

Course Outline STAT*6761: Winter 2022

General Information

Course Title: Survival Analysis

Course Description: Kaplan-Meier estimation, life-table methods, the analysis of censored data, survival and hazard functions, a comparison of parametric and semi-parametric methods, longitudinal data analysis.

Credit Weight: 0.5

Academic Department (or campus): Math and Stats

Campus: Guelph

Semester Offering: Winter 2022

Class Schedule: Lectures: Wednesday, 2:30 to 5:30 pm, Rozanski 108. For the first 2 weeks lectures will be delivered via Zoom on the Courselink website.

Instructor Information

Instructor Name: Tony Desmond

Instructor Email: tdesmond@uoguelph.ca

Course Content

We will be interested in statistical models appropriate for analyzing groups of individuals for which there is defined a point event often called failure. Areas of application include:

1. **Industrial Reliability:** Lifetimes of machine components.
2. **Economics:** Durations of strikes or periods of unemployment.
3. **Medicine:** Survival times of patients in a clinical trial.

Problems involved with this kind of data include:

- a) The development of regression models and inference procedures for highly non-normal distributions.
- b) The development of methods to cope with the types of incomplete and censored data often encountered in this type of data.

Course Outline

1. **Basic Concepts: Hazard Functions, Survivor Functions, Residual Life Functions**
2. **Important Parametric Models: Exponential, Weibull, Gamma, Generalized Gamma etc.**
3. **Censoring. Non-parametric estimation of survival and hazard functions.**
4. **Inference and Estimation for Exponential, Weibull and Extreme Value Distributions.**
6. **Inference for other parametric models.**
7. **Parametric Regression Models.**
8. **Proportional Hazards and Accelerated Failure Time Models.**
9. **Other topics: process based models, cure models, frailty models, competing risks.**

Grading: 4 or 5 Assignments, 30%

Midterm: In Class, Wednesday March 2, 2022, 2:30 to 4:30, 30%

Term Project, 40%

The term project will involve application of the theory in a subject-matter discipline, such as medicine, economics, engineering, etc. and will be expected to go beyond the material delivered in lectures. Specific suggestions will be made.

Familiarity and expertise with the R package will be assumed.

Course Resources

Required Texts

Statistical Models and Methods for Lifetime Data, 2nd Edition, by J.F. Lawless, Wiley and Sons 2003.

Modelling Survival Data in Medical Research, 3rd Edition, by Collett, D, CRC Press 2015

Applied Survival Analysis using R, by Dirk F. Moore, Springer 2016.

Additional Recommended Texts: Survival and Event History Analysis: A Process Point of View, by Aalen, Odd et al., Springer 2008.

Each of these texts will be on reserve as e-books.

Course Policies

Late Assignments or Projects will not be accepted, except under very exceptional circumstances.

Course Policy on Group Work:

Assignment solutions should be your own work, be clear, legible and well organized. You may discuss assignments with other classmates, but the work handed in should be your own. Work on take-home exams/projects should be entirely your own,

Course Policy regarding use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

University Policies

Email Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for [Academic Consideration](#).

Drop Date

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

Copies of Out-Of-Class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: www.uoguelph.ca/sas

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the

responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is outlined in the Undergraduate Calendar.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via Courselink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

COVID-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, that these guidelines may be updated as required in response to evolving University, Public Health or government directives.

