ORIGINAL COURSE IMPLEMENTATION DATE: May 1994

REVISED COURSE IMPLEMENTATION DATE: September 2023

COURSE TO BE REVIEWED (six years after UEC approval)**:**

Course outline form version: 28/10/2022

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: STAT 402	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Applied Generalized Linear Models and Survival Analysis **Course Short Title:** Applied GLM and Survival Analysis	
Faculty: Faculty of Science	**Department (or program if no department):** Mathematics & Statistics

Calendar Description:

Covers the application of methods of the linear model analysis to non-normal data. This includes analysis of contingency tables, analysis of incidence data, analysis of binomial data, analysis of case-control data, analysis of matched case-control data, and analysis of survival data.

Prerequisites (or NONE):	STAT 271 or STAT 315.
Corequisites (if applicable, or NONE):	none
Pre/corequisites (if applicable, or NONE):	none

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number: **MATH 402**

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Supervised laboratory hours (computer lab)	50
Total hours	**50**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**

(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**

(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Infrequent**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **No**

Submit outline for (re)articulation: **No**

(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	December 2022
Faculty Council approval	**Date of meeting:**	January 6, 2023
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	February 24, 2023

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. Demonstrate how to extend the methods of the univariate linear models to a large variety of models based on the exponential family.
2. Discuss the commonly used applications of generalized linear models.
3. Apply generalized linear models to data sets using statistical software.
4. Discuss parametric and semi-parametric survival time models.
5. Apply parametric and semi-parametric survival time models to data sets using statistical software.
6. Interpret published analyses of incidence and survival data.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Assignments:	20%	Quizzes/tests:	30%	Final exam:	50%
			%		%

Details:

The above percentages may vary among instructors and years. Assignments may include group projects. The final exam is comprehensive. Students must obtain at least 40% on the final exam in order to receive credit for this course.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures, class discussion, use of statistical software in computing labs.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	McCullagh, P. and Nelder, J.A.	Generalized Linear Models. 2e. Chapman and Hall	1989
2.	Textbook	Dobson, A.J. and Barnettt, A. G.	An Introduction to Generalized Linear Models. 4e. Chapman and Hall	2018
3.	Textbook	Kalbfleisch, J.D. and Prentice, R.L.	The Statistical Analysis of Failure Time Data. John Wiley.	2002
4.	Textbook	Agresti, A.	Categorical Data Analysis. 3e. Wiley	2012
5.	Textbook	Roback, P. and Legler, J.	Beyond Multiple Linear Regression: Applied Generalized Linear Models and Multilevel Models in R. 1e. CRC Press	2020

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Statistical software such as R, SAS, or Python will be used.

Course Content and Topics

1. Principles of statistical modeling.
2. Introduction to exponential families of distributions and generalized linear models.
3. Introduction to maximum likelihood estimation.
4. Log-likelihood ratio statistics, deviance, and goodness-of-fit test statistics.
5. Normal linear models as special case of generalized linear models.
6. Analysis of binomial (binary) data, logistic regression, probit and complementary log-log models.
7. Analysis of nominal and ordinal data, nominal logistic regression, and ordinal logistic regression.
8. Analysis of count data, Poisson regression, and log-linear models.
9. Analysis of survival data, parametric modelling, semi-parametric modelling, and empirical survivor functions.
10. Analysis of overdispersed data.