

# PSYC\* 6940, Course Outline: Fall 2025

## General Information

**Course Title:** Discrete-Variable Research Design and Statistics

**Course Description:** This course is an in-depth examination of statistical approaches used in psychology, with an emphasis on experimental research designs with discrete independent variables (e.g., t-test, ANOVA, general linear model), and how these approaches address ongoing statistical challenges faced by psychological researchers, such as replication and generalizability.

**Credit Weight:** 0.5

**Academic Department (or campus):** Department of Psychology

**Semester Offering:** Fall 2025

**Class Schedule and Location:** Lectures held on Fridays, 11:30 - 2:20 pm, MacNaughton Building (MACN), Room 202

## Instructor Information

Instructor Name: Chris M. Fiacconi, PhD

Instructor Email: cfiacon@uoguelph.ca

Office location and office hours: MacKinnon Extension 3019; appointments as needed

## GTA Information

This course does not have any assigned GTA's.

## Course Content

### **Specific Learning Outcomes:**

Students will be able to, within the context of psychological research:

1. Understand and describe the statistical concepts behind the general linear model, in particular as applied to t-tests, one-way ANOVAs, factorial ANOVAs, ANCOVA, repeated-measures ANOVA, and linear contrasts.
2. Compare and contrast the merits of using omnibus vs. focused tests within the NHST framework.
3. Understand and describe the strengths and weaknesses of different statistical tests within the NHST framework.

4. Apply knowledge from (2) to judge when different statistical tests are appropriate given the nature of the research question(s) and experimental design.
5. Choose modern solutions that can overcome the limitations of NHST for a given statistical context, such as confidence intervals, registered replications, meta-analyses, and resampling.
6. Be able to use R to clean/organize data, obtain descriptive statistics, and conduct inferential statistical tests.
7. Create effective visual depictions of data analyses using R and R Markdown.

### **Schedule:**

Week of:

|         |                                                                                                                                                                                                 |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sep. 5  | Review of inferential statistics focusing on interpretation of $p$ -values, Open Science initiatives, Introduction to R<br><b>Readings:</b> Cohen, J. (1994); Loftus, G. (1996); Goodman (2008) |
| Sep. 12 | Central Limit Theorem, Confidence Intervals, t-tests, Power, Effect Size<br><b>Readings:</b> Department of Psychology Statistical Guidelines for Graduate Theses                                |
| Sep. 19 | Introduction to the General Linear Model & Analysis of Variance (ANOVA)<br><b>Readings:</b> MDK Chapter 3<br><b>Assignment #1</b>                                                               |
| Sep. 26 | Omnibus vs. Focused tests, Linear contrasts, Trend Analysis<br><b>Readings:</b> MDK Chapters 4 and 6<br><b>Assignment #2</b>                                                                    |
| Oct. 3  | The Multiple Comparisons Problem – Controlling Type I Error<br><b>Readings:</b> MDK Chapter 5<br><b>Assignment #3</b>                                                                           |
| Oct. 10 | Midterm Review<br>Midterm Exam (take-home, open-book)                                                                                                                                           |
| Oct. 17 | Between-Subjects Factorial ANOVA (Main Effects & Interactions) <b>Readings:</b> MDK Chapter 7<br><b>Assignment #4</b>                                                                           |
| Oct. 24 | Analysis of Designs with Covariates (ANCOVA & Blocking)<br><b>Readings:</b> MDK Chapter 9 (pp. 451-492; 498-511)<br><b>Assignment #5</b>                                                        |

|         |                                                                                                                                                     |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Oct. 31 | Random-Effects & One-Way Repeated-Measures ANOVA<br><b>Readings:</b> MDK Chapter 10 (pp. 547-572); Chapter 11 (pp. 611-652)<br><b>Assignment #6</b> |
| Nov. 7  | Factorial Repeated-Measures ANOVA & Split-Plot ANOVA<br><b>Readings:</b> MDK Chapter 12<br><b>Assignment #7</b>                                     |
| Nov. 14 | Final Exam Review                                                                                                                                   |
| Nov. 21 | Final Exam (take-home, open-book)<br>NO CLASS (Psychonomics Conference – Denver, CO)                                                                |

### Course Assignments and Tests:

| Assignment or Test | Due Date                           | Contribution to Final Mark (%) | Learning Outcomes Assessed |
|--------------------|------------------------------------|--------------------------------|----------------------------|
| Midterm Exam       | Fri. Oct. 10                       | 25%                            | 1-7                        |
| Final Exam         | Mon. Nov. 24                       | 40%                            | 1-7                        |
| Weekly Assignments | Due at the beginning of next class | 7 X 5% = 35%                   | 1-7                        |

### Additional Notes:

1. The midterm and final exams will be take-home and open-book. The final exam is cumulative, but emphasis will be placed on most recent material. Both exams will consist of a series of questions involving datasets on which you will be asked to perform various calculations and statistical tests using R along with written summaries of the results.

2. Between the weeks of Sep. 19 and Nov. 14, you will complete and submit 7 assignments (see Assignments document for detailed information on each assignment). Each assignment will be due at the beginning of the following class. Assignments will involve data analysis using R software, communicating these results in written form, along with short-answer conceptual questions.

**Final examination date and time:** Monday Nov. 24 – Wednesday Nov. 26 (take-home).

**Final exam weighting:** 40%

[Examination Regulations](#)

## **Course Resources**

**Required Texts:** Maxwell, S.E., Delaney, H.D., & Kelley, K. (2018). *Designing Experiments and Analyzing Data: A Model Comparison Perspective (3<sup>rd</sup> Ed.)*. New York: Routledge (MDK)

[https://www.amazon.ca/Designing-Experiments-Analyzing-Data-Perspective/dp/0367202646/ref=tmm\\_pap\\_swatch\\_0](https://www.amazon.ca/Designing-Experiments-Analyzing-Data-Perspective/dp/0367202646/ref=tmm_pap_swatch_0)

**Recommended Texts:** Long, J.D., & Teeter, P. (2011). *R Cookbook 2<sup>nd</sup> Ed.*. O'Reilly.

<https://rc2e.com/>

**Other Resources:** Lecture slides will be made available in .pdf format on Course Link following each class as soon as possible. Tutorial documents that demonstrate how to use R to perform calculations, statistical tests, etc. will be made available on Course Link prior to each lecture. You are expected to have these documents available to you during class. Required readings that are not found in the textbook will be posted on Course Link. The assignments document detailing each assignment will also be posted on Course Link during the first week of classes.

**Software:** In this class we will be learning to use the R software package to conduct statistical analyses. I highly recommend downloading this free program onto your personal computer/laptop so that you can work on assignments, practice, etc. outside of lab hours. The links for downloading are provided below. R is the basic program, and R Studio provides a user-friendly interface. My recommendation is that you install both of these software programs, as both are free.

**R:** <http://cran.us.r-project.org/>

**R Studio:** <https://www.rstudio.com/products/rstudio/download/>

**Field Trips:** No field trips

**Additional Costs:** No additional costs

## **Course Policies**

**Grading Policies:** If you are unable to attend the midterm or final exam due to medical, psychological, or compassionate reasons, you must provide formal documentation (i.e., note from physician or counselor) to the course instructor, and appropriate accommodations will be made on a case-by-case basis. No other reasons for missing an examination will be accepted (e.g., other exams on the same day, final exam conflicts, travel plans). There are no make-up assignments. Late assignments will be subject to a 10% per day grade penalty.

**Course Policy on Group Work:** No group work

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

Electronic recording of classes is expressly forbidden without consent of the instructor. When 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.

**COVID-19 Policies:** In the event that the university shifts to online learning due to safety concerns surrounding COVID-19, lectures will be held via Zoom. Links will be provided to students at that time.

## **University Policies**

### **Academic Consideration**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for

Academic Consideration:

[Academic Consideration, Appeals and Petitions](#)

### **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.

The Academic Misconduct Policy is detailed in [Graduate Calendar](#).

### **Accessibility**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of

the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the [Student Accessibility Services](#) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 54335 or email [csdexams@uoguelph.ca](mailto:csdexams@uoguelph.ca) or the [Student Accessibility Services Website](#)

### **Course Evaluation Information**

Please refer to the [Course and Instructor Evaluation Website](#) .

### **Drop date**

The last date to drop one-semester courses, without academic penalty, is Friday, November 28, 2025. For regulations and procedures for Dropping Courses, see the [Schedule of Dates in the Graduate Calendar](#).

### **Additional Course Information**

No additional course information.