PSYC 802: Multivariate and Multivariable Statistics
Winter 2026

Course Instructor: Jill A. Jacobson, Ph.D.
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Office: Craine Hall Room 318
Student Hours: Before/after class/lab or by appointment

- I have a few times I know in advance that I'll be available each week that you can sign up for without having to email me first. Just click on "Sample Service" at the link below to schedule a meeting.
  - https://jill-jacobson.setmore.com
- If none of those times work, you don't need to send a separate email asking if we can meet. The answer is always yes. Just email me some days/times when you are free (including any evening or weekend times if you are open to meeting outside of typical business hours), and I will set up a meeting for a mutually agreeable time.

Teaching Assistant: Lily Martin
Email: lwm3@queensu.ca
Office: Humphrey Hall Room 205
Student Hours: Fridays 2:00 pm - 3:00 pm

Student Hours/Appointments

I strongly recommend that you take advantage of the opportunity to meet with me and/or Lily. You also should feel free to ask questions before, during, or after lecture and lab. If you are having trouble understanding the course material, please see me well in advance of the exam and final project. We want you to do well and learn the material in this course, but we can do little to help you if you do not take the initiative. Waiting until the last minute will not be a wise strategy.

Course Purpose

The primary purpose of this course is to introduce you to multivariate and multivariable statistical analyses. You will be expanding on the knowledge you gained in PSYC 801 (or equivalent course) to more advanced statistical techniques. You also will be developing marketable skills in programming and conducting statistical tests in R and translating statistical results into understandable language.

Intended Student Learning Outcomes

By the end of this course, you will be able to:

- Choose the appropriate multivariate and multivariable statistical techniques to assess your research questions
- Defend your statistical choices to other researchers
- Conduct multivariate and multivariable analyses in R
- Interpret the results of multivariate and multivariable analyses
- Communicate the results of multivariate and multivariable analyses adhering to the guidelines of the field

Course Materials

Copyright of Course Material

Course materials created by the course instructor, Jill A. Jacobson, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell, or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale, or other means of dissemination, without the instructor's express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.

Required

Flora, D. B. (2018). *Statistical Methods for the Social & Behavioural Sciences: A Model-Based Approach*. Thousand Oaks, CA: Sage. **Price at The Campus Bookstore**: $113.95 CAD or digital version for $95 CAD at https://campusebookstore.com/link/?id=c7647260-3038-4f1b-8912-64146e69f0b1

Flora's online resources available at: https://study.sagepub.com/researchmethods/statistics/flora-statistical-methods-for-the-social-and-behavioural-sciences

R software for Windows or Mac OS. R Core Team (2025). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/. **Price**: Free

RStudio software for Windows or Mac OS. RStudio Team (2025). *RStudio: Integrated Development for R*. RStudio, Inc., Boston, MA URL https://posit.co/downloads/ **Price**: Free

Recommended

American Psychological Association. (2020). *Publication Manual of the American Psychological Association* (7th ed.). Washington, DC: Author. **Price at the APA website**: $34.99 USD

Baruffa, O. (2024). *The Big Book of R*. https://www.bigbookofr.com/ This compilation of 300+ free R books and resources includes the two I most often recommend, Navarro's *Learning Statistics with R* and Wickham and Grolemund's *R for Data Science*. **Price**: Free

Lecture slides, other readings, and additional course materials will be posted on onQ.

Course Components

Participation. This component of your grade will be based on:

Attendance. The lectures and labs provide active engagement, promote a deeper understanding of the course content, and contribute to your success not just in this course but in your academic career. Your presence in lecture and participation in lab contribute to the knowledge and skills that you will develop. I expect you to attend all class meetings to take advantage of these times, which are already built into your schedules, to learn the course material and to complete the lab assignments.

Comprehension Checks. Two 80-minute in-person lectures are scheduled for each week. Slides for the lectures will be available on onQ at least 1 hour before the day the lecture is scheduled. Most weeks the first lecture will be conceptual, and in the second lecture, I will introduce how to do the analyses in R. Each week you will complete a ***formative*** (not evaluative) check to provide feedback to me and to you about your comprehension of that week's lecture material. This comprehension check must be **completed by 10:00 pm on Thursday** to be counted as participation.

Laboratories. Labs will be in-person and will start with a review of any common problems or misunderstandings about the current week's topic. I also can answer any other questions before, during, or after the primary lab activity. After the brief review, you will work on the weekly lab assignment, which typically will involve completing exercises in R via RStudio and writing up an APA-style Results section based on the output. You are expected to attend the 10 laboratories to work on at least the R portion of the lab assignment. Both the TA and I will be available for the full 2 hours of the lab meetings because we can more easily and efficiently provide clarification and assist you with coding problems, etc. in person than via email. Your final lab assignment mark will be based on the best 9 out of 10 assignments, and you must complete at least 9 assignments to pass this course (i.e., if you do not, you will receive a failing mark for the class regardless of your performance on the other components of the course). The weekly lab assignments are due by 5 pm on Friday but see below under "Assignment Submission Policy" about the built-in 3-day grace period.

Final Project. You must complete the final project to pass this course (i.e., if you do not, you will receive a failing mark for the class regardless of your performance on the other components of the course). The final project will primarily involve conducting analyses that you learned in PSYC 802 and writing up a briefer version of an APA-style paper. Because learning is enhanced when an activity is relevant, you will need to use multivariate and/or multivariable data that you, your advisor, or your lab already has collected and that are appropriate for one of the statistical techniques covered in this course. If you do not have the necessary data but want to use data available in R or online, please contact me for approval before Tuesday, April 7th (i.e., 2 weeks before the final project is due) and provide the link to the data in your final project write up. You cannot use open data for which the code necessary for the final project is available as well. I also can assist you in finding

data if you do not have access to any. The final project must be submitted in electronic format (e.g., Word, PDF, etc.) on onQ by 5:00 pm on Tuesday, April 21st.

Final Exam. One in-class exam will be held during the lecture time (1:00 pm – 2:30 pm) on Thursday, April 2nd. Exams will not be moved or deferred to accommodate employment, travel/holiday plans, or flight reservations. For information regarding what is considered extenuating circumstances and qualifications for Academic Consideration, please see Queen's Graduate School policy on accommodation and academic consideration (including the relevant forms) at https://www.queensu.ca/academic-calendar/graduate-studies/admission-registration/ (scroll down to "Accommodation for Graduate Students with Disabilities"). You must write the exam to pass this course (i.e., if you do not, you will receive a failing mark for the class regardless of your performance on the other components of the course). You will receive a letter grade for the exam.

Assignment Submission Policy

Please see Queen's Graduate School policy on accommodation and academic consideration (including the relevant forms) at https://www.queensu.ca/academic-calendar/graduate-studies/admission-registration/ (scroll down to "Accommodation for Graduate Students with Disabilities"). To build in flexibility and promote accessibility and inclusion for all students, this course uses universal design including built-in grace periods where possible.

Written Submissions. All written assignments will be submitted in electronic format (i.e., Word, PDF) on onQ. They must be originally and individually written including the R code and must follow the format of the 7th edition of the *Publication Manual of the American Psychological Association.* All written assignments have a built-in 3-day grace period, which aligns with the policy for Academic Considerations. If you have extenuating circumstances when a submission is due, and these circumstances will last up to 3 days, you can use the grace period without applying for formal Academic Considerations through the Portal. The grace period is automatically applied to papers submitted up to 3 days late (e.g., submitted before 5:00 pm on the Monday following the lab assignment's Friday due date). However, if your circumstances will last more than 3 days, and you have documentation, please use the Academic Considerations Portal. If you have accommodations that allow you to have extensions on assignments, the extension time begins the day assignment is due, not at the end the 3-day grace period. The grace period is part of your extended time.

Late Policy: Late assignments and final projects submitted beyond the grace period will be penalized 1 letter grade per day that they are late unless arrangements have been made. Thus, if your initial grade for an assignment was an A, but the document was submitted after 5:00 pm on the Monday following the lab assignment's Friday due date or after 5:00 pm on Friday, April 24th, for the final project, your final grade for the assignment will be an A-.

Statement of Academic Integrity

All written assignments in this course including the exam must be originally and individually written. If you are uncertain about what constitutes plagiarism, please review Queen's Graduate School policy on academic integrity at https://www.queensu.ca/academic-calendar/graduate-studies/academic-integrity-policy/ .

Generative Artificial Intelligence (AI) Tools

Students must submit their own work and cite the work that is not theirs. Generative AI tools such as ChatGPT are permissible only when explicitly noted in the assignment instructions and you have sought and received prior approval from me. In these cases, you must cite the material that they generate. Any other use constitutes a Departure from Academic Integrity.

Student Code of Conduct

As a Queen's student, you are bound by the Student Code of Conduct available for review at https://www.queensu.ca/secretariat/sites/uslcwww/files/uploaded_files/policies/board/StudentCodeOfConduct.pdf . The code is the foundation for the university's non-academic misconduct (NAM) system, which provides a process for identifying and addressing misconduct within the Queen's community, encouraging informal resolution of grievances while taking into account the well-being of each student and the safety and well-being of the community.

Turnitin Statement

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarized text in this course. Data from submissions is also collected and analyzed by Turnitin for detecting Artificial Intelligence (AI)-generated text. These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's Privacy Policy, Acceptable Use Policy and End-User License Agreement, which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's University Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes. For further information about how you can exercise control over cookies, see Turnitin's Privacy Policy.

Turnitin may provide other services that are not connected to the purpose for which Queen's University has engaged Turnitin. Your independent use of Turnitin's other services is subject solely to Turnitin's Terms of Service and Privacy Policy, and Queen's University has no liability for any independent interaction you choose to have with Turnitin.

Evaluation

You are responsible for all lecture and laboratory material and all corresponding material on onQ. You must complete 9 of the 10 lab assignments, write the final exam, and complete the final project to pass this course. You also are expected to adhere to the indicated due dates (see the "Assignment Submission Policy" below for more details including the late policy). Exams and assignments due in other courses will not be sufficient grounds for excusal, and the PSYC 802 exam and assignment dates will not be changed to accommodate conflicts with your other courses' schedules. No extra credit opportunities will be offered.

Summary of evaluation components (all are required):

PARTICIPATION TOTAL	Attendance/Completing comprehension checks before Thurs. 10 pm
EXAM TOTAL	1 Exam
PROJECT TOTAL	1 Project
LAB WORK	Best 9 of 10 Labs

Weighting of evaluation components: Participation will be worth 10%. Of the remaining three, the component on which you perform the best will be worth 40% of the final grade, and the component on which you perform the worst will be worth 20% of the final grade. The remaining component will be worth 30% of the final grade. All components must be completed to pass this course.

Grading Method

All components of this course will receive letter grades, which, for purposes of calculating your course average, will be translated into numerical equivalents using the Faculty of Arts and Science approved scale (see below). Your course average then will be converted to a final letter grade according to Queen's Official Grade Conversion Scale (see below).

Arts & Science Letter Grade Input Scheme and Official Grade Conversion Scale

Grade	Numerical Value for Calculation of Final Grade	Numerical Course Average (Range)
A+	93	90-100
A	87	85-89
A-	82	80-84
B+	78	77-79
B	75	73-76
B-	72	70-72
C+	68	67-69
C	65	63-66
C-	62	60-62
D+	58	57-59
D	55	53-56
D-	52	50-52
F	48	49 and below

PSYC 802 Course Outline Winter 2026

Week	Date	Topics	Reading*
1	January 5	Introduction and Review of Statistical Foundations	Flora 1
	January 8	Simple Regression	
	January 9	R Review	
2	January 12	Multiple Regression with Continuous Predictors	Flora 2
	January 15	Regression Diagnostics and Polynomial Regression	
	January 16	*Lab 1: Multiple regression with continuous predictors*	
3	January 19	Multiple Regression with Categorical Predictors	Flora 3
	January 22	ANCOVA and Regression Power Analysis	
	January 23	*Lab 2: Multiple regression with categorical predictors*	
4	January 26	Moderated Regression I	Flora 4
	January 29	Moderated Regression in R	
	January 30	*Lab 3: Moderated regression I*	
5	February 2	Moderated Regression II	
	February 5	Logistic Regression	
	February 6	*Lab 4: Moderated regression II*	
6	February 9	Simple Mediation	Flora 5 (up to p. 158)
	February 12	Simple Mediation in R	
	February 13	*Lab 5: Mediation*	
		Reading Week	
7	February 23	Multiple Mediators	Flora 9 (pp. 288-302)
	February 26	Conditional Process Analysis	Flora 5 (pp. 158-160)
	February 27	*Lab 6: Multiple mediators and/or CPA*	
8	March 2	Third Variables: Confounds, Covariates, and Colliders	
	March 5	Multiple Outcome Models: rANOVA, MANOVA, and MLM	
	March 6	*Lab 7: Third Variables*	
9	March 9	Multilevel Modeling	Flora 6
	March 12	Multilevel Modeling in R	
	March 13	*Lab 8: MLM*	
10	March 16	Exploratory Factor Analysis	Flora 8
	March 19	Exploratory Factor Analysis in R	
	March 20	*Lab 9: EFA*	
11	March 23	Structural Equation Modeling	Flora 9 - 10
	March 26	Structural Equation Modeling in R	
	March 27	*Lab 10: SEM*	
12	March 30	Growth Curve Modeling and Exam Review	Flora 11
	April 3	Final Exam	
	April 4	*Queen's Holiday - Class Cancelled*	
Exam	April 21	Final Project Due by 5 pm	

**Other resources to supplement the lecture and lab material and the textbook will be posted on onQ.*