APMA 1650 – SYLLABUS

Welcome to APMA 1650 – an exciting statistics adventure awaits you! This is the survival manual for this course, where you can find all the administrative info you need to know, such as office hours, grading, and other goodies. Feel free to e-mail me for any other questions.

Disclaimer: Any item on this syllabus is subject to change. Any in-class or online announcement, verbal or written, is considered official addendum to this syllabus.

1. At a glance

Course Name	Statistical Inference
Term	Fall 2023
Class Times and Location	MWF 2–2:50 pm in Salomon Center 1
Instructor Name	Peyam (π-m) Tabrizian
E-mail	drpeyam@brown.edu
Course Website	APMA 1650 Website
Office	Room 316, 182 George Street
Office Hours	TBA

Date: Wednesday, September 6, 2023.

TA	Role	Email
Nicholas Arosemena	GTA	nicholas_arosemena@brown.edu
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2. Logistics

Course Description: This course is an overview of basic probability and statistics. We will cover chapters 1-10 of the textbook. Specific topics include probability spaces, discrete and continuous random variables, methods for parameter estimation, confidence intervals, and hypothesis testing. To learn even more about the theory, I suggest taking APMA 1655.

Prerequisites: Integral calculus, i.e. any of MATH 0100, MATH 0170, MATH 0180, MATH 0190, MATH 0200, or MATH 0350 or equivalent coursework. While not required, prior experience with multivariable calculus will be an advantage.

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

- Understand new and more complex statistical methods

- Critically evaluate the strengths, weaknesses and appropriateness of existing statistical methodologies
- The foundation to learn to apply these principles in new settings

Calculator Policy: Calculators are **NOT** allowed on the exams. That said, you **ARE** allowed to use them on the Homework.

What this course is really about: I highly doubt that you'll forget the techniques you'll learn in this course because they are essential to human survival. That said, as Steve Krantz puts it in his book How to teach Mathematics, there is another goal of teaching this course. Namely, real purpose of this course is to teach you about mathematical discourse and critical thought. Just like in rhetoric, philosophy or politics, mathematics has its own language and way of thinking. How do mathematicians deal with an unknown problem? What methods do they use? What do they do when a given method doesn't work? Getting acquainted with all those different types of discourses is what your college education is really about.

Textbook: *Mathematical Statistics with Applications*, Wackerly, Mendenhall, Schaeffer, 7th edition.

Online resources you can use:

- Course website: This is the main course website, where you can find the lecture notes, homework, and study material
- Canvas: Here is where I'll post announcements and you can find the lecture recordings
- Gradescope: Here is where you upload your homework, take your exams, and check your grades

- Ed Discussion: A forum-like tool like Canvas Discussions or Piazza, where you can post questions and your classmates can answer them. **Please use Edstem instead of emailing me with questions**
- Dr Peyam: My YouTube channel ☺

3. Grading

Assignment	**Date**	**Percentage**
Homework	Weekly on Fridays	25 %
Mini-Project	Friday, Dec 8	5 %
Midterm 1	Friday, October 13	20 %
Midterm 2	Friday, November 17	20 %
Final Exam	Saturday, December 16	30 %

Range	Grade
$[90, 100]$	A
$[80, 90)$	B
$[65, 80)$	C
$[0, 65)$	NC

Note: The scales above are a *guarantee*. For example, if you get 80, you are guaranteed at least a B. The final grade calculation is up to my discretion. For students taking this course S/NC, a min grade of 65% is required to guarantee a grade of S.

Exams: There will be two midterm and a final in the course. All exams will be administered online. Each midterm is 1h20 long and the final is 3h20 long. Bring your student ID and a pencil to all exams. The exams are closed book and no calculators are allowed. **You are allowed to use a standard two-sided 8.5 × 11 cheat sheet for the exams.**

Online Exam Modality: You can start each exam within 24h of it being released. For example Midterm 1 will be released on Friday, Oct 13 at noon and you have until Saturday, Oct 14 at noon to take it. You will download and print out the template from Gradescope, take your exam on that template, and scan and submit it back to Gradescope. You can also write directly on the exam using your tablet if you wish.

The exam times include upload time, so we will not be accepting any excuses saying you didn't have time to upload the exam. Also there will not be any lecture the day of the exam, but you are free to use the lecture room to take it. Since the lecture rooms are equipped with Wifi, **we will not be accepting any excuses saying you had no internet to take the exam. Finally, if at any point cheating occurs, then we will revert back to in-person exams**

Graded Homework: Homework will be due on Fridays by 3 pm and will be posted on the course website. You will upload your assignments on Gradescope. **Make sure to check your submission, we will NOT accept any incomplete or corrupt files.** You are encouraged to work together but all students must independently write up their own solutions. There is no 'make up' homework, but **the lowest 2 assignments are dropped (this does not include the programming assignment or the mini project)**

Note: You can find all your homework and exam grades on Gradescope. By the end of the semester all your scores will be uploaded to your Canvas gradebook.

Extra Credit: There is a 1% extra credit opportunity, which will be given to the top 10 posters on Edstem. You can achieve this by asking questions on Edstem and answering your peer's questions.

Mini-Project: There will be a small fun project due at the end of the semester, where you pick your favorite ODE and write a $1-2$ page describing it. It won't be too time-consuming.

Late Assignments: We grant two late assignments per student, no later than Sunday 11:59 pm, unless you have a medical note or SAS accommodations. **Please do NOT email me to ask for an extension, use the google form on the course website instead** You have to use the google form for every late assignment, even the first two ones.

Regrades: If there is a mistake in the grading of your assignment or exam (points are added incorrectly, your score was mis-entered into the grade book) please let me know immediately. If you disagree with the grading of your assignment then you may submit a regrade request on Gradescope. **You only have 1 week after your score has been posted to request a regrade, otherwise we won't accept it. There will be no regrades for the last homework and the final** Please note that small changes in homework points generally do not affect an overall grade.

Recitation Sessions: There will be **optional** recitation sessions led by the GTA. What is covered in those sessions is up to the GTA.

Lecture Recordings: The lectures will be recorded, you can find the recordings on Canvas under Media Library > Lecture Captures

Reading Period: There will be class and office hours during reading period, but they will be optional and held via Zoom

4. Miscellaneous Information

Statement on Inclusivity: I strive to foster an inclusive, collaborative, and supportive learning environment where everybody is welcome and feels they belong. I also aim to create an atmosphere where everyone is comfortable to add their voices and opinions. Being a member of the LGBT community, I acknowledge that there are many disparities in representation in the mathematical sciences and that we, as a community, need to work much harder and more persistently to become more diverse.

Accessibility and Accommodations Statement: Brown University is committed to full inclusion of all students. Please inform me early in the term (by email, office hours, after class, or by appointment) if you may require accommodations or modification of any of course procedures. If you need accommodations around online learning or in-classroom accommodations, please reach out to Student Accessibility Services (SAS) for their assistance (sas@brown.edu, 401-863-9588). Undergraduate students in need of short-term academic advice or support can contact an academic dean in the College by emailing college@brown.edu. Graduate students may contact one of the deans in the Graduate School by emailing graduate_school@brown.edu.

Books, Supplies, and Materials If your Brown undergraduate financial aid package includes the Book/Course Material Support Pilot

Program (BCMS), concerns or questions about the cost of books and course materials for this or any other Brown course (including RISD courses via cross-registration) can be addressed to bcms@brown.edu. For all other concerns related to non-tuition course-related expenses, whether or not your Brown undergraduate financial aid package includes BCMS, please visit the Academic Emergency Fund in E-GAP (within the umbrella of "E-Gap Funds" in UFunds) to determine options for financing these costs, while ensuring your privacy.

Finally: Sit back, relax, and enjoy the show! On the next page, you can find *very tentative* schedule of the lectures.

#		**Date**	**Section**	**Lecture Title**	
1	W	Sep 6	1	Introduction to Statistics	
2	F	Sep 8	2.1 - 2.4	Set Notation	
3	M	Sep 11	2.4 - 2.5	Probability and Counting (I)	
4	W	Sep 13	2.6	Probability and Counting (II)	
5	F	Sep 15	2.7	Conditional Probability	HW 1 due
6	M	Sep 18	2.7 - 2.9	Independence and Multiplicative Law	
7	W	Sep 20	2.10 - 2.12	Bayes' Theorem	
8	F	Sep 22	3.1 - 3.2	Discrete Random Variables	HW 2 due
9	M	Sep 25	3.3	Expectation and Variance	
10	W	Sep 27	3.4 - 3.5	Binomial and Geometric Distribution	
11	F	Sep 29	3.7	Hypergeometric Distribution	HW 3 due
12	M	Oct 2	3.8	Poisson Distribution	
13	W	Oct 4	3.9	Moment Generating Functions	
14	F	Oct 6	3.11	Markov and Chebyshev's Inequality	HW 4 due
	M	Oct 9		No class	
15	W	Oct 11	4.1 - 4.2	Continuous Random Variables	
16	F	Oct 13		Midterm 1	

17	M	Oct 16	4.3	Expected Values for Cont Random Variables	
18	W	Oct 18	4.4 - 4.5	Uniform and Normal Distribution	
19	F	Oct 20	4.6 - 4.7	Gamma and Beta Distribution	HW 5 due
20	M	Oct 23	4.9 - 4.10	Expected Values and Chebyshev's Theorem	
21	W	Oct 25	5.1	Multivariate Distributions (I)	
22	F	Oct 27	5.2	Multivariate Distributions (II)	HW 6 due
23	M	Oct 30	5.3 - 5.4	Marginal and Conditional Distribution	
24	W	Nov 1	5.5 - 5.6	Independence, Expectation, and Covariance	
25	F	Nov 3	5.7 - 5.8	Functions of Random Variables	HW 7 due
26	M	Nov 6	5.9 - 5.10	Multinomial and Bivariate Prob Distr	
27	W	Nov 8	6	Conditional Expectation	
28	F	Nov 10	6	More Functions of Random Variables	HW 8 due
29	M	Nov 13	7	Central Limit Theorem	
30	W	Nov 15	8.1 - 8.3	Point Estimators and Bias	
31	F	Nov 17		Midterm 2	

32	M	Nov 20	9.3, 9.7	Consistency and MLE	
	W		Nov 22	No class	
	F		Nov 24	No class	
33	M	Nov 27	8.5 - 8.6	Confidence Intervals (I)	
34	W	Nov 29	8.7 - 8.8	Confidence Intervals (II)	
35	F	Dec 1	8.9	Sample Size	HW 9 due
36	M	Dec 4	10.1 - 10.3	Hypothesis Testing (I)	
37	W	Dec 6	10.4 - 10.6	Hypothesis Testing (II)	
38	F	Dec 8		Catch up/Review (online, via Zoom)	HW 10 due
					Mini Project due
39	M	Dec 11		Catch up/Review (online, via Zoom)	
40	Sa	Dec 16		Final Exam	