# STAT4170/STAT7240

# Winter Term - 2017

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**Course Title**: Lifetime Data Analysis (Survival Analysis)

**CRN**: 55363

**Instructor:** Dr. Po Yang
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**Lecture hours and location:** Tuesday and Thursday: 11:30am - 12:45pm, 316 Machray Hall

**Office hours:** Tuesday and Thursday: 1:30am-2:30am, or by appointment

**Course web:** All course materials will be posted on the UM Learn system regularly.

**General description:** An introduction to basic principles and techniques for survival analysis in biostatistics and reliability, with emphasis on both theory and applications. Topics to be covered include: censoring, survival, hazard and other functions, parametric, semi-parametric and nonparametric methods, proportional hazards regression. The computer software SAS will be used to analyze data.

**Prerequisites:** STAT 3480 and STAT 3800 (or STAT 3600). Some knowledge of calculus is also assumed.

**Recommended references:**

1. *Statistical methods for survival data analysis* (4th edition), E. T. Lee and J. W. Wang, John Wiley and Sons, New York, 2003.
2. *Statistical models and methods for lifetime data* (2nd edition), J. F. Lawless, John Wiley and Sons, New York, 2003.
3. *Modelling survival data in medical research* (3rd edition), David Collett, Chapman & Hall/CRC, 2003.

**Grading:**

Three Assignments 15%
Midterm Test 35%
Final Examination (2 hours) 50%

**Note:**

1. The midterm test will be tentatively on Thursday, March 23, 2017, during the class time.
2. Midterm exam missed with final-exam-type excuse will transfer 35% to final-exam contribution rather than being make-up with a make-up test. 0 with no excuse.
3. Both the mid-term test and final examination are closed book. A calculator is necessary. Required statistical tables are provided.
4. Students in STAT 7240 are required to do some extra work for the assignments and exams.

**Course contents:**

*Module I:* Basic concepts, models, functions and distributions Censoring: Types I, Type II, interval, random, etc. Continuous and discrete models: survival function, (cumulative) hazard function, mean residual lifetime function, mean and median survival times. Distributions: exponential, Weibull, Gamma, normal, etc.

*Module II:* Nonparametric methods: one-sample and multiple-sample, product-limit (Kaplan-Meier) and actuarial (life-table) estimators, Greenwood's formula, confidence band, (Mantel-Haenszel) log-rank test, Wilcoxon test, etc.

*Module III:* Semi-parametric regression: Cox's proportional hazards, partial likelihood, global and local tests, estimation, etc. Model building, variable selections, and diagnostics for PH assumptions.

*Module IV:* Parametric methods: MLE for Type I/II censoring. Exponential and Weibull distributions. Other distributions: normal, log-normal, Gamma, etc. (time permitting)

*Module V:* Optional topics (time permitting): Parametric regression, accelerated failure time models, competing risks models, time-dependent covariates, stratified models, recurrent events, sample size determination, etc.

**Academic Dishonesty**:

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

*http://umanitoba.ca/science/undergrad/resources/webdisciplinedocuments.html*

Typical penalties imposed within the Faculty of Science for academic dishonesty are also described.

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**Class Communication**

The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. Please see:

*http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html*

You are required to obtain and use your U of M email account for all communication between yourself and the university.

**Student Accessibility Services**

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

*http://umanitoba.ca/student/saa/accessibility/*

**ROASS Schedule A**

Schedule "A" of the *Responsibilities of Academic Staff with regards to Students* (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. This document is available from the Department of Statistics weg page at:

*http://umanitoba.ca/science/statistics/*