Faculty of Science Course Syllabus
Department of Psychology and Neuroscience
PSYO 2501, Statistical Methods I
Fall 2020

Instructor:	Dr. Sean P. Mackinnon
	Department of Psychology and Neuroscience
Drop-in Virtual Office Hours	TBA
Contact Information:	E-mail: mackinnon.sean@dal.ca
Lecture Times:	N/A (Online Videos Only)
Lecture Location:	N/A (Online Only)
Teaching Assistants (x3):	Danika Desroches, Brodie Badcock-Parks, Rhiannon Holt
Drop-in Virtual Office Hours:	TBA
TA Contact Information:	(Danika) danika.desroches@dal.ca
	(Brodie) brodiebp@dal.ca
	(Rhiannon) rh313493@dal.ca

Course Description (from university calendar)
This course provides an introduction to research design and statistics within Neuroscience and Psychology. Particular emphasis is placed on conducting and interpreting various statistical procedures, including descriptive and inferential statistics (z-test, t-test, ANOVA, chi-square tests), frequently used in these fields.

Course Prerequisites
PSYO 2000.03 or NESC 2007.03 (must be taken concurrently)

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. A self-test and basic mathematics review is posted on the course website for those students who need to review these skills. No statistical knowledge is needed before taking the course: It is assumed that this will be students' first statistics course.

Course Goals and Outcomes

1. **Conceptual Knowledge:** Conceptually understand descriptive and inferential statistics, hypothesis testing, and the theory that allows researchers to make inferences about a population from a sample.

2. **Application:** Select the right statistic or data visualization to use given a specific hypothesis and type of data.

3. **Calculation:** With the aid of a calculator and provided formulas, be able to calculate simple descriptive and inferential statistics.

4. **Interpretation:** Interpret and make appropriate inferences from computerized output from statistical software, data visualizations, or summaries of results written in APA format.

Course Materials

Required Textbook

Diez, D. M., Barr, C. D., & Cetinkaya-Rundel, M. (2019). *Open-Intro statistics 4th edition*. CreateSpace independent publishing platform.

This book has the associated readings for the course, and also contains practice problems and links to online videos. This textbook is an open access textbook. This means the electronic version of the book is FREE and available online without any cost. The associated textbook website with additional resources, and a .pdf copy to download can be found here (and is also posted on our PSYO 2501 Brightspace page):

https://www.openintro.org/stat/os4.php

It asks for a donation, but you can set it to $0 to get the .pdf of the book for free. There are also a limited number (~125) of printed copies of the textbook available at the bookstore, for students who prefer to read a paper copy. These textbooks should be around $35 each and are likely much more convenient than printing the book using a computer printer. You can also buy a printed copy of the text from Amazon:

https://www.amazon.ca/OpenIntro-Statistics-Fourth-David-Diez/dp/1943450072

IMPORTANT: The 3rd edition of the book is no longer suitable for the course, as there were some BIG structural changes in the new book version. Use the 4th edition, not the 3rd edition of this book.

Optional Textbook

Klein, G., & Dabney, A. (2013). *The cartoon introduction to statistics.* New York: Hill and Wang.

This textbook is a supplementary guide intended to provide extra help to gain conceptual understanding of statistics. This book is a VERY straightforward guide that will help you understand the conceptual and theoretical parts that underlie all of the statistics we cover in this class. Anecdotal evidence from last year's students suggests that those who have read it found it quite helpful. It may also please you to know that this book is written entirely in comic book form, making it fun to read. This book only covers material from the first month of the course, but these foundations remain applicable throughout the course. The book is relatively inexpensive, and there are copies available at the bookstore for purchase (though not many, since I anticipate that many students will not buy this book). You can also buy this on Amazon, or at many other online bookstores:

https://www.amazon.ca/Cartoon-Introduction-Statistics-Grady-Klein/dp/0809033593

Software

The current class will make use of RShiny applications (https://shiny.rstudio.com/), which are created with R statistical software. These applications are point-and-click software that work through an Internet Web Browser and will not require you to install anything. A license to use these applications in our class is graciously provided by RStudio (https://rstudio.com/). We will use these RShiny applications during workshops and exams.

Electronic Devices

We will occasionally use online calculators and tools during class time. These tools work through Internet web-browsers, such as Firefox or Safari. Though these work on phones and tablets, you will probably find them easier to use on a laptop or desktop computer, if you have one. You may also find a old-fashioned calculator to be useful and more efficient when completing exams and workshops, even if you have a calculator on your phone.

Course Assessment

Component	Weight (% of final grade)	Date(s)
Midterm Exam 1	20%	Oct 14-15
Midterm Exam 2	20%	Nov 18-19
Final Exam	24%	TBA in exam period
9 Workshops	36% (4% each)	W1: Friday, Sept 18 W2: Friday, Sept 25 W3: Friday, Oct 2 W4: Friday, Oct 9 W5: Friday, Oct 23 W6: Friday, Oct 30 W7: Friday, Nov 6 W8: Friday, Nov 27 W9: Friday, Dec 4
Experimental Participation	2% Bonus	Up until Dec 1

Conversion of numerical grades to Final Letter Grades

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)

Course Policies

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.

Of course, this was a lot easier to facilitate when classes were in-person! To help give everybody an equal opportunity to develop a peer social support network in this class, I will ask everybody to complete a short survey at the beginning of the year where I ask you about your time-zone, preference for voice vs. text chat, and to get your permission to share your Dalhousie email with a group of about 5 other students in the class to introduce you to each other (with some slight matching based on time zones, and communication preferences to facilitate easier scheduling).

You won't be "locked in" to working with this group and can move around between groups however works best for you. If things are not working out with your group, send me an email and I can also introduce you to another group in the class. The goal with this group matching process is just to make sure everybody has an equal opportunity to have a peer social support network in this class. We are social creatures, and it is important for learning and mental health to have a social support network of fellow students you can work with in this class.

That said, you can still work entirely by yourself if you prefer, and I won't share your email with anyone if you don't want to be in a group.

WORKSHOPS (36%)

Each week, you will work on applied statistics problems from a posted .pdf handout. This may involve hand calculations, using online statistical tools, and/or interpreting output from statistical software. Though you may work with others in your groups, each person will be graded individually. Your grade will come from answering quiz questions online using Brightspace. These questions will be closely linked to the activities of the workshop, so attending the workshop is important for doing well on these questions. When completed in person, most students completed these workshops in ~2 hours, so it is likely similar in length online.

The answer to these questions will always be due **at 11:59PM on Fridays**.

I would encourage you to work on workshops during the same times as my or the TAs posted drop-in virtual office hours. If you get stuck you can get a quicker answer to your questions if you plan to work during these times.

EXAMS (64%)

There will be two exams: One midterm and a final. Given the nature of material in statistics, all exams are <u>cumulative</u> (i.e., material from prior exams can show up on the second midterm and final). Aside from multiple choice questions (which you are famililar with form PSYO 1011/1012), exam formats will also include two other question types: Select all that apply or number fill-in questions.

A "select all that apply" question is like a multiple-choice question, but works like this example:

1. Which of the following are a measure of central tendency in statistics (select all that apply)?

   A. Mean
   B. Median
   C. Mode
   D. Standard Deviation
   E. Interquartile range

In this case, A, B & C are correct answers. The question is worth 5 points total, and you get 1 point for each correct answer correctly indicated. For example, if you only selected "A & B" you would get 4 out of 5 points. If you selected every option, you'd get 3 out of 5 points. If you selected only "E", you'd get 1 out of 5 points. In other words, it is possible to get full or partial value for these kinds of questions. There will always be at least 1 option to select (i.e., the fully correct answer will never be to leave EVERY option blank).

Fill in the number questions typically involve mathematical calculations. You will not be showing your work but will instead just be typing your final answer into a blank space. This means these kinds of questions will not have partial value awarded. For example:

2. What is 2 divided by 3? (round to two decimal places)

_____

Answers should be written as decimal numbers, not fractions. In this case, the answer is 0.67. The question will always specify how many decimal places to round to. Moreover, each question will have a "tolerance" to account for rounding. For instance, I might accept any answer from .66 to .68 as a correct answer. This is because I am not so concerned with small rounding errors in this course.

EXPERIEMENTAL CREDIT BONUS POINTS (2%)

Up to **2.0** bonus credit points are available by participating in research at Dalhousie University. Typically, 1 credit point is awarded for each hour of experiment participation, up to a maximum of 1 points. This is a great way to boost your grade and learn about real research that is ongoing at Dalhousie, and students are encouraged to participate. Any credit points that will contribute to a student's final grade in PSYO 2501 must be assigned by the <u>last day of classes</u>. To sign up for a SONA account and view available studies go to this weblink: <u>https://www.dal.ca/faculty/science/psychology_neuroscience/research/credit-point-information.html</u>

PRACTICE QUESTIONS (0%)

Each week, there is a file with practice questions that will be posted in a .pdf file. You can work on these practice problems for extra practice. Some practice problems are created by me, while others are in the OpenIntro textbook. In all cases, there is an answer key provided for these questions. They are self-study questions and are not worth points. However, they are good practice for the quizzes and exams.

The free OpenIntro textbook also has 100s of practice questions. The odd-numbered questions have an answer keys you can access in Appendix A. Each week in the "Practice Questions" document, I have selected out a subset of those questions that you can try on your own time for practice. I tried to select questions that (a) cover material from class; (b) are relatively close to the style of questions I create; and (c) are more likely to use examples relevant to psychology.

A few frequently asked questions regarding the practice questions:

Q: Where are the practice questions?
A: At the end of each chapter in the OpenIntro textbook in the sections labeled "Exercises." For example, question 1.5 is found at the end of Chapter 1, and question 3.1 is found at the end of chapter 3. There will be a list of practice questions as a pdf file called "Week X PSYO 2501 Practice Questions" for each week of the course posted on Brightspace.

Q: Should I do every practice question in the book?
A: No. I provide a smaller list of practice questions you can try each week. I have tried to omit questions I do not think are relevant for our course.

Q: Where are the answers?
A: The answers to odd-numbered questions (1.5, 1.7, etc.) are found in Appendix A in the OpenIntro textbook. The even-numbered questions (1.6, 1.8. etc.) are not open-access and are not provided to students. The answers to the questions I create are in the same .pdf as the questions.

Q: Why can't you just post all of the even-numbered answers?
A: Because the answer key for the even-numbered questions are protected by copyright law, and I do not have permission to share them. Here are the reasons given by OpenIntro: "OpenIntro's mission is to increase access to high-quality, low-cost education materials. Without teachers choosing to use our resources, we cannot fulfill our mission, and many teachers have told us it is critical to have some exercises for graded homework or exam questions where no solutions are not readily available to students. Without a large collection of such exercises, many teachers would drop OpenIntro and instead require a more expensive and lower-quality textbook. For this reason, we do not permit sharing of this solution manual. We know this creates challenges for some students and self-study learners who could benefit from a full solution guide, and this decision was not made lightly."

Q: What do I do if the answer key is wrong?
A: It is always possible that there are typos in the answer key. If you think this is the case, please email me at mackinnon.sean@dal.ca and I will review it. If there is an error in the key, I will update the document so everyone is aware (or alternatively, will explain the answer to you if the answer key is actually correct).

Q: Are these worth points?
A: No. They are for practice and studying only.

Q: Are these questions exactly like your exam and workshop questions?
A: No, but they will still be helpful practice.

POLICY REGARDING MISSED WORKSHOPS AND EXAMS

Dalhousie University recognizes that students may experience short-term illness, distress or other extenuating circumstances (such as caregiving duties; immediate family illness, injury or death; involvement in an accident; legal proceedings or being a victim of a crime) that may affect their ability to complete required graded academic requirements. 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 a **maximum of 2 times throughout the term and may only cover 3 consecutive days of absence per form.**

Here are the specific rules for each assessment component:

Missed Exams: You will complete a make-up exam online in a similar fashion to the regular exam. This will generally need to be no later than one week after the original exam deadline, as late exams will delay feedback for the rest of the class.

Missed Workshop Quiz: There will be no make-up quiz for a missed workshop quiz. Instead, the weight of the missed workshop will be moved to the other completed workshops. That is, the 8 workshops you actually complete will be worth 4.5pts each instead of 9 workshops being worth 4pts each (both are a total of 36pts towards your final grade).

Student declaration of absence forms cannot be used to reschedule assessments for leisure activities (e.g., going to the beach, leaving town on vacation). They also cannot be used to cover up lack of planning/preparation (e.g., forgetting to study, procrastinating on a paper). Using a student declaration of absence form for these purposes constitutes academic dishonesty and may make you subject to University discipline.

If have circumstances making your studies difficult that is lasting for periods longer than 3 days, a student declaration of absence form may not be suitable. In these cases, please email me and we will work out something on a case-by-case basis.

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 Schedule

Dates	General Topic	Readings
Sept 6 – Sept 12	Getting Acquainted	
Sept 13 – Sept 19	Introduction to Data, Data Visualization, & Descriptive Statistics	OpenIntro: 1.1, 1.2, 2.1, 2.2 (Skip 2.1.7, 2.1.8) Cartoon Guide: Ch 1-5
Sept 20 – Sept 26	The Normal Distribution & z-scores	OpenIntro: 4.1
Sept 27 – Oct 3	Variability, Confidence Intervals and the Central Limit Theorem	OpenIntro: 5.1, 5.2 Cartoon Guide: Ch 6-8
Oct 4 – Oct 10	Hypothesis testing	OpenIntro: 5.3 Cartoon Guide: Ch 9-13
Oct 11 – Oct 17	EXAM WEEK Exam Days: Oct 14 & 15	
Oct 18 – Oct 24	Categorical Data I: Test of Proportions	OpenIntro: 6.1, 6.2. (skip 6.2.4, 6.2.5)
Oct 25 – Oct 31	Categorical Data II: Chi-Squares	OpenIntro: 6.3, 6.4. (skip 6.3.5)
Nov 1 – Nov 7	t-tests & effect size	OpenIntro: 7.1, 7.2, 7.3 (Skip 7.3.4)
Nov 8 – Nov 14	READING WEEK: NO CLASS!	
Nov 15 – Nov 21	EXAM WEEK Exam Days: Nov 18-19	
Nov 22 – Nov 28	One-Way ANOVA	OpenIntro: 7.5
Nov 29 – Dec 5	Linear Regression and Correlation	OpenIntro: 8.1, 8.2, 8.3, 8.4

Holidays: September 7 (Labor Day), October 12 (Thanksgiving Day), November 8-14 (Reading Week)

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: http://www.dal.ca/cultureofrespect.html)

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

> https://www.dal.ca/academics/important_dates.html

University Grading Practices

> https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Research Lab Safety
https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html