-mail:** whe@stats.uwo.ca
- Lecture:** M 2:30-4:30 pm in WSC 248  
W 3:30-4:30 pm in WSC 248
- Office Hours:** Thu. 2:30-3:30pm, or by appointment
- Prerequisites:** A minimum mark of 60% in Statistical Sciences 3858B
- Description:** Survival models, nonparametric estimation of the survival function, one and two or more sample hypothesis tests, inference for semiparametric regression models, inference for parametric regression models.
- Objectives:** This course is intended to provide students with an understanding of the theory and applications of survival analysis. By the end of the course, students are expected to be able to perform statistical inference for various types of survival data by using parametric, semi-parametric or nonparametric survival models.
- Main Reference Book:** *Statistical Models and Methods for Lifetime Data, 2<sup>nd</sup> Edition*, by Jerald F. Lawless, John Wiley & Sons, 2003.  
  
*The Statistical Analysis of Failure Time Data, 2<sup>nd</sup> Edition*, by John D. Kalbfleisch and Ross L. Prentice. John Wiley & Sons, 2002.
- Topics:**
1. Introduction to survival analysis.
  2. Essential preliminaries: survivor function, hazard function, cumulative hazard function, density function and their relationships for both continuous and discrete survival times. Censoring and truncation.
  3. Basic properties of lifetime distributions: the common lifetime distributions, how the distributions are derived in survival analysis, and their properties that are essential in choosing distributions in practice.

4. Non-parametric estimation and graphical methods: Kaplan-Meier estimator, Nelson-Aalen estimator, and their variance estimators; Log-rank test for distribution difference; Graphical methods that combining nonparametric estimation and choices of parametric models in practice.

5. Parametric survival models: statistical inference for parametric model settings.

6. Regression analysis for parametric models: goodness of fit and model selection for regression models under parametric settings.

7. Regression analysis for semi-parametric models: goodness of fit and model selection for regression models under semi-parametric settings where part of the models is left unspecified.

**Evaluation:** 20% Assignments +45% Tests + 35 % Project

Four Assignments Due in Class:

Sep. 23

Oct. 21

Nov. 18

Dec. 4

Two In-class Tests:

Oct. 9

Nov. 27

Project due: Dec. 18, 11:59pm: submit through email

**Note:** There will be no make up tests. No late assignment is allowed. You are allowed to discuss your assignments, but everyone has to write the assignment himself/herself. No copy is allowed. Final project is a group project. At most three students in each group. In the project report, each of you has to report your role in the project

**Calculators:** Non-programmable calculators are allowed for the tests.

**Aid Sheet:** One double sided letter size aid sheet is allowed for each test.

**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. For further information, please consult the universitys 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). If you miss the Final Exam, please contact your facultys 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)).

**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 individuals 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. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at these websites: undergraduates: [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), and graduates: [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_grad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf).

**Support  
vices:**

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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 yearround 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>.