

## GENERALIZED LINEAR MODELS COURSE OUTLINE

**Course Name: Generalized Linear Models.**

**Course Number: SS3860B**

**Term: Winter 2022**

**Location: WSC-240**

**Lecture Hours: Tuesdays 9:30-11:30**

**Tutorial: Wednesdays 10:30-11:30**

**Classes Begin: Tuesday, January 11, 2022**

**Reading Week: February 19-27, 2022**

### 1. Course Information

**Course Description:** The Material covered in this course contains the theoretical and applied features of Linear Regression models and the extension to the broad framework of Generalized Linear Models (GLM). Topics in this course will cover the multiple normal regression for continuous outcome, binary logistic regression, Count regression using Poisson models, negative binomial regression, and multinomial regression. For correlated outcomes, such as repeated measures and clustered data we shall use the generalized estimating equation (GEE) and the generalized linear mixed models (GLIMIX). When time permits, we shall cover nonparametric regression (Generalized Additive Models). For data analyses, we shall use the software package R.

**Course Objectives:** When the course is completed, you should be able to

- 1- Do data visualization, summarize that data, and select the appropriate method for modeling your data.
- 2- Understand the theory and application of the maximum likelihood inference for the GLM.
- 3- Find point and interval estimators, conduct hypothesis testing, comparing between models and assess goodness of fit
- 4- Interpret the results and report your findings in a comprehensive manner.

**List of prerequisites: SS 3859A/B with at least 60%.**

Unless you have either the prerequisite 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 if you are dropped from a course for failing to have the necessary prerequisites.

## **Course updates and changes due to COVID-19**

The University has decided to delay the start of the Winter 2022 term by one week until January 10. In addition, the new term will begin online, and remain online until at least January 31.

### **Please note the following dates:**

- 1- January 10 first day of classes for the University, and January 11 for this course.
- 2- Feb. 19–27 Reading Week
- 3- April 8 last day of classes
- 4- April 9 study day
- 5- Apr. 10–30 final exams (excluding Apr. 15–17 for Easter and Passover)

## **Course delivery and assessment with respect to the COVID-19 pandemic:**

Although the intent is for this course to be delivered in-person to the extent possible, the changing COVID-19 landscape may necessitate some or all-of the course to be delivered online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience), as deemed most appropriate by the instructor.

When deemed necessary, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledging that you will be required to provide personal information (including some biometric data) and that the session will be recorded. Completion of this course will require:

- a laptop or computer
- a working microphone and webcam
- a reliable internet connection

## **2. Instructor Information**

**Instructor: Mohamed Shoukri**  
**Department of Epidemiology and Biostatistics**

Students must use their Western (@uwo.ca) email address when contacting the instructor. Messages may be sent to the instructor's email (Shoukri.mohamed@gmail.com)

### 3. Course Materials

Required text: **Faraway, J. J. (2016) Extending the Linear Model with R: Generalized Linear, Mixed Effects and Nonparametric Regression Models, 2nd Edition. CRC Press.**

**R statistical software package:** This course is heavily based on R and, therefore, all assignments and final project will require coding in R. Please make sure you have the latest R version installed in our computer(<https://cran.r-project.org/>)

All course material will be posted to OWL: <http://owl.uwo.ca>.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

### 4. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments	20 %
Quizzes (4)	10 %
Midterm 1	15 %
Midterm 2	15%
Final Exam	40 %

**Quizzes:** There will be four 30-minutes quizzes to be held during the Wednesday tutorial timeslot on the following dates: Wednesday January 26, February 16, March 16, and March 23. Each quiz will consist of a few short answer questions.

**Midterms:** There will be two one-hour tests held during the tutorial time. The tentative dates of these test are: Midterm 1 February 11. Midterm 2: March 9.

**Final Exam:** To be scheduled by the registrar's office

**Calculators:** Any programmable calculator may be used. Only quizzes and midterms are closed book.

### 5. Accommodation

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 in NCB 280, 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).

### **Late Submissions**

- Late assessments without illness self-reports will be subject to a late penalty of 20% per day or portion thereof, and assessments that are submitted 5 or more days late will not be graded.
- Late assessments with illness self-reports should be submitted within 24 hours of submission of the last illness self-report, after which they will be subject to a late penalty of 20% per day or portion thereof, and assessments that are submitted 5 or more days late will not be graded.

## **6. Student Absences**

### **Academic Consideration for Student Absences**

Students who experience an extenuating circumstance (illness, injury, or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:
  - an absence must be no more than 48 hours
  - the assessments must be worth no more than 30% of the student's final grade
  - no more than two SRAs may be submitted during the Fall/Winter term
- (ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.
- (iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered, unless otherwise instructed in the course outline.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf)

and for the Student Medical Certificate (SMC), see:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf).

## Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

## Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you can do so. They will assess your eligibility to write the Special Examination (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" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

# 7. Accessibility

## Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf),

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

In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf),

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.

**Non-programmable calculators are permitted for use during the midterm exam. No other aids are allowed (unless otherwise noted). Cellular phones, iPods, and other similar technology are not permitted in the midterm rooms. This means that cellular phones, iPods, and other similar technology cannot be used as a timekeeper/clock, calculator, or for any other purpose. Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:**

[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).

**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). **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.uwo.ca/stats/undergraduate/mutual-expectations.html>. 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.

**Scholastic offences** are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the above Web site:

## 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 Student Accessibility Services (SAS) at 661-2147 if you have any questions regarding accommodations. The policy on Accommodation for Students with Disabilities can be found here: [http://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](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>.