

Multivariate Methods (PSY 505)
Stony Brook University
Fall 2019 (3 Credits)
Tuesday/Thursday, 10am-11:20am
Psychology A 256

Instructor

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Office hours (Psychology B 324):

- 1) Tuesdays 12pm to 1pm
- 2) Wednesdays 3pm to 4pm
- 3) Thursday afternoons by appointment

Teaching Assistant

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Course Readings

Required: As assigned by the instructor

Recommended: Various multivariate statistical texts, depending on students' needs

Prerequisite

This course assumes you have completed PSY 502 or an equivalent course covering multiple regression. In addition, students should have some knowledge of a statistical software package, or the motivation to learn one.

Learning Objectives

This course is an introduction to selected multivariate statistical methods and related concepts used in psychological science. My goals are to present students with an overview of these methods and to illustrate how they can be applied. By the end of the course, students should be able to:

- (a) identify what methods are appropriate for particular questions
- (b) articulate conceptual underpinnings of these methods
- (c) explicate basic mathematical foundations of these methods
- (d) understand how to conduct these analyses
- (e) interpret results of these analyses
- (f) present these results in a clear and accurate way

Assignments and Grading Policy

Weekly assignments. Weekly assignments will be posted to Blackboard on Tuesdays or Thursdays and will be due one week later (the following Tuesday/Thursday) before the beginning of class. Assignments will give students the opportunity to think creatively and

critically about multivariate methods and to apply them to their own area of research when possible. Assignments will be graded on a 0-2 point scale, where 0 represents inadequate performance, 1 represents mostly successful performance (assignment completed but with notable errors or insufficient information), and 2 represents fully successful performance. Partial credit will be given. The lowest assignment grade will be dropped. Assignments will be turned in on Blackboard. Late assignments may be turned in until the beginning of class the next Wednesday with a .5 point penalty; no assignments will be accepted more than one week late. In past semesters, there have been approximately 8 to 12 homework assignments.

Final project. Each student will complete a final project for the course that applies multivariate statistical methods and related concepts to a research topic of the student's choosing. Students will write up the project, with a focus on the methods, results, and interpretation. Students are strongly encouraged to choose a final project that can be adapted into a publishable journal article. More information will be given about the final project's expectations and grading as the course unfolds. Depending on enrollment and scheduling, students may give a brief in-class presentation about their projects.

Grading. The combined score of the weekly assignments will compose 50% of the final course grade, and the final project will compose the remaining 50%.

Attendance

Attendance is not a component of the final grade, with the exception that students must be present for any presentations they do. This being said, students are strongly advised to attend every class session. Learning statistics requires patience and practice, and repeated exposure to topics in lecture will solidify understanding.

Data

Each student will need to provide one or more datasets for use throughout the course. Ideally, this dataset will be something in the student's content area and can be explored throughout the semester in various assignments, testing potential analyses for the final project. The instructor will provide some datasets for particular assignments as well.

Statistical Software

Throughout this course, students will be exposed to several statistical software packages. Some of these packages are freely available; others are available in the computing lab; still others must be purchased (and can be very expensive). To complicate matters further, specific packages can conduct different multivariate analyses, offering multiple features, benefits, and limitations. Different areas of psychological science tend to use different software packages as well. Various programs will be discussed and used throughout the course by the instructor; however, students may choose to use any statistical software package that is appropriate for their purposes for assignments. This "open software" approach allows you to choose and use the optimal software for your purposes, but the downside is that the instructor has limited knowledge of many software packages. Thus, problems emerging with particular packages will require that students collaborate with other users or search online/documentation for solutions.

Collaboration and Academic Misconduct

Students should feel free to discuss readings, lectures, analyses, and ideas outside of class. Further, in and out of class, students are encouraged to work together on challenging issues. Students may collaborate on weekly assignments, but each student must turn in an assignment with original and unique answers. Students may also assist each other with final projects—particularly helpful if they have expertise in the same content area or are using similar multivariate methods—but each student must submit a totally original and unique final project.

Academic misconduct, including cheating and any other forms of academic dishonesty, will not be tolerated. Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work, including homework answers, as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. Further, the instructor also reserves the right to lower the grade of the assignment(s) in question, including decreases to zero points earned, as well as the final grade. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the Academic Judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary>. In addition, expected student behavior is outlined in the Stony Brook University Student Conduct Code, including respect for others.

Disability Accommodations and Diversity

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Educational Communications Center (ECC) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. I will be happy to work with you to accommodate your needs and facilitate your success in the course.

In my courses, it is a requirement that students be shown respect by their peers, instructor, and teaching assistants. No student shall be harassed or discriminated against due to their race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, political affiliation, veteran status, sexual orientation, gender identity, health status, and so on. The university system provides a “marketplace of ideas” where various opinions and beliefs come together in civil and knowledge-promoting dialogue. All students, and their reasonable viewpoints, will be respected, with the exception of slanderous, ad hominem, or hate speech, or any other behaviors deemed by the instructor to be disruptive or disrespectful.

Please inform the instructor of any way in which the class might better accommodate you, including religious holidays, preferred pronouns, and so on.

Students who are parents should feel welcome to bring their children to class, making efforts to reduce any disruption this may cause.

Syllabus

This syllabus, and the policies and schedule herein, are subject to change at the instructor's discretion. The instructor reserves the right to change this syllabus and any other aspect of the course at any time.

Example Schedule (This *will* change, including homework due dates, depending on length of lectures and student needs)

Date	Topic	Assignment Due
8/27	Introduction to multivariate methods and software	
8/29	Review of statistical principles, ANOVA/ANCOVA	
9/3	Matrix algebra, MANOVA/MANCOVA	#1 due
9/5	MANOVA/MANCOVA	
9/10	Discriminant analysis	#2 due
9/12	Review of correlation/regression, data screening, and transformations	
9/17	Logistic and Poisson regression	#3 due
9/19	Multilevel modeling	
9/24	Multilevel modeling	#4 due
9/26	Multilevel modeling in Mplus	
10/1	Multilevel modeling in Mplus	#5 due
10/3	Regression with multiple DVs	
10/8	Regression with multiple DVs	#6 due
10/10	Principal components analysis	
10/15	NO CLASS	#7 due
10/17	Introduction to factor analysis	
10/22	Exploratory factor analysis	#8 due
10/24	Exploratory factor analysis	
10/29	Confirmatory factor analysis	#9 due
10/31	Confirmatory factor analysis	
11/5	Confirmatory factor analysis	#10 due
11/7	Structural equation modeling	
11/12	Structural equation modeling	#11 due
11/14	Structural equation modeling	
11/19	Item response theory	#12 due
11/21	Item response theory	
11/26	Invariance testing	#13 due
11/28	NO CLASS	
12/3	Miscellaneous topics*	
12/5	Miscellaneous topics*	Final project due

*If time permits, students and the instructor may choose from miscellaneous advanced topics, including: Construct validity, data structures (dimensions, classes, etc.), person-centered approaches (k -means and model-based cluster analysis), latent class analysis, non-parametric statistics, advanced topics in SEM (hierarchical, biometric, exploratory SEM), factor mixture models, classical test theory, multi-trait/multi-method approaches, Bayesian statistics, philosophy of science (falsification, null/null hypothesis testing, causation), GLM, missing data, survival analysis, network analysis, etc.