

PSYC*6780, Course Outline: Winter 2026

General Information

Course Title: Foundations in Cognitive Science

Course Description:

This course will provide students with intermediate and advanced skills that are critical for conducting experimental research in psychology. More specifically, students will learn to use the programming software *R* to carry out computational tasks commonly used in designing experiments and analyzing and visualizing data. Topics to be covered include basic programming-related skills including scripts and functions, power analyses and simulation, data visualization, common inferential statistics tests, data wrangling/manipulation, and meta-analysis. The goal of the course is to provide students with a computational toolkit that they can use when conducting their own research.

Credit Weight: 0.5

Academic Department (or campus): Psychology

Semester Offering: Winter 2026

Class Schedule and Location: Mondays 8:30 - 11:20 am; Crop Science Building (CRSC) 101

Instructor Information

Instructor Name: Chris M. Fiacconi Instructor

Email: cfiacon@uoguelph.ca

Office location and office hours: MCKN 3019; by appointment only

Course Content

Specific Learning Outcomes:

Learning Outcome 1: Critical and Creative Thinking

- 1.1. Problem solving: involves using one's understanding to work through a series of operations to come to a conclusion or implement a solution.
- 1.2. Creativity: involves the ability to use one's depth and breadth of understanding to adapt to situations of change, to initiate change, and to take intellectual risk.
- 1.3. Depth and breadth of understanding: demonstrates both broad and in-depth knowledge of the computational skills required for experimental research in psychology.

Learning Outcome 2: Literacy

- 2.1. Information literacy: is the ability to know when there is a need for information, where to locate it and the ability to identify the value and differences of potential resources in a variety of formats.
- 2.2. Methodological and technological literacy: is the ability to evaluate, design, and implement appropriate methodologies, and select and use appropriate technologies for rigorous science.
- 2.3. Quantitative literacy: includes numeracy, and competence in working with numerical data and statistics.
- 2.4. Visual literacy: is the ability to effectively find, interpret, evaluate, use, and create visual media, and to effectively present information visually.

Learning Outcome 3: Communication

- 3.1. Oral communication: includes interpersonal skills, oral speaking and active listening.
- 3.2. Written communication: is the ability to express one's ideas and summarize computational tasks
- 3.3. Reading comprehension: is the understanding of theoretical and empirical literature.
- 3.4. Integrative communication: is the ability to synthesize information from a variety of sources into a communicable form.

Lecture Content:

Jan. 5	Introduction to <i>R</i> Software Environment Resources: Lab Tutorial I Data Camp Chapters: Intro to R basics, Data frames
Jan. 12	Data Wrangling/Cleaning Resources: Lab Tutorial II Data Camp Chapters: Intro to Tidyverse – Data Wrangling, Grouping and Summarizing
Jan. 19	Data Visualization Resources: Lab Tutorial III Data Camp Chapters: Intro to Data Visualization with ggplot2, Aesthetics

<p>Jan. 26</p>	<p>Planning a Research Project</p> <p>Resources: Lab Tutorial IV</p> <p>Anderson, S.F., Kelley, K., & Maxwell, S.E. (2017). Sample-size planning for more accurate statistical power: A method adjusting sample effects sizes for publication bias and uncertainty. <i>Psychological Science</i>, 28, 1547-1562</p>
<p>Feb. 2</p>	<p>Common Inferential Tests</p> <p>Resources: Lab Tutorial V</p> <p>Helpful websites: https://learningstatisticswithr.com/ https://crumplab.github.io/statistics/</p>
<p>Feb. 9</p>	<p>Meta-Analysis</p> <p>Resources: Lab Tutorial VI</p> <p>Borenstein, M., Hedges, L.V., Giggins, J.P.T, & Rothstein, H.R. (2010). A basic introduction to fixed-effect and random-effects models for meta-analysis. <i>Research Synthesis Methods</i>. 97-111.</p> <p>Viechtbauer, W. (2010). Conducting Meta-Analyses in R with the metafor package. <i>Journal of Statistical Software</i>.</p>
<p>Feb. 16</p>	<p>Reading Week – No Class</p>
<p>Feb. 23</p>	<p>Bayesian Approaches to Statistics</p> <p>Resources: Lab Tutorial VII</p>
<p>Mar. 2</p>	<p>Student Presentations I</p>
<p>Mar. 9</p>	<p>Student Presentations II</p>
<p>Mar. 16</p>	<p>Student Presentations III</p>
<p>Mar. 23</p>	<p>Student Presentations IV</p>
<p>Mar. 30</p>	<p>Review</p>

Labs: No Labs

Seminars: Each student will lead a presentation in which they use the programming skills developed during Weeks 1 – 6 to analyze their own thesis data using *R*. Students must prepare an *R* Markdown document that details step-by-step how they conducted their analyses including both the code and the corresponding output. Text should accompany code so that a brief explanation of the programming logic is clearly illustrated. The document should be submitted to the course Dropbox no later than 11:59 pm the night before each students' scheduled presentation.

Course Assignments and Tests:

Assignment or Test	Due Date	Contribution to Final Mark (%)	Learning Outcomes Assessed
Lab Assignments	Due the following Sunday by 11:59 pm for weeks 1-3, 5, 6.	5 X 7% (35%)	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4
DataCamp Lessons	Weekly for weeks 1-3	3 X 5% (15%)	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4
Presentation	See Student Presentation dates listed above	30%	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4
Final Exam (Take Home)	Due: April 10, 2026	20%	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4

Final examination date and time: April 10, 2026

Final exam weighting: 20%

Course Resources

Required Texts: No required textbooks.

Recommended Texts:

1. Wickham, H., & Grolemund, G. (2017). *R for Data Science*. O'Reilly Media. (available online: <https://r4ds.had.co.nz/>)

2. Healy, K. (2019). *Data Visualization: A Practical Introduction*. Princeton University Press.

Great user-friendly book that details how to use the *ggplot2* package for *R* to create beautiful graphs, figures, etc. with ease.

Lab Manual: No Lab Manual

Other Resources:

Here are some additional resources that will help you as you learn to program in *R*:

1. <https://www.crumplab.com/programmingforpsych/> This link is for a book created by Matt Crump that provides a detailed guide to using *R* for pretty much anything data related. Includes in-depth coverage of techniques for data wrangling/cleaning, conducting statistical tests, and data visualization, among many other topics.
2. <https://learningstatisticswithr.com/> Another great resource with in-depth lessons on how to perform a variety of different computational tasks using *R*.

Field Trips: No field trips.

Course Policies

Grading Policies

If you are unable to complete course assignments/exams 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.

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 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 the 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 Student Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 54335 or email accessibility@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 April 6, 2026 . For regulations and procedures for Dropping Courses, see the Schedule of Dates in the Academic Calendar. Instructors must still provide meaningful and constructive feedback to students prior to the 40th class day.

Additional Course Information

No additional course information.