

PSYC 940: Structural Equation Modeling
Winter 2025

Course Instructor: Jill A. Jacobson, Ph.D.

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Student Hours: After class/labs and 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. Just send 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.

Course Purpose

The primary purpose of this course is to introduce you to latent variable model analyses. You will be expanding on the knowledge you gained in PSYC 802 (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:

- Explain the key procedural steps in the implementation of exploratory factor and composite analysis, confirmatory factor and composite analysis, and structural equation modeling.
- Implement the procedures and interpret the results of exploratory factor and composite analysis, confirmatory factor and composite analysis, and structural equation modeling.
- Communicate the results of exploratory factor and composite analysis, confirmatory factor and composite analysis, and structural equation modeling 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

R software for Windows or Mac OS. R Core Team (2024). *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 (2024). *RStudio: Integrated Development for R*. RStudio, Inc., Boston, MA URL <https://posit.co/downloads/> **Price:** Free

Recommended

Kline, R. B. (2023). *Principles and Practice of Structural Equation Modeling* (5th Ed.). New York, NY: The Guilford Press. **Price at The Campus Bookstore:** \$95.95 CAD

American Psychological Association. (2019). *Publication Manual of the American Psychological Association* (7th ed.). Washington, DC: Author. **Price at the APA website:** \$31.99 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 when learning R, 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

Lectures/Laboratories. One 120-minute lecture/lab is scheduled for each week in Nicol Hall Room 232. Slides for the lecture portion will be available on onQ at least one hour before the lecture is scheduled to begin. The laboratory portion will focus on practicing techniques in R by working on a short lab assignment. 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.

Lab assignments. The lab assignments will consist of answering questions about activities or demonstrations intended to enhance understanding of material covered in lecture and/or completing exercises in R. These assignments will be completed during the lab, so I can assist you with any problems. You must complete all 3 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 8:00 pm on Monday but see below under “Assignment Submission Policy” about the built-in 3-day grace period.

Homework assignments. Students must complete both homework 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). Because learning is enhanced when an activity is relevant, you will need to use data that you, your advisor, or your lab already has collected. You are encouraged to use the same data for both homework assignments (e.g., use Homework 1 to do the measurement model portion of the structural regression model that you use for Homework 2). If you do not have the necessary data but want to use data available in R or online, please get my approval prior to the homework due date and provide the link to the data in your write up. **You cannot use open data for which the code necessary for the homework assignment is available as well. Also, you may not submit the same assignment you used for PSYC 802.** I also can assist you in finding or simulating data if you do not have access to any, or your data collection is not yet finished. The homeworks are due by 8:00 pm on the date listed in the Course Outline but see below under “Assignment Submission Policy” about the built-in 3-day grace period.

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 8:00 pm on the Thursday following the lab assignment's Monday 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. So, for example, if your initial grade for a lab assignment was an A, but the document was submitted after 8:00 pm on the Thursday following the lab assignment's Monday due date, your final grade for the lab assignment will be an A-.

Statement of Academic Integrity

All written assignments in this course 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 writing tools such as ChatGPT are only permissible when explicitly noted in the assignment instructions. In these cases, be sure to 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.

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Evaluation

You are responsible for all lecture and laboratory material and all corresponding material on onQ. You must complete all 3 lab assignments and both homeworks 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). Exceptions will be made only under relevant circumstances. Exams and assignments due in other courses will not be sufficient grounds for excusal, and the PSYC 940 due 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	6%
ASSIGNMENT TOTAL	3 Lab Assignments	24%
HOMEWORK TOTAL	2 Homework Assignments	70%

Weighting of evaluation components: The shorter in-class lab assignments will be averaged together and worth 24% toward your final grade. Homework 1 will be worth 30% toward your final grade, and Homework 2 will be worth 40%.

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 940 Course Outline Winter 2025

Week	Date	Topics	Due
1	January 6	Introduction and Review	
2	13	Exploratory Factor and Composite Analyses I	
3	20	Exploratory Factor and Composite Analyses II	
4	27	Structural Equation Modeling Basics	
5	February 3	Confirmatory Factor and Composite Analyses I	
6	10	Confirmatory Factor and Composite Analyses II	Lab Assignment #1
READING WEEK			
7	February 24	Multiple Groups Analysis and Invariance Testing	
8	March 3	Moderation and Mediation	Homework #1: Measurement
9	10	Longitudinal Models I	
10	17	Longitudinal Models II	Lab Assignment #2
11	24	Dyadic Data Analysis and Multilevel SEM	
12	31	Mixture Models and Best Practices	Lab Assignment #3
Exam	April 25	Final paper due by 8:00 pm	Homework #2: SEM