Statistical Methods II Syllabus
Department of Psychology and Neuroscience
PSYO 3502 Fall 2026

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructors and Contact Information Office Hours

Instructor: Dr. *Sean P. Mackinnon, mackinnon.sean@dal.ca*

Office Hours: Mondays, 9:30am to 11:30am, LSC 2540
Other appointments by appointment (send an email)

Teaching Assistants: (Jacob van Haaften) Jacob.vanHaaften@dal.ca
. (Mackenna Pattison) Mackenna.Pattison@dal.ca

Email Expectations: My working hours are usually 9am to 5pm on weekdays, I may not check my email outside those times consistently. I will usually try to respond to you within 1 business day, though it may be longer if your request is complex or time-consuming.

Course Structure

Lectures: Tuesday/Thursday, 1:35pm to 2:25pm, Rowe 1011

Laboratories: Fridays, 8:35am – 10:25am, Rowe 1011

Credits: 3 credit course

Course delivery: In-person, with recorded lectures. Labs are not recorded.

Course Description

This course is the continuation of PSYO 2501.03, with the examination of more complex, but commonly used, inferential statistics. Topics include factorial ANOVA, ANCOVA, and multiple regression. This course is intended for Honours students in Psychology or Neuroscience. Class work includes computer-based assignments.

Course Prerequisites/Corequisites

Restricted to PSYO and NESC Honours students only. PSYO 3502.03 is to be taken concurrently with PSYO 4500X/Y.06/ NESC4500X/Y.06.

Key knowledge or skills expected of students coming into the course

Students are expected to have basic algebra and arithmetic skills at a high school level. This includes: Order of operations, fractions, decimals, negative numbers, basic algebra, exponents and square roots. Some familiarity with using laptop/desktop computers (Mac or PC) is also expected. Students are expected to know how to read and write results sections using APA formatting (PSYO 2000). Students are also expected to have taken at least one undergraduate course in statistics during their career thus far (usually, PSYO 2501). This includes general

understanding of basic statistical principles (e.g., inferential statistics, p-values, confidence intervals, error, hypothesis testing). No prior experience using jamovi or R software is expected.

CLASS FORMAT

In general, the format of a typical week goes like this:

Sunday	N/A
Monday	N/A
Tuesday	50 min live lecture. It will be recorded but may not be posted online until the next day. If there was a graded lab in the previous week, they are due by 11:59PM on Tuesdays.
Wednesday	N/A
Thursday	50 min live lecture. It will be recorded but may not be posted online until the next day. Lab handouts posted on Brightspace for those who want to start early.
Friday	Dedicated time to work on the labs using statistical software and in-person support from the instructor and TAs. They are 2-hour sessions in a different room, and you will be provided a printed handout of the lab to make it easier to work on it.
Saturday	N/A

Learning Objectives

1. **Conceptual knowledge:** Explain the statistical theory underlying numerous statistical tests, explain in plain language what R code is doing, and be able to determine if the underlying assumptions are met or violated

2. **Application:** Select the right statistical model, data visualization, and data restructuring to use given a specific hypothesis and type of data.

3. **Calculation:** Manage databases and analyze data using jamovi and R software. That is, be able to use these programs to calculate the necessary statistical models and plots.

4. **Reproducibility:** Produce statistical syntax and output that is fully transparent and reproducible by a third party. That is, analyze data in such a way that a third party can reproduce it exactly.

5. **Interpretation:** Interpret the results of statistical analyses while balancing the competing needs of technical accuracy and simplifying for a lay audience.

Student Resources

Our weekly labs on most Fridays are a main source of support for learning the material (one Instructor and all teaching assistants will be present during labs to help you). Our Brightspace page also has a discussion board where you can post questions about course material asynchronously. The Instructor holds weekly drop-In office hours for in-person one-on-one assistance (see schedule above). Finally, if none of the above work for you, you can send the Instructor or teaching assistants an email with questions or to schedule a virtual meeting at a mutually convenient time.

Course Materials

Open Access Textbooks

Hadley, W. & Grolemund. G. (2023). R for Data Science 2nd edition. [available from url: https://r4ds.hadley.nz/]

Navarro D. J. and Foxcroft D. R. (2018). *Learning statistics with jamovi: A tutorial for psychology students and other beginners.* (Version 0.70). [Available from url: https://sites.google.com/brookes.ac.uk/learning-stats-with-jamovi]

These textbooks are open access textbooks. This means the electronic version of the book is FREE and available online without any cost. However, unlike in PSYO 2501 there is no print version available at the bookstore; the readings are available only online. Note that the Hadley et al. just updated to the 2nd edition in June, 2023. Make sure you don't accidentally go to the 1st edition (the chapter numbers don't match, so you'll get confused!). All readings are free to access and do not require that you purchase anything.

Electronic Devices

This class will require a laptop or desktop computer with statistical software installed. Macs or PCs are both acceptable and will be about equally easy either way. You won't be able to complete this class with just a smartphone or tablet.

Required statistical software

All students are required to have the following software on their computers: R, RStudio and jamovi software. All software can be downloaded for free online.

https://www.r-project.org/
https://www.rstudio.com/products/rstudio/download/
https://www.jamovi.org/download.html

In the very first lab, you can bring your computer in and try to install all these things with myself and the TAs available for troubleshooting.

Course Assessment

Component	Weight (% of final grade)	Due Date(s)
10 Lab Assignments --Lab 1 (Intro to R) --Lab 2 (Data Wrangling) --Lab 3 (Intermediate Data Viz) --Lab 4 (Categorical Data) --Lab 5 (t-tests) --Lab 6 (Multiple Regression) --Lab 7 (ANOVA) --Lab 8 (ANCOVA) --Lab 9 (Factorial ANOVA) --Lab 10 (Nonparametric tests)	80% (8% each)	 Sept 22 Sept 29 Oct 13 Oct 20 Oct 27 Nov 3 Nov 10 Nov 24 Dec 1 Dec 8
In-Person Final Exam	20%	During Final Exam Period (Dec 11-20)

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D**	(50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F**	(<50)
A- (80-84)	**B-** (70-72)	**C-** (55-59)		

Student Collaboration and Working in Groups

You are encouraged to work together in small groups when completing assessments in this class. Statistics is a difficult and often anxiety-provoking topic with a lot of problem-solving, and you will learn a lot more if you work with others to solve the problems and discuss your answers together. This is much easier if you show up to the Friday lab sessions! There are no formal assigned groups, but if you're having trouble finding colleagues to collaborate with, let me know and I can introduce you to a classmate!

10 LABS (8% each, total of 80%)

Most weeks, you will be provided a handout with instructions for a hands-on applied statistical analysis activity. This will usually involve analyzing a dataset and interpreting the results, though other applied problems may sometimes be provided.

Like in PSYO 2501, your grade will come from answering quiz questions in Brightspace. These questions will be closely linked to the activities of the lab, so actually doing the lab is important for doing well on these questions. However, unlike PSYO 2501 I will not assess you using closed-ended questions very often (e.g., multiple choice, enter single numbers) and will instead tend to use more long-form written formats and review of your saved data analysis. That said, I will still use multi-select or multiple choice occasionally. Typically, you will need to submit:

a) Submitting complete syntax files that show all your results (i.e., the code/files that run your analyses)

b) Short written answers to questions (e.g., interpreting results), and answers to multi-select questions (used rarely).

Your lab submissions will generally be **due at 11:59PM on Tuesdays. Late lab assignments up to 3 days late will be assigned a flat late penalty of -10%.** The submission portal will close at 11:59PM on Fridays, 3 days after the due date. It will usually take a few days to grade all the assignments. After 3 days, you can no longer submit the assignment, and you will get a zero. This is because we need to get feedback to students in a timely fashion before the next lab is due, but feedback cannot be released if there are still students completing the assignments.

STUDENT DECLARATION OF ABSENCE

Student declaration of absence forms are a standardized way to handle student absences that interfere with the completion of graded academic requirements (exams, quizzes, presentations, papers, etc.).

Here is the procedure you should follow if you experience short-term illness, distress or other extenuating circumstances that affects your ability to complete assessment components:

a) The Student Declaration of Absence form or alternate verification of the absence must be submitted to the course instructor, or to the instructor's designate **online through Brightspace** within three (3) calendar days following the last day of absence. I only accept forms submitted via Brightspace, not in person or by email.

b) The Declaration may only be used for a **maximum of 2 labs throughout the term.**

Late Lab Assignments. Using your student declaration of absence on a late submission will remove one -10% late penalty from an assignment, so long as it is not more than 3 days late. You may receive your feedback a couple of days later than the rest of the class.

Missed Lab Assignments. If you do not submit the lab at all by the 3 day extension, your labs will be re-weighted to accommodate the missed one such that you will not lose any points. See the next section "How Points are Adjusted if you Miss a Lab and submit a SDA" for details.

When you submit the SDA, you will automatically get both accommodations for that lab (i.e., an extension and if you miss the extension, a reweighting of your grades).

Policies may differ slightly for students with registered accommodations with accessibility services depending on the nature of your accommodations plan; however, in general this set of policies will be the first line of defense for all students, including those with registered accommodations. Students with long-term problems (e.g., prolonged illness or injury) not already covered by a registered accommodation with accessibility services should get in contact with me, and we can discuss how to proceed on a case-by-case basis.

If you have any questions, please feel free to talk with me; life happens sometimes, and we can work together to find a productive solution.

How Points are Adjusted if you Miss a Lab and submit a SDA

If you miss a lab, make sure to submit a student declaration of absence (SDA). If you do, up to two labs can be reweighted, since you have a maximum of 2 SDAs. Below, I will outline how your grade will be re-calculated if you submit an SDA and cannot complete 1 or 2 labs:

A. If you complete all 10 labs: Each lab is worth 8%
B. If you miss one or two labs, the missing grade(s) will be replaced with the average of all the other labs that you did complete. This only happens at the end of the term once lab 10 has been completed.
C. If you miss more than two labs, part B above still applies, but every subsequent missed lab beyond the second will count as a zero.

To illustrate, here are four student situations and how they'd be graded:

Lab	**Student 1** **(All 10 labs)**	**Student 2** **(Missed 1 lab)**	**Student 3** **(Missed 2 labs)**	**Student 4** **(Missed 3 labs)**
1	87.5%	**Missing** Replaced with 91.4%, which is the average of the 9 remaining lab grades	**Missing** Replaced with 91.1%, which is the average of the 8 remaining lab grades	**Missing** Replaced with 89.8%, which is the average of the 7 remaining lab grades
2	93.75%	93.75%	**Missing** Replaced with 91.1%, which is the average of the 8 remaining lab grades	**Missing** Replaced with 89.8%, which is the average of the 7 remaining lab grades
3	100%	100%	100%	**Missing** Replaced with 0
4	90%	90%	90%	90%
5	87.5%	87.5%	87.5%	87.5%
6	95%	95%	95%	95%
7	95%	95%	95%	95%
8	93.75%	93.75%	93.75%	93.75%
9	87.5%	87.5%	87.5%	87.5%
10	80%	80%	80%	80%
Total Quiz Grade	91%	91.39%	91.1%	80.84%

This is NOT best-of grading. That is, you are not permitted to do all 10 and then drop your two lowest. Instead, if you miss a lab because events in your life prevent you from getting it done (e.g., sickness, mental health problem, stress) then it will not affect your grade.

FINAL IN-PERSON EXAM (20%)

There will be one in-person exam held during the final exam period. This exam will be without the aid of a computer and will be pen-and-paper only and thus will focus most heavily on interpretation and statistical theory. It will be some combination of closed ended (e.g., multiple choice) and open-ended questions (e.g., fill-in, short answer), with questions similar in character to those in the labs. The exam will be cumulative covering all material in the course. That said, more specific details will be provided as the exam date gets closer to focus your studying (after the exam has been created). Moreover, the last week of class will be dedicated to review and exam practice.

ACADEMIC INTEGRITY IN LABS

You are expected to show up in person to the labs unless unexpected circumstances prevent it. Though attendance is not graded, it is part of the social contract of the course and is important for building trust and effective learning. Showing up in person is the best way to avoid academic integrity problems, as it is a way of demonstrating your honesty and hard work.

You are allowed to work with colleagues during the lab (and in fact, are encouraged to do so!), and can compare and contrast your results on lab assignments in study groups outside of class, if that is your preference. That said, grades are still individual, and you should take care to avoid plagiarism. The majority of the grading will be done by humans and requires the assessment of your independent writing. Because approaches to writing and conducting analyses are idiosyncratic, please do not copy answers verbatim from colleagues when submitting answers to labs online. This is easily identified and qualifies as academic integrity issue. A similar issue would arise if submitting someone else's code/syntax as your own; like writing, statistical syntax is also idiosyncratic, and copying is often easy to identify.

The safest approach to working with colleagues is to work independently, compare your answers (discussing if necessary), then once you are satisfied that you got similar answers, move on to answer the questions on Brightspace independently.

Using online resources like websites and discussion boards are acceptable, but online resources are difficult for a novice to use effectively because incorrect information is randomly interspersed with correct information. As a novice, there will be no easy way for you to identify misinformation. Thus, it is much safer to rely on the course materials, textbooks, and support from your instructor and teaching assistants.

I would strongly encourage you to not use any AI tools (e.g., ChatGPT, Claude, Gemini, Posit Assist) in this course as it will harm your cognitive ability. **The red line that crosses into an academic integrity issue is submitting AI-generated text or code as though it were your own writing without disclosure.** In return, the teaching team will not use AI tools to create any content or vet your work in any capacity (except, of course, in the one lecture teaching you about how AI works). If we get submissions that bare little resemblance to how the material was taught (suggestive of outsourcing learning) someone on the teaching team will schedule a meeting with you. It doesn't necessarily mean you are in trouble, but I will want an oral explanation from you to build trust and to ensure you are still learning.

If you are ever in doubt, ASK ME. I can help you navigate issues of academic integrity in an ethical way.

HOW GRADES ARE ROUNDED FOR FINAL LETTER GRADES

Individual assessment components are not rounded (and are left as a decimal grade when appropriate). Final grades with a decimal value greater or equal to 0.5 (e.g., 65.60%) will be rounded up. Final grades with a decimal value less than 0.5 (e.g., 65.49%) will be rounded down.

Course Content and Schedule

Dates	General Topic	Readings	Due date for lab
Mon., Sep. 7	Labour Day (University Closed)		
Wed., Sep. 9	Getting Acquainted	---	
Fri., Sep. 11	**Lab 0: Installing R, RStudio and jamovi**		N/A
Mon., Sep. 14	Intro to R and data visualization	Hadley et al., Ch 1-2 & 6	
Wed., Sep. 16	Intro to R and data visualization		
Fri., Sep. 18	**Lab 1: Intro to R and data visualization**		**Sept 22**
Mon., Sep. 21	Data Wrangling in R	Hadley et al. Ch 3 & 7	
Wed., Sep. 23	Data Wrangling in R		
Fri., Sep. 25	**Lab 2: Data Wrangling in R**		**Sept 29**
Mon., Sep. 28	Intermediate Data Visualization		
Wed., Sep. 30	Day for Truth and Reconciliation (University Closed)		
Fri., Oct. 2	Bonus Unit: Intro to AI tools (and their associated problems)		N/A
Mon., Oct. 5	Intermediate Data Visualization	Hadley et al., Ch 9 & 10	
Wed., Oct. 7	Intro to jamovi & Categorical Data Analysis		
Fri., Oct. 9	**Lab 3: Intermediate Data Visualization**		**Oct 13**
Mon., Oct. 12	Thanksgiving Day (University Closed)		
Wed., Oct. 14	Intro to jamovi & Categorical Data Analysis	Navarro, Ch 10	
Fri., Oct. 16	**Lab 4: Categorical Data Analysis**		**Oct 20**
Mon., Oct. 19	t-tests and effect size		
Wed., Oct. 21	t-tests and effect size	Navarro, Ch 11	
Fri., Oct. 23	**Lab 5: t-tests and effect size**		**Oct 27**
Mon., Oct. 26	Correlation & Multiple Regression	Navarro, Ch 12	
Wed., Oct. 28	Correlation & Multiple Regression		
Fri., Oct. 30	**Lab 6: Correlation & Multiple Regression**		**Nov 3**
Mon., Nov. 2	One Way ANOVA	Navarro, Ch 13	
Wed., Nov. 4	One Way ANOVA		
Fri., Nov. 6	**Lab 7: One Way ANOVA**		**Nov 10**
Mon., Nov. 9	FALL STUDY BREAK (NO CLASS)!		
Wed., Nov. 11	FALL STUDY BREAK (NO CLASS)!		
Fri., Nov. 13	FALL STUDY BREAK (NO CLASS)!		
Mon., Nov. 16	ANCOVA	--	
Wed., Nov. 18	ANCOVA		
Fri., Nov. 20	**Lab 8: ANCOVA**		**Nov 24**
Mon., Nov. 23	Factorial ANOVA	Navarro, Ch 14	
Wed., Nov. 25	Factorial ANOVA		
Fri., Nov. 27	**Lab 9: Factorial ANOVA**		**Dec 1**
Mon., Nov. 30	Nonparametric tests & rank transformations	Navarro Textbook Review: 11.9 Review: 12.1.6 Review: 13.9	
Wed., Dec. 2	Nonparametric tests & rank transformations		
Fri., Dec. 4	**Lab 10: Nonparametric tests**		**Dec 8**
Mon., Dec. 7	Exam Practice		
Tues., Dec 8	Lieu Day (Monday classes held) **No Class!!**		
Wed., Dec 9	Lieu Day (Wednesday classes held) Exam Practice		

University Policies and Statements
(Generic statements for required for all university courses)

Use of Generative AI (Copilot Chat): According to Dalhousie and Nova Scotia privacy laws, instructors are not permitted to require students to use generative AI other than Microsoft 365 Copilot Chat, which is a free AI-powered tool included with all Dalhousie accounts. If generative AI is used in cases where it is not permitted, it will be considered an academic integrity offence, and you will be subject to appropriate disciplinary and/or corrective measures.

Accessibility: Refer to the Student Accommodation Policy for information on how Dalhousie instructors and staff work collaboratively with students to create and sustain an accessible educational environment.

- If there are aspects of this course, including but not limited to its design, teaching approaches, learning activities, and assessments, that result in barriers to your learning or do not align with your formal academic accommodations, reach out to me to collaboratively find a solution that meets your needs.
- You are eligible for accommodations based on protected characteristics such as religion. If you have religious, cultural, or community-significant observances that conflict with course requirements, reach out to me to collaboratively find alternatives for completing the course requirements.
- To begin the process of requesting a formal academic accommodation, contact the Student Accessibility Centre (or the Student Success Centre for Faculty of Agriculture courses).
- Your classroom may contain accessible furniture and equipment. It is important that these items remain in the classroom, undisturbed and unused, so that classmates who require their use will be able to fully participate in the course.

Academic Integrity: Dalhousie expects all students to be responsible learners, demonstrating the values of intellectual honesty, trust, fairness, and respect in your work. Key aspects of academic integrity include, but are not limited to: avoiding plagiarism, not engaging in cheating, submitting original work, and acknowledging sources of information and ideas when they are not your own. Refer to the Statement on Intellectual Honesty for definitions of various academic offences. Failure to meet Dalhousie's academic integrity standards will result in appropriate disciplinary and/or corrective measures.

Important Dates (e.g., holidays)

https://www.dal.ca/study/plan-your-degree/important-dates.html

Syllabus Appendix: Student Supports & University Statements, Policies, and Guidelines

Select the link below for student supports available to all Dalhousie students, and University-wide statements, policies, and guidelines applicable to your academic studies.

https://dalu.sharepoint.com/sites/learn-teach/SitePages/syllabus-appendix.aspx