



Department of Biology
BIOL 9915A Analytical Methods and Study Design
Fall 2026

Draft 8/25/2026

1. Course Information

Lecture: MW 12:30-1:30 PM, TBA

Lab: W 2:30-5:30 PM, TBA

Website: <https://westernu.brightspace.com/>

First class: September 9

First lab: September 16

Reading week: October 10–18

Last class: December 9

For each 1 hour of lecture time, expect to spend 2 hours of out-of-class study time.

2. Enrollment Restrictions

Enrollment in this course is restricted to graduate students in Biology, as well as any graduate student that has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student's home program.

This is an introductory course and the expectation is that students will have some background theoretical and practical knowledge about probability distributions, summary statistics, t-tests, ANOVA, and linear regression.

3. Instructor Information

Prof. Yolanda Morbey, ymorbey@uwo.ca, x80116

Office hours by appointment during scheduled lab times.

The TA and will be serving the role of **peer supporter** during lab times, and will not be involved in the grading of any 9915 student. TA information will be posted on Owl.

4. Course Description and Graduate Course Level Learning Outcomes

Course description

Statistical methods are tools that allow us to answer questions and learn about the world around us from samples of data, because we can never have complete information about a problem. As a biologist you might apply analysis of variance to learn about the effects that different diseases have on plant growth, linear regression to explore the impacts of climate change on species diversity, or logistic

regression to understand the factors affecting an animal's presence on the landscape. This course aims to help students understand, conduct, and present biological research using statistics. The emphasis will be on basic theory and practical application, and will focus on the following topics: data preparation, experimental design, exploratory data analysis, general linear models, generalized linear models, and linear mixed models. Students will gain experience using R and R Studio statistical software for effective data tidying, visualization, and analysis.

My role in this course is to guide you as you develop practical skills for the application and interpretation of statistics. The intent is not for you to learn every single statistical method. Rather, it is for you to gain confidence and skill in the use of statistics in biology.

Learning outcomes

By the end of this course you should be able to:

- Understand, explain, and evaluate the assumptions of a statistical model.
- Decide whether a specified statistical method is appropriate to analyze data from a given study.
- Implement data management, visualization, and statistical analyses in R and R Studio and interpret the results.
- Report the results of statistical analyses in language appropriate for a general audience.
- Recognize the importance of ethical data practices and use of generative AI.

5. Course Timeline and Format

Lectures will focus on these topics in order: data preparation, experimental design, exploratory data analysis, general linear models, generalized linear models, and linear mixed models. Graduate student presentations will occur towards the end of the semester.

Laboratory sessions will focus on practical skill development in R Studio.

The course will be taught in person and jointly with Bio 4259F. Supporting material will be available on Owl Brightspace. Quizzes will use a mixed format of in-person, group work, and online.

6. Course Materials

Laptop: Bring your own to lectures and labs.

Software (free):

R version 4.6.1 (<https://cran.r-project.org/>)

RStudio Desktop v2026.08.1 (<https://posit.co/download/rstudio-desktop/>)

*If you have an earlier version of R and RStudio on your laptop, I would recommend that you uninstall R, RStudio, and all libraries, and then install the most recent versions.

*You may also use R Studio Cloud, which is hosted online.

Books:

Beckerman, A.P., D.Z. Childs, O.L. Petchey. 2017. Getting Started with R: An Introduction for Biologists. 2nd edition. Oxford University Press, Oxford, UK. You must use this edition. Electronic access via the university library, ebook for rental from the bookstore (\$39.00), or textbook for purchase from the bookstore (\$79.60).

Hector, A. 2021. The New Statistics with R: An Introduction for Biologists. 2nd edition. Oxford University Press, Oxford, UK. Use of the first edition (2015) will be fine. Electronic access via the library.

7. Methods of Evaluation

- 4% Engagement, professionalism, and participation. This will be based on characteristics including, but not limited to, professionalism, integrity, attitude, independence, cooperation, improvement, and contribution during class time.
- 21% Quizzes (best 7 of 10 x 3% per quiz = 21%). Each quiz will be done in three phases: individually (closed book), by group, and online. For each quiz, you will receive 1% if you participate in the individual phase, 2% if you correctly answer $\geq 80\%$ of the questions on the online quiz, 1.5% if you correctly answer 70–80% of the questions, 1% if you correctly answer 60–70% of the questions, and 0% otherwise. Quizzes will normally happen weekly at the beginning of the laboratory session.
- 40% Peer-supported independent project on “Quantitative methods in [insert disciplinary focus here].” Instructions will be posted on Owl. Grading will be based on a final R Markdown report (due 2 days before the seminar, worth 20%) and an individual 30 min seminar (to be scheduled, worth 20%).
- 35% Final Exam. In person, closed book. Date TBA. Up to 20% of the final exam will differ from the Bio 4259F exam.

General information about missed assessments & deadlines

If more than 3 quizzes are missed, those marks will be allocated to the final exam. Late project submissions will be subject to a deduction of 1% of the course grade per day.

Absences from final examinations

When a student misses the Final Exam and academic consideration has been granted from the Graduate Chair of their program, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam).

8. Statement on Academic Offences

Scholastic offences are taken seriously and students are directed to read the Scholastic Offences policy (https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf), specifically, the definition of what constitutes a Scholastic Offence.

9. Health/Wellness Services

Students who are in emotional/mental distress should refer to Mental Health Support at Western (<https://www.uwo.ca/health/psych/index.html>) for a complete list of options about how to obtain help.

10. Accessible Education

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program. Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education (AE), a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AE and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations may include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.

11. Statement on Gender-Based and Sexual Violence

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who is going through or has gone through these traumatic events. If you are experiencing or have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts on the Wellness and Wellbeing website (<https://www.uwo.ca/health/gbsv/index.html>). To connect with a case manager or set up an appointment, please contact support@uwo.ca.

12. Statement on the Use of Generative Artificial Intelligence (AI)

Guidance for the use of generative AI tools can be found here: <https://ai.uwo.ca/Guidance/index.html>. Generative AI tools (e.g., ChatGPT, Copilot, Gemini) may be used to support learning, but students must accept the risks and understand the ethical ramifications. Ultimately, courses are opportunities to learn, and shortcuts do not facilitate learning. Everything submitted for grading is the student's responsibility.

Appropriate uses in this course:

- Tutor for reinforcing the learning of the specific skills taught in this course
- Definitions of unfamiliar terms
- Brainstorming
- Occasional grammar correction & spell-checking
- Occasional translation

Inappropriate uses:

- Plagiarism
- Infringement of copyright
- Presentation of fabricated or false information
- Submission of quiz questions to obtain answers
- Drafting and revision of R code (except ggplot arguments)

- Substantive editing of writing quality (i.e., polishing).