



UNIV*6020 - Experimental Design and Applied Data Analysis for the Agricultural Sciences

Fall 2026 Course Outline

Section: 01

Credits: 0.50

Land Acknowledgement: Guelph

The University of Guelph resides on the ancestral lands of the Attawandaron people and the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land and offer respect to our Anishinaabe, Haudenosaunee and Métis neighbours. Today, this gathering place is home to many First Nations, Inuit, and Métis peoples and acknowledging them reminds us of our important connection to this land where we work and learn.

Calendar Description

This two-semester course focuses on statistical principles, experimental designs, and communication of findings to research peers within the agricultural field. Students apply statistical techniques and perform data analyses.

Department(s): Department of Plant Agriculture

Course Description

This course will be delivered in a modular format, with each module lasting one to two weeks. It will be offered during the Fall and Winter semesters, with mandatory modules scheduled in the Fall and optional modules extending from late Fall into the Winter semester. The modular design aims to provide students with flexibility while building a base knowledge of applied data analyses so that departments and faculty members can teach more advanced and specialized courses.

Students, with their advisors, must select the required number of modules to provide 12 weeks of instruction in total, to obtain credit for the course. There are 4 modules (8 weeks) that are mandatory, covering the core statistical toolkit every student needs: foundational statistical concepts and tests, experimental design (from basic through more advanced designs), and regression and multivariate methods, with hands-on coding practice in both SAS and R throughout.

Optional modules give students flexibility to explore topics matched to their own research. These modules cover specialized applied-statistics topics relevant to agricultural and environmental research — such as advanced experimental designs, data visualization, research data management and reproducibility, and specialized modelling approaches (e.g., meta-analysis, genotype x environment analysis, GLMMs, AI/machine-based methods). Additional modules may be added to meet specific needs as they arise, with faculty collaboration.

The course concludes with a final research project that prepares students to apply what they have learned to their own research. Thesis-based students use this time to define the experimental design and statistical approach for their own thesis research, and to write and test the corresponding SAS/R code before their research begins. Course-based students instead work on a real research project — either using their own data or selecting from a set of suggested research projects— giving them hands-on experience solving an authentic statistical problem from start to finish.

Please note that examples used throughout the course will be from the agricultural and natural science fields, to cover the topic areas studied in OAC.

Lecture Schedule

MonWedFri 11:30am-12:20pm in THRN*1307 (9/10 to 12/22)

Lab Sections

Day	Time	Location	Sections
Monday	2:30 PM - 4:30 PM	ROZH 105	01
Friday	2:30 PM - 4:30 PM	MINS 037	02



Instructor Information

Amir Bazrgar

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Learning Resources

Helpful Resources:

1. Bowley, S.R., van Santen, E., Riley, S., Michelson, D.K., and Hummel, R.M. 2025. Applied Statistics in Biology: A Practical Guide Using SAS, R, and JMP. 2nd edition. ASA, CSSA, SSSA, Madison, WI. ISBN 978-0-89118-394-5 (print) | 978-0-89118-395-2 (online).

An online/e-book version is available partially through the UofG Library

2. Kuehl, R.O. 2000. Design of Experiments: Statistical Principles of Research Design and Analysis. 2nd edition. Duxbury Press. CA, USA.

Text is available on Reserve in the Library

3. Glaz, B., and Yeater, K.M. (Editors). 2018. Applied Statistics in Agricultural, Biological, and Environmental Sciences, Print ISBN:9780891183594 | Online ISBN:9780891183600 | DOI:10.2134/appliedstatistic

E-Book copy is available through the UofG library: <https://acsess.onlinelibrary.wiley.com/doi/book/10.2134/appliedstatistics>

CourseLink:

CourseLink (<https://courselink.uoguelph.ca/shared/login/login.html>) will be used to distribute assignments, data files, information, and other materials associated with the course. You will also use this to submit the pdf copy of your SAS/R analyses for the graded reports. There are also four graded quizzes during the course; these will be conducted online via CourseLink.

Note that if you are in arrears regarding tuition fees, your access to the CourseLink website will be unavailable until you have settled matters with the Registrar's Office.

Marks will be collated in CourseLink throughout the course. It is your responsibility to review these grades and report if there are any discrepancies. Keep paper and/or other reliable backup copies of all in- and out-of-class assignments: You may be asked to resubmit work at any time.

Statistical Computing Software:

To perform the statistical analyses in this course, you will be required to use either SAS or R. You will ONLY need one of the two packages — please set yours up before your first lab session in Week 1.

Option A – SAS

Choose **one** of the two SAS options below (not both).

A1. SAS OnDemand for Academics (free, browser-based, nothing to install):

- Go to <https://welcome.oda.sas.com> (<https://welcome.oda.sas.com/>) and click "Register."
- Create a free SAS profile (use your @uoguelph.ca email).
- Once your account is verified, log in and open *SAS Studio* — it runs entirely in your browser, so there is nothing to download or install.
- Works on any laptop, Chromebook, or tablet with an internet connection.
- Get started and join the SAS community: Base SAS | SAS Support (<https://support.sas.com/en/software/base-sas-support.html>)

A2. SAS 9.4 licensed workstation install (installs SAS on your own computer):

- Complete the Free for Students SAS 9.4 Workstation (2026–2027) Student License Request Form (<https://forms.office.com/r/uxe0hS4Npb/>) through CCS.
- Follow the installation instructions CCS emails you after your request is approved.

Option B – R + RStudio (both are required, in this order)



R and RStudio are two separate, free downloads — install R first, then RStudio.

Step 1 — Install R:

- Go to <https://cran.r-project.org> (<https://cran.r-project.org/>) (the official R website).
- Click the download link for your operating system (Windows / macOS / Linux) and download the latest version.
- Run the installer and accept the default settings.

Step 2 — Install RStudio Desktop:

- Go to <https://posit.co/download/rstudio-desktop> (the official Posit/RStudio website).
- Download the free “RStudio Desktop” version for your operating system.
- Run the installer and accept the default settings. Open RStudio (not R itself) each time you work — RStudio automatically uses the R you installed in Step 1.

Cost of Textbooks and Learning Resources

Textbook / Learning Resource	Required / Recommended	Cost
None		

Students are advised that prices are often determined by the publisher or bookstore and may be subject to change.

Course Learning Outcomes

1. Select and differentiate among classical inference statistical tests;
2. Choose an appropriate experimental design to match research goals and available resources;
3. Identify and analyze statistical models that match experimental designs and/or research goals;
4. Critique, evaluate, and defend data analyses and research outputs to their peers;
5. Apply research data management skills to their own research.

Audit Students

To receive an “Audit” from this course, you are required to:

1. Complete three quizzes.
2. Submit two data analysis reports.

Lecture Schedule

Semester 1 & 2 Schedule

Fall 2026 Weeks 1 - 8

Mandatory Modules: Topics will range from a review of statistical tests to the partitioning of variation in experimental design and regression analysis.

Fall 2026 Weeks 9 - 12 & Winter 2027 Weeks 1 - 6

Optional Modules: A variety of agricultural statistics topics, including guest lectures by OAC faculty.

Winter 2027 Weeks 7 - 12

Final Presentations / Final project consultations.

Assessment Breakdown for Semester 1 2

Description	(%)	Start Date	Due Date
1. Assignments – Mandatory Modules			
Data Assignment #1	10%	7-Oct-2026	20-Oct-2026
Data Assignment #2	10%	23-Oct-2026	30-Oct-2026
Data Assignment #3	10%	6-Nov-2026	13-Nov-2026
2. Assignments – Optional Modules			



Mini Data Assignment/Quiz #1	5%	Optional module completion date	2–7 days after module completion
Mini Data Assignment/Quiz #2	5%	Optional module completion date	2–7 days after module completion
Mini Data Assignment/Quiz #3	5%	Optional module completion date	2–7 days after module completion

3. Quizzes

Quiz #1	10%	23-Sep-2026	25-Sep-2026
Quiz #2	5%	7-Oct-2026	9-Oct-2026
Quiz #3	5%	6-Nov-2026	10-Nov-2026
Quiz #4 (Review)	5%	26-Feb-2027	2-Mar-2027

4. Final Project

Final Presentation*	10%	1-Mar-2027	12-Apr-2027
Final Written Report**	20%	—	12-Apr-2027

* First and last day of presentation.

**Deadline for final report submission.

Friday, November 6: 40th class day. Instructors have provided feedback on a minimum of 20% of the final course grade.

Last Day to Drop Course

The final day to drop Fall 2026 courses without academic penalty is the last day of classes: December 04

After this date, a mark will be recorded, whether course work is completed or not (a zero is assigned for missed tests/assignments). This mark will show on the student's transcript and will be calculated into their average.

Course Standard Statements

Course Constraints

There is a ban on the use of writing services and statistical analysis services for all reports submitted in this course. AI tools may be used only with explicit instructor permission and according to specific guidelines.

Quizzes

Quizzes will be available online through the CourseLink. Each quiz will open at 6:00 pm on the start date (normally the final day of the module) and remain available until 11:59 pm, approximately two weekdays later. Please refer to the 'Assessment Breakdown for Semester 1 and 2' table for the exact due dates. To receive a mark, you must complete the quiz within this time frame. You are allowed up to two attempts for each quiz. Your recorded grade will be the average of all attempts. You do not need access to SAS or R to complete the quizzes.

Data Analysis Assignments

The data analysis reports must be submitted electronically as PDF files via the CourseLink DropBox by 8:30 am on the due date.

Final Project

To be submitted electronically via the CourseLink DropBox by 8:30 am on the due date. Late reports will not be accepted after the DropBox closes and these will receive a 0 grade.

Conflict with a Due Date

If a due date for an assignment/quiz conflicts with a scheduled academic activity such as attendance at a conference, an activity involving a research project, or personal issues such as medical procedures, jury duty, etc., email me ahead of time so we can make alternate accommodation.

Course Policy on Group Work

It is anticipated that you will work on the assignments in study groups; however, the assignments and reports you submit for grading **must be independent and document only your work.**

Plagiarism will be strongly suspected if two or more students submit individual projects that have identical or substantially identical components.

Tables, figures, and paragraphs in reports should reflect your own efforts, not be copies or essential derivatives of work performed by someone else.

See "Academic Misconduct" below for the procedures that are followed if this arises.

Course Policy regarding use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without the prior consent of the Instructor. This prohibition extends to all components of the course, including, but not limited to, lectures, seminars, and lab instruction. If 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.

Additional Course Information - Style Guide

Tables and figures should be suitable for submission to one of the refereed journals of the Agricultural Institute of Canada (<https://www.aic.ca/publications/journals/>) (AIC) such as the *Canadian Journal of Plant Science*, *Canadian Journal of Soil Science*, and *Canadian Journal of Animal Science*. The citation format is Council of Science Editors (<https://cdnsiencepub.com/journal/cjps/authors#guidelines>) (CSE) Name-year. Title, figures, tables and footnotes (if any) should be self-explanatory so that one can interpret what is being presented without having to refer to the methods/results. Titles need to be brief but sufficiently detailed to explain the data and statistical analysis.

See the guidelines for authors for each journal. Follow the instructions as a reference guide for the figures and tables to submit to UNIV*6020. Focus on this phrase: Figures and tables should be self-explanatory so that one can interpret what is being presented without having to refer to the methods/results. Figures & tables are to be suitable for submission for review of a manuscript. There are two exceptions for the assignments for this course: 1) Do not turn on line numbering; and, 2) Place the title of a Figure on the same page as the figure image – do not place the Figure title on a separate page (as you would typically do for a manuscript).

Standard Statements for Graduate Courses

Academic Integrity

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 (<https://calendar.uoguelph.ca/graduate-calendar/general-regulations/academic-misconduct/>) is outlined in the Graduate Calendar.

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.

Use of the SAS Exam Centre requires students to make a booking at least 10 business days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). For students at the Guelph campus, information can be found on the SAS website. (<https://www.uoguelph.ca/sas>)

Accommodation of Religious Obligations

If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements.

See the Academic calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations (<https://calendar.uoguelph.ca/graduate-calendar/general-regulations/academic-accommodation-religious-obligations/>)

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.

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 (<https://calendar.uoguelph.ca/graduate-calendar/general-regulations/registration/>) dropping courses are available in the Graduate Calendar (<https://calendar.uoguelph.ca/graduate-calendar/general-regulations/registration/>).



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.

Health and Wellbeing

The University of Guelph provides a wide range of health and wellbeing services at the Vaccarino Centre for Student Wellness (<https://wellness.uoguelph.ca/>). If you are concerned about your mental health and not sure where to start, connect with a Student Wellness Navigator (<https://wellness.uoguelph.ca/navigators>) who can help develop a plan to manage and support your mental health or check out our mental wellbeing resources. (<https://wellness.uoguelph.ca/shine-this-year>) The Student Wellness team are here to help and welcome the opportunity to connect with you.

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).

Recording of Materials

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

Resources

The Academic Calendars (<http://www.uoguelph.ca/registrar/calendars/?index>) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

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 Graduate Calendar for information on regulations and procedures for Academic Consideration (<https://calendar.uoguelph.ca/graduate-calendar/general-regulations/grounds-academic-consideration/>).