

PSY 509
Seminar in Quantitative Methods: Introduction to Multivariate Statistics
Spring, 2023

GENERAL INFORMATION

Instructor:	James M. LeBreton	Teaching Assistant:	TBD
Office Location:	632 Moore Building	Office Location:	
Office Telephone:	814-867-4847	Office Hours:	
Office Hours:	by appointment	E-mail:	
E-mail:	james.lebreton@psu.edu		
Class Time:	W 9:00am – 12:00pm		
Class Location:	444 Moore Building		

Required Texts

Tabachnick, B. G., & Fidell, L. S. (2019). Using multivariate statistics (7th ed.). NY: Pearson.

Recommended Texts

Stevens, J. P. (2002). Applied multivariate statistics for the social sciences (4th ed.). Mahwah, NJ: Lawrence Erlbaum.

PREREQUISITES

You are required to have earned a B or better in PSY 507 and PSY 508 or approved course equivalents. If you have questions about the equivalence of your courses, please see the instructor during the first week of classes. Students are also expected to be comfortable using R and RStudio for data management and analysis.

STATISTICAL SOFTWARE

R and RStudio are free software packages that will serve as the primary software used in the course. If you are using a PSU computer from the CLA, you should be able to download and install a copy if it is not already installed. If you are having trouble, you can contact the LA Helpdesk. On personal computers, you can just download R (<https://www.r-project.org>) and RStudio (<https://www.rstudio.com>).

COURSE DESCRIPTION & OBJECTIVES

This course examines the application of multivariate statistical methods to the analyses of social science data. We will discuss different approaches to multivariate data including matrix algebra, the general linear model, multivariate analysis of variance, canonical correlation, discriminant function analysis, and factor/component analysis. Time will also be spent on issues in data screening. Be aware, this is an *advanced doctoral-level statistics course*. As such, emphasis is placed on the theory, mathematics, assumptions, application, and interpretation of multivariate statistics, specifically within the context of social & organizational research.

This course has three goals:

- 1) To provide students with a **theoretical understanding** of multivariate analyses.
- 2) To provide students with the **applied skills** necessary to integrate techniques in their research.
- 3) To provide students with a treatment of the **mathematical foundations** of these topics so the interested student has the requisite background to pursue advanced training in these areas.

CANVAS & ZOOM

I will use CANVAS to post announcements, data sets, etc. It is the student's responsibility to monitor CANVAS for announcements and postings.

This is not an online class; however, if circumstances dictate, we may be required to transition to an online format using Zoom. If that occurs, I will activate the Zoom link for the course.

CLASS PHILOSOPHY

This class is my opportunity to introduce you to the interesting and complex world of multivariate statistics. It is my personal mission to make sure that all of you walk away from this class capable of discussing in great depth the topics we cover. I expect everyone to be *proactively* involved in this educational and professional developmental opportunity.

I will actively support and encourage an environment characterized as open, supportive, and fun. I will actively discourage an environment that is characterized as overly critical or hostile. I expect all of us to work together to create an environment that reinforces constructive criticism and feedback, accompanied by comments designed to guide everyone to a better understanding of the issues at hand. I would encourage all of you to think outside the box-- try to frame and address issues in innovative and creative ways. Finally, ***always be thinking about how the topics we discuss relate back to the research questions in each of your specialty areas.*** I am more than happy to meet with you individually to discuss or clarify how the ideas presented in class are germane to your research.

OVERVIEW OF COURSE FORMAT

This course is scheduled to meet for 3 hours/week. Each week will focus our on a different topic. Because this course is an advanced survey course, emphasis is placed on students grasping issues at both the conceptual/theoretical level and the technical/operational level.

It is expected that students show up prepared for class, which implies that AT A MINIMUM: 1) students have **read the assigned readings** (*at least once*), 2) students have generated a list of questions concerning areas of confusion, 3) students have made a good faith effort to answer those questions, and 4) any unanswered questions will be shared with the class for discussion.

COURSE REQUIREMENTS

1. *Seven assignments.* Each assignment will be worth 25 points.
2. *Participation.* 25 points will be awarded for participation (see below).
3. *Quizzes.* There will be occasional pop quizzes throughout the semester, each worth up to 10 points.

INDIVIDUAL AND GROUP WORK

You are strongly encouraged to consider working in groups for the homework/assignments so that you benefit from collaborative learning. However, you must submit your own individual solutions to each assignment. Collaboration is not permitted on the quizzes.

GRADING

Assignments not turned in by their due date will be assigned a grade of zero (0). Please be present, prepared, and on-time for each class. Unavoidable absences resulting in missed work may be excused by the instructor and will require written supportive documentation (e.g., doctor's certificate, approved University absence).

Grades will be assigned using the following scale:

Letter Grade	Percentage of Points
A	100% to 90%
B	89.9999% to 80%
C	79.9999% to 70%
D	69.9999% to 60%
F	59.9999% to 0%

ACADEMIC INTEGRITY

Students with questions about academic integrity should visit:

<https://la.psu.edu/current-students/undergraduate-students/education/academic-integrity>

Penn State defines academic integrity as “the pursuit of scholarly activity in an open, honest and responsible manner.” (Senate Policy 49-20). Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without permission from the instructor or tampering with the academic work of other students. Students facing allegations of academic misconduct who drop the course will be returned and will be expected to complete course work and meet course deadlines until the allegations are dismissed and the drop is permitted. Students responsible for academic misconduct often receive academic sanctions, which can be severe, and put themselves at jeopardy for disciplinary sanctions assigned by the University's Office of Student Conduct (see Senate Policy G-9).

To avoid plagiarism in this course, always include an in-text citation that includes the author(s) last name(s) and the year the source was published at the end of any sentence/after any image that includes words, images, or ideas you found in a source, always included quoted text within quotation marks, and always include a reference for any source at the end of your paper (reference format will be discussed in class).

Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Students MAY collaborate on the homework assignments.

Students MAY NOT collaborate on the quizzes. If you have questions or require clarification about any aspect of the quizzes, please direct those inquiries to James or the TA. If you have any questions about what constitutes appropriate or inappropriate collaboration, please ask James or the TA.

DISABILITY SERVICES

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides contact information for every Penn State campus (<http://equity.psu.edu/sdr/disability-coordinator>). For further information, please visit Student Disability Resources website (<http://equity.psu.edu/sdr/>).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines (<http://equity.psu.edu/sdr/guidelines>). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

COUNSELING & PSYCHOLOGICAL SERVICES

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

Counseling and Psychological Services at University Park (CAPS)
(<http://studentaffairs.psu.edu/counseling/>): 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses
(<http://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/>)

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400
Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

EXTENDED ABSENCES

During your enrollment at Penn State, unforeseen challenges may arise. If you ever need to miss an extended amount of class in such a circumstance, please notify your professor so you can determine the best course of action to make up missed work. If your situation rises to a level of difficulty you cannot manage on your own with faculty support, reach out to the Student Care & Advocacy office by phone at (814-863-2020) or email them at StudentCare@psu.edu. Office hours are Monday-Friday, 8 a.m. to 5 p.m.

COVID-19

The course will be following [Penn State COVID-19 guidance for faculty and instructors](#).

ZOOM

In the event we need to transition to Zoom, keep in mind that this is a classroom environment and others should be treated with respect. Please keep your microphone muted unless you want to ask a question or interact with someone. If your microphone is not muted, the entire class will be able to hear what is going on in your environment. Also, as an instructor, I personally like to see people's faces. Also, as a participant, I am more involved when I have my camera on. I realize, however, that there are many reasons why you might not want to turn on your camera such as poor internet connection, joining via phone, or other privacy concerns. It is your choice as to whether you would like to have the camera on or not.

In the past when I have taught on Zoom, students found it helpful for me to record the sessions. Thus, video and audio recordings of class lectures will be part of the classroom activity. The video and audio recordings are used for educational uses/purposes and only may be made available to students presently enrolled in the class. For purposes where the recordings will be used in future class sessions/lectures, any type of identifying information will be adequately removed. At this point, I do not envision using these recordings in the future.

NATURAL OR UNNATURAL DISASTERS

In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances.

TENTATIVE COURSE SCHEDULE

Wk	Date	Topic	Readings Completed Prior to Class	Assignments
1	01/09/23	Introduction, Expectations, & Matrix Algebra	T & F: Appendix A Stevens: Chapter 2 (optional)	
2	01/16/23	No Class – MLK	T & F: Chapter 2	
3	01/23/23	Matrix Algebra		Assign. #1 Given
4	01/30/23	Data Screening	T & F: Chapter 4 Newman (2014) Aguinis, Gottfredson, & Joo (2013) Becker, Robertson, & Vandenberg (2019) DeSimone & Harms (2015)	Assign. #1 Due Assign. #2 Given
5	02/06/23	Canonical Correlation	T & F: Chapter 12	Assign. #2 Due
6	02/13/23	Canonical Correlation		Assign. #3 Given
7	02/20/23	MANOVA	Stevens: Chapter 4 Stevens: Chapter 5	Assign. #3 Due
8	02/27/23	MANOVA		Assign. #4 Given
9	03/06/23	No Class – Spring Break		
10	03/13/23	MANCOVA	T & F: Chapter 7	Assign. #4 Due
11	03/20/23	MANCOVA		Assign. #5 Given
12	03/27/23	Flex Week		
13	04/03/23	DFA	T & F: Chapter 9	Assign. #5 Due Assign #6 Given
14	04/10/23	DFA or Flex Week		Assign #6 Due
15	04/17/23	PCA/EFA		Assign. #7 Given
16	04/24/23	PCA/EFA or Flex Week		Assign. #7 Due
17	05/01/23	No Class – Final Exams		

The above schedule and procedures in this course are subject to change in the event of extenuating circumstances. Any changes will be announced *in class or via CANVAS*, and the student is responsible for obtaining updated information regarding those changes.

Flex Week topics might include a) wrapping up existing topics that took longer than expected, b) reviewing or revisiting previous topics in light of information learned from new topics, or c) completely new topics (e.g., cluster analysis, multidimensional scaling, multivariate multiple regression, event history/survival analysis, confirmatory factor analysis).