STAT430 - PROBABILITY

Fall 2025

Instructor

	Email	Office Hours
Yuting Wei	ytwei@wharton.upenn.edu	Tues 2:15 - 3:15 PM (Starting from Sep 2)
		Office: 307 Academic Research Building

Lecture time	Tues, Thurs, 10:15 PM – 11:45 AM (Section 003) 3:30 PM – 5:00 PM (Section 004)
Location	Morning: Jon M. Huntsman Hall F85 Afternoon: Jon M. Huntsman Hall G60
Textbook	*Mathematical Statistics with Applications* (7^{th} Edition) Wackerly, Mendenhall, & Scheaffer (ISBN 978-0-495-11081-1)

Teaching Assistants:

Ph.D. TA:	Jiuyao Lu Office hours: Wed 2 - 3pm, jiuyaolu@wharton.upenn.edu
Undergraduate TAs and OH:	Yifan Pan, Tue 5:15 - 6:15pm, yifanpan@sas.upenn.edu Bastin Anika, Fri 3:15 - 4:15pm, abastin@wharton.upenn.edu Jerry Liu, Mon 5:30 - 6:30pm, jeliu27@sas.upenn.edu Ajay Hatkar, Thu 5 - 6pm ahatkar@sas.upenn.edu

In this course, we will cover material in Chapters 2-7 of Wackerly et al.: the basic rules of probability, discrete and continuous random variables, functions of random variables, univariate and multivariate probability distributions, and the central limit theorem. In addition, additional materials such as the law of large numbers, Markov processes, probabilistic graphical modeling, etc. will be discussed if time permits.

This is a concept-driven class: the numbers you derive while answering a problem are secondary in importance to fully understanding the concepts that you applied when solving the problem!

By the end of this course...

- You will understand and will be able to verbally describe fundamental concepts of probability: (un)conditional probability, random variables, univariate and multivariate distributions and metrics associated with them, covariance, transformations of random variables, moment-generating functions, statistics and sampling distributions, and the central limit theorem.
- You will understand how the concepts listed above fit within the overall discipline of statistics: when and why do we make use of them? How do we choose families of distributions? In what contexts do we make use of sampling distributions? Etc.
- You will be able to carry out mathematical operations to effectively model random phenomena: what is the mean of a distribution? What is the probability that the next datum I

observe will have a value between a and b? If I transform my data, how does the probability density function change? Etc.

Administrative Remarks

Grades

Your final numerical grade will be 50% from homework and 50% from exams.

$$\text{Numerical Grade} = 50\% \times \text{Homework Grade} + 50\% \times \text{Exam Grade}$$

- The lowest homework score will be dropped and the highest will count double.
- There will be two midterm exams (10/07, 11/11, tentatively). They will take place in our lecture room if not otherwise announced. The final exam will take place on 12/02 (tentatively). Your grades from the exams will be based on:

$$\text{Exam Grade} = 40\% \times \max\left\{\text{Midterm}_1, \text{Midterm}_2\right\} + 60\% \times \text{Final}$$

Your final letter grade will be based on a curve. The characteristics of the curve depends on how the class does as a whole and will be determined at the end of the semester. Note that your final letter grade will never be lower than what I would assign via a straight-scale grading model ($\geq$90 for an A, 80-90 for a B, etc.). For instance, a final numerical grade of 72 would earn you at least a C regardless of the curve.

** there will be 5 bonus points for attendance!*

Software

In this course we will occasionally use computer simulations to assist understanding of randomness and probability computation. Sometimes we will also use software packages to numerically evaluate some distribution functions. These can be conveniently achieved by using the software package `R`. Tutorials for basic use of `R` will be provided on Canvas when necessary. You are also free to choose other tools, such as `Python`, if you prefer.

A Simple Calendar

There will be one homework assignment every week, and all homework assignments are due on Sundays (11:59pm). For example, hw 1 will be due on Sunday, Aug 31 and hw 2 will be due on Sunday, Sep 7.

** There might be some small changes to this calendar which will be announced at class.*

```
Week 1  08/26 08/28 hw 1 due (background survey)
Week 2  09/02 09/04 hw 2 due
Week 3  09/09 09/11 hw 3 due
Week 4  09/16 09/18 hw 4 due
Week 5  09/23 09/25 hw 5 due
Week 6  9/30  10/02
Week 7  10/07(midterm 1) 10/9(fall break)
```

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Week 8  10/14 10/16 hw 6 due
Week 9  10/21 10/23 hw 7 due
Week 10 10/28 10/30 hw 8 due
Week 11 11/04 11/06
Week 12 11/11(midterm 2) 11/13
Week 13 11/18 11/20 hw 9 due
Week 14 11/25 11/27 hw 10 due
Week 15 12/02 (final)
```

Note: the drop deadline of this course is the Oct 6, while the withdrawal deadline is the Nov 3.

Homework

Homework. We will use `Gradescope` as our assignment submission and grading platform. Homeworks will posted before Wednesday, and are due on Sundays (11:59pm).

You will need to provide a clean, easily readable scan of your assignment, either through the use of a scanner or your phone and submit it on `Gradescope`. Fail to submit your assignment ontime will result in loss of your homework points.

(For more information about how to use `Gradescope`, see:
`sas-lps.freshdesk.com/support/solutions/articles/42000086803-gradescope-for-students`.)

Late homework submission. Homework assignments that are turned in late but no more than 6 hours late will receive 75% credit; those turned in more than 6 hours late but no more than 24 hours late will receive 50% credit; those turned in more than 24 hours late will not be graded and will receive 0 credit, regardless of the reason they are late. Homework solutions will be posted on Canvas 24 hours after due time.

Homework scores. Homework will be graded and the scores will appear on `Gradescope` and `Canvas` within one week of submission. You must bring any missing homework score to my attention within one week of the homework being graded, so check your grades on `Canvas` often. Feel free to discuss homework assignments with others, but realize that the work you hand in must be your own. Simply copying someone else's work (or any solutions floating around on the web, dark sectors or otherwise) is plagiarism; see "Cheating" below. **Your lowest homework score will be dropped; your highest score will count double.**

Miscellaneous

Ed Discussion. The main mode of electronic communication between students and staff, as well as amongst students, will be through Ed Discussion (`https://edstem.org/`). It is intended for general questions about the course, clarifications about assignments, student questions to each other, discussions about materials, and so on. We strongly encourage students to participate in discussion, ask and answer questions through this site. The course staff will monitor discussions closely.

(a) Do not provide answers to homework problems, or discuss exam problems, etc., until after homework is turned in, or all exam solutions have been posted, etc. Violations of this rule

will result in what I will call a "doubling penalty": the first time, a 1% final grade penalty; the second time, a 2% final grade penalty; etc. The penalties are cumulative, e.g., after the second violation your final grade will be reduced by 3% total, etc.

(b) Be considerate! This is *not* an Internet comment board. Inappropriate content will be removed. Repeated lack of consideration will lead to my implementation of the "doubling penalty," at my discretion.

Cheating. Cheating or plagiarism on homework, or exams is not allowed in this course. Please familiarize yourself with Penn's Code of Academic Integrity:
`https://catalog.upenn.edu/pennbook/code-of-academic-integrity/`.

I do not anticipate any problems with academic integrity. In the unlikely event that any concerns do arise on this score, I will forward all related materials to Penn's Office of Student Conduct, `http://www.upenn.edu/osc/index.html`, for an impartial adjudication. *Note that if a problem happens to be a reused one and you copy from a previously posted solution set, you will receive a grade of zero for the assignment the problem is on.*

Email. All the course materials related questions should go to Ed Discussion. If you have personal issue, you can email me at `ytwei@wharton.upenn.edu` and cc TA Jiuyao Lu at `jiuyaolu@wharton.upenn.edu`. Note, however, that sending email does not shift any responsibility from you to me; you are still responsible for completing your assignments.

On a final note... Many of your syllabi will have verbiage about taking care of yourself. This is especially important in this unusual environment. My take on this is that you have to realize that in the greater scheme of things, your performance in this course is not as important as your physical and mental health. Use your time wisely during the day, and sleep at night. Sleep during the day too, if you need to. Don't take on more courses and more responsibilities than you can reasonably handle. For some of you, this is easier said than done, but do try to scale back if you need to.