

**University of Guelph**  
**Department of Mathematics and Statistics**  
**Course Outline: Stat\*3210 Fall 2020**  
**Experimental Design**

**Disclaimer:**

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website <https://news.uoguelph.ca/2019-novel-coronavirus-information/>

**General Information**

**Course Title: Stat\*3210: Experimental Design**

**Course Description:** This course presents the basic principles of design: randomization, replication, and local control (blocking); RCBD, Latin square and crossover designs, incomplete block designs, factorial and split-plot experiments, confounding and fractional factorial designs, response surface methodology; linear mixed model computer analysis of the designs; nonparametric methods; Taguchi philosophy.

The above is the official description in the course calendar.

**Credit Weight:** 0.5

**Prerequisite:** Stat\*2050

**Academic Department (or campus):** Mathematics & Statistics

**Campus:** University of Guelph

**Semester Offering:** Fall 2020

**Class Schedule and Location:** The current COVID-19 pandemic necessitates remote delivery of the course. Currently I have reserved Mondays at 2:00PM-2:50PM for “synchronous” delivery of lecture material via Zoom or some similar platform. Every effort will be made to record and post all synchronous lectures, but you will want to try to take in each of these lectures as they take place. The other two lectures each week will be delivered asynchronously; that is, they will be recorded in advance and available on or before Wednesday and Friday at 2:00PM.

## **Instructor Information**

**Name:** Gary J. Umphrey

**Email:** [umphrey@uoguelph.ca](mailto:umphrey@uoguelph.ca)

**Office Phone:** (519) 824-4120 x53288 (voice mail here)

**Office location and office hours:** My office is in MacNaughton 551, but it seems unlikely that I will be allowed to hold office hours or otherwise meet students there. I will have some remote office hours via Zoom (or similar platform), schedule T.B.A.

## **GTA Information**

The course has two Graduate Teaching Assistants this semester:

Julia Harvie-Miller (**Email:** [jharvie@uoguelph.ca](mailto:jharvie@uoguelph.ca))

Patrick McMillan (**Email:** [pmcmilla@uoguelph.ca](mailto:pmcmilla@uoguelph.ca))

## **Course Content**

### **Specific Learning Outcomes:**

I try to optimize the educational outcomes for each student in the course. Specifically some of the outcomes I consider desirable are:

- Increase the breadth and depth of your knowledge in the statistical field of Experimental Design.
- Improve your capacity to plan and implement designed experiments, and to analyze and interpret the data generated.
- Increase your understanding of how designed experiments strengthen scientific inference.
- Gain a stronger appreciation of the issues and tradeoffs that researchers face in attempting to design experiments that are efficient for generating desired information.
- Strengthen your understanding of the role of mathematical models for condensing and communicating information.
- Improve your capacity to communicate statistical results.

### **Lecture Content:**

We will cover, to varying degrees of depth, most of the topics covered by Oehlert (see the Course Description and schedule below for guidance). Other topics may appear in the course that are not covered by Oehlert. You need to keep on top of the recordings and other course materials as we progress through the semester.

Here's an approximate schedule of course topics.

Week 1: Overview of some key designs, getting started quickly  
Week 2: Principles of Experimental Design, including data analysis  
Week 3: Contrasts; multiple comparison procedures  
Week 4: More on factorial designs  
Week 5: Nested designs  
Week 6: More on fixed effects, random effects and mixed effects  
Week 7: Split-plot designs and variants  
Week 8: More on Latin square designs and variants  
Week 9: Incomplete block designs  
Week 10: Fractional factorial designs  
Week 11: Response surface designs  
Week 12: Additional topics in Experimental Design

**Labs:**

This course does not have a lab, but you will be working with hands-on statistical analyses using R statistical software during at least some of the synchronous classes. Make sure to install the latest version of R (and/or R-Studio) on your computer.

**Course Assignments:**

There will be no standard tests or final exam in this course for the Fall 2020 semester. Evaluation will be based entirely on six assignments. The assignments may have individual or group work components (or both). Assignment questions will be posted on Courselink. At least part of each assignment will be posted at least one week before the assignment is due, but questions can be added to any assignment up to 72 hours before the assignment is due.

Your solutions will be submitted electronically, through one or more platforms such as Crowdmark or Courselink. Details of the submission process will be explained for each assignment.

Your final grade will be determined as follows: the first five assignments will be worth 15% each and the sixth (last) assignment will be worth 25%. Heavier weight is assigned to the last assignment since it will include a final project report.

Assignment due dates are:

- Assignment #1: Friday September 25
- Assignment #2: Friday October 9
- Assignment #3: Friday October 23
- Assignment #4: Friday November 6
- Assignment #5: Friday November 20
- Assignment #6: Friday December 4 (last class day)

**Final examination date and time:**

There will be no final exam in this course this semester. This is not a good semester to take the course if you enjoy writing final exams.

## **Course Resources**

### **Required Texts:**

This semester we will use Gary Oehlert's (2000) text, "A First Course in Design and Analysis of Experiments", which Dr. Oehlert has generously made available for free as a pdf download. You can find the link here:

<http://users.stat.umn.edu/~gary/Book.html>

### **Other Resources:**

I will be providing other materials (all accessible electronically) as we move through the course.

## **Course Policies**

### **Grading Policies**

Assignments will be submitted electronically, details to be posted on our course website. Deadlines are strictly enforced, unless I decide otherwise. A penalty of 10% per day can be imposed for late assignments. An assignment cannot be submitted after graded assignments are returned to the class. An unsubmitted assignment without an approved request for academic accommodation will receive a grade of 0. If an assignment cannot be submitted but has an approved request for academic consideration, a substitute assignment (not necessarily of the same format as the original assignment) will be provided.

### **Course Policy on Group Work:**

Some assignments may allow or even require group work on one or more components. Explicit rules for such components will be explained with the assignment guidelines. Make sure you understand the rules, academic misconduct will not be tolerated.

### **Course Policy regarding use of electronic devices and recording of lectures**

Recordings or other course materials 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**

I am a strong proponent of live lectures as part of the learning experience within a vibrant campus environment, but the COVID-19 pandemic requires that we adapt to current and (rather uncertain) future circumstances. After all, we don't want to waste time as we work on building our personal educational capital! I have taught this course several times in the past, and I am

confident that this will be a good course to take remotely. It will not be as tightly structured as many online courses are, rather I will be attempting to capture the experience of taking a “live” lecture course as much as possible.

The course is designed so that you can take it wherever you might be living, whether in Canada or any other country. You will need a computer with internet access, but I will be structuring the assignments so that there is some leeway for working around inevitable internet access issues.

For those living in or near Guelph in the Fall 2020 semester, I am not adverse to having a couple of face-to-face meetings, provided that such meetings can be done safely for all involved. To do so can only be done with the approval of various higher levels of administration, and this can’t be counted on at this time – but I will be looking into it.

## **University Policies**

### **E-mail Communication**

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

### **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. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

**The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.**

### **Drop Date**

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative

delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

The last date to drop one-semester courses this semester, without academic penalty, is **Friday, December 4, 2020**.

### 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.

### 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. Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website <https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgewnc.com/services/accessibilityservices.cfm>

### Academic Misconduct

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.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

### Recording of Materials

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

### Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

### Course Evaluation Information

Please see:

[https://mathstat.uoguelph.ca/sites/uoguelph.ca.mathstat/files/public/TeachevaluationformW16\\_1.pdf](https://mathstat.uoguelph.ca/sites/uoguelph.ca.mathstat/files/public/TeachevaluationformW16_1.pdf)

### Recording of Lecture Materials

By enrolling in a course, unless explicitly stated and brought forward to their instructor, it is assumed that students agree to the possibility of being recorded during lecture, seminar or other “live” course activities, whether delivery is in-class or online/remote.

If a student prefers not to be distinguishable during a recording, they may:

1. turn off their camera
2. mute their microphone
3. edit their name (e.g., initials only) upon entry to each session
4. use the chat function to pose questions.

Students who express to their instructor that they, or a reference to their name or person, do not wish to be recorded may discuss possible alternatives or accommodations with their instructor.