

## PSYC 5407 – Multivariate Data Analysis Spring 2024

### Instructor Information:

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### Course Information:

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Class Meetings: **Lectures – Mondays and Wednesdays**  
1:00 – 2:20 PM  
318 Life Science  
**Lab – Wednesdays**  
2:30 – 5:20 PM  
318 Life Science

### Course Content:

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This course is a continuation of the graduate statistics sequence (PSYC 5405). You will learn some advanced data analysis skills and statistical techniques. We will start with correlation and simple linear regression, then move to multiple regression, and finally to techniques like factor analysis. Although we will refer to the general linear model, we will focus more heavily on the conceptual and pragmatic aspects of statistics, rather than the computational formulae. However, we will always refer to the formulae to keep a grounding in the mathematics and logic of the statistics. Another major part of the course will be learning how to implement various data analytic and visualization techniques in statistical programming software.

### Student Learning Outcomes:

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In this course, students will:

- Analyze bivariate datasets
- Analyze multivariate datasets
- Build and test models
- Write R code to perform statistical analyses
- Write R code to transform and visualize data
- Write R code to perform statistical tests on data
- Interpret output of statistical tests
- Generate reports of data patterns, statistical tests, and their interpretations

### Required Textbooks and Other Course Materials

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There is no required text for this course, and there will rarely be required reading. However, there are a few very useful texts that you can refer to if you want additional materials. I will recommend chapters from these books for specific analytic techniques. All material that you will be tested on will come from lecture and lab content. Readings will be for those who want to supplement course material with additional background.

Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Psychology Press.

*^This book is gold standard text for multivariate data analysis. It is computational in nature, but it gives a great mathematical and conceptual underpinning to multivariate statistics.*

Einspruch, E. L. (2022). *An Introductory Guide to R*. Guilford Press.

*^This book is a hands-on walk through of some basic steps and analyses in R, many of which we will use in this class.*

Wickham, H., & Grolemund, G. (2016). *R for Data Science*. O'Reilly.

*^This book gives an in-depth coverage of tidying, transforming, visualizing, and modeling data in the tidyverse. It is available for free online at <https://r4ds.had.co.nz/> and is also available in print for purchase.*

Ismay, C., & Kim, A. Y. (2021). *Statistical Inference via Data Science*. CRC Press.

*^This book also covers data management with the tidyverse, but gives more in-depth coverage of regression, hypothesis testing, sampling, bootstrapping, and inference. It is available for free online at <https://moderndive.com/> and is also available in print for purchase.*

## Technology requirements

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We will be using R software in this course. You will need to install both R and R Studio. You can do via these links. R is available for Mac, Windows, and Linux systems. **Please download and install both R and R Studio before the first class meeting so you can follow along.** If you would like to follow along in R as we go through code in class, you can bring your computer to class (but this is not mandatory). However, **bring your laptops to lab!!!**

[Downloading R for the first time](#)

[Downloading R Studio for the first time](#)

(Unless you know what you're doing, follow the default settings for installation. This will make things easier down the road).

## Grading

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Quizzes (x 9) – 20 points each	180 points
Lab assignments (x 14) – 20 points each	280
Midterm exam	100
Final exam	100
Attendance/Participation	40
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	700 points

A = 90 – 100%

B = 80 – 89%  
C = 70 – 79%  
D = 65 – 69%  
F = Below 65%

I reserve the right to adjust exam grades upward (curve) based on the average grades of students on exams. I will never adjust grades downward. I will also round grades up to the nearest percentage point (e.g., 89.6% → 90%). However, do not ask me to round up beyond that (e.g., 88.7% → 90%). There are plenty of opportunities for you to maximize your semester point total and grade. Please take advantage of them.

## Exams

The exams will be split into two parts. One will be a conceptual take-home exam. The conceptual portion of the exam will include true/false, multiple choice, and short-answer questions regarding statistical concepts and interpretations. The other will be a more technical report completed in R. You will be given exercises to complete, and you will be graded on the appropriateness of your analysis, the functionality of your code, and your interpretation of data patterns. The conceptual portions of the exam will be worth 60 points, and the technical portion will be worth 40 points.

## Homework Assignments

The homework assignments will contain conceptual questions about course material. Usually, they will be due at 12:00 pm CST on Wednesdays. They will be posted after lectures on Mondays. These assignments will be graded for accuracy.

## Lab Assignments

In labs, you will learn technical skills in R, and how to perform various statistical tests. You will then complete exercises and answer questions based on R output. These assignments will be given in lab and worked through as a group. However, you will be responsible for completing the assignment and submitting it individually on Canvas. Lab assignments will be due at 12:00 PM CST on Fridays.

## Grade grievances

To dispute your grade, please use official UTA online [Grade Grievance form](#).

## Research and General Help

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### Ask for Help

- [Academic Plaza Consultation Services](http://library.uta.edu/academic-plaza) (library.uta.edu/academic-plaza)
- [Ask Us](http://ask.uta.edu/) (ask.uta.edu/)
- [Research Coaches](http://libguides.uta.edu/researchcoach) (http://libguides.uta.edu/researchcoach)

### Resources

- [Library Tutorials](http://library.uta.edu/how-to) (library.uta.edu/how-to)
- [Subject and Course Research Guides](http://libguides.uta.edu) (libguides.uta.edu)
- [Librarians by Subject](http://library.uta.edu/subject-librarians) (library.uta.edu/subject-librarians)
- [A to Z List of Library Databases](http://libguides.uta.edu/az.php) (libguides.uta.edu/az.php)
- [Course Reserves](https://uta.summon.serialssolutions.com/#!/course_reserves) (https://uta.summon.serialssolutions.com/#!/course\_reserves)
- [Study Room Reservations](http://openroom.uta.edu/) (openroom.uta.edu/)



<b>Week</b>	<b>Topic(s)</b>	<b>Suggested Reading/Homework</b>
1	RStudio, scripts, variables, vectors	Syllabus, download R and R studio
	Lab #1	Einspruch Chapter 2
2	Packages, projects, importing data	
	Mutate, filter, select	Einspruch Chapter 3
	Lab #2	
3	Group and summarize	
	Pivot wider/longer	
	Lab #3	
4	ggplot (plot types)	Einspruch Chapter 6
	ggplot (plot manipulation)	
	Lab #4	
5	R Markdown	
	R Markdown	
	Lab #5	
6	Univariate analysis ( <i>t</i> -test)	
	Univariate analysis (ANOVA)	Quiz #1
	Lab #6	
7	Bivariate correlations	Cohen Chapter 2
	Simple linear regression	Quiz #2
	Lab #7	
8	Multiple regression	Cohen Chapter 3
	Multiple regression	Quiz #3
	Lab #8	
8	<b>EXAM #1</b>	
9	<b>Spring Break – no class</b>	
	<b>Spring Break – no class</b>	
10	Multiple regression	
	Multiple regression	Quiz #4
11	Interactions	Cohen Chapter 7
	Interactions	Quiz #5
	Lab #11	
12	Interactions	Cohen Chapter 8
	Interactions	Quiz #6
	Lab #12	
13	Latent variable analysis	Cohen Chapter 15
	Latent variable analysis	Quiz #7
	Lab #13 (due 4/14)	
14	Latent variable analysis	
	Latent variable analysis	Quiz #8
	Lab #14 (due 4/21)	
15	Linear mixed effect modeling	Cohen Chapter 14
	Linear mixed effect modeling	Quiz #9
16	Review	
17	<b>FINAL EXAM</b>	

***As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.***

## **Institutional Information**

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UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](https://resources.uta.edu/provost/course-related-info/institutional-policies.php) page (<https://resources.uta.edu/provost/course-related-info/institutional-policies.php>) which includes the following policies among others:

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

## **Attendance**

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At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. **Attendance at lectures and labs is mandatory.** However, I understand there may be instances when you cannot come to class. It is your responsibility to complete any assignments you miss. As the instructor of this section, I will passively monitor attendance. If I notice you are not attending lectures and/or labs, I reserve the right to dock you points for attendance. *Coming to office hours should not serve as a replacement for coming to lectures and labs.* However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

## **Emergency Exit Procedures**

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Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.