STAT 210: INTRODUCTION TO PROBABILITY AND STATISTICS
Winter 2024
MWF 12:00 - 12:50 PM, Harris Hall 107
Dr. Jeffrey T. Lewis (ECON)
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Office Hours: Monday 2:15-3:15, Wednesday 2:15-3:15, Thursday 3:00-4:00, Friday 2:15-3:15/
(or by appointment)

Teaching Assistant	Section Times/Locations
TA Michael Armah	21: Tu, 5:00-5:50, Lunt Hall 107
TA Michael Armah	22: Th, 4:00-4:50, Locy Hall 111
TA Ashley Chang	23: Tu, 5:00-5:50, Locy Hall 301
TA Ashley Chang	24: Th, 4:00-4:50, University Hall 122
TA Jiangli Liu	25: Tu, 5:00-5:50, Lunt Hall 105
TA Jiangli Liu	26: Th, 4:00-4:50, Frances Searle Building 2370

TA Michael Armah (MichaelArmah2027@u.northwestern.edu)
TA Ashley Chang (ashleychang2026@u.northwestern.edu)
TA Jiangli Liu (JiangliLiu2027@u.northwestern.edu)

TA office hours and locations will be posted on Canvas.

LEARNING OUTCOMES
In this class, students will: Increase their knowledge of both descriptive and inferential statistics. Understand and apply probability theory. Construct confidence intervals and conduct hypothesis tests.

COURSE WEBSITE
This course has a website on Canvas. Everyone should automatically be enrolled in the Canvas website upon official enrollment in the class. I will post my lecture notes on the website by 5:00 pm the day before class. You should print out the materials and bring them to class. Problem sets, problem set solutions, and other materials will also be posted on the website. I will post announcements on the website stating what you should print out for class and when assignments are due.

COURSE MATERIALS
The textbook for the course is *Statistics for Business and Economics* (Eighth Edition) by Paul Newbold, William L. Carlson, and Betty M. Thorne. We are using *Statistics for Business and Economics*: *Second Custom Edition for Northwestern University*, which includes just the first 11 chapters from the eighth edition. The ISBN-13 is 978-1-256-86179-9. You will also need a calculator for this class. You can use any type of calculator. Bring your calculator to every class.

SECTIONS
Each week, I will post section problems on Canvas. You will print out the section problems and bring them with you to section. You don't have to solve the problems ahead of time. The TAs will work through the solutions. The section problems will be similar to problems that you will encounter on the problem sets and exams.

CANVAS PROBLEM SETS
Almost every week, I will post at least one problem set on Canvas. You will need to submit numerical answers or answer multiple choice questions on Canvas. Canvas will automatically grade the problem sets. If you miss the deadline for submitting your answers, you will not receive credit for that problem set. For questions about how to complete the Canvas problem sets, read the policy_canvas_psets handout on Canvas (under Policies folder).

OFFICE HOURS
During office hours, you can't check over your problem sets. You can ask us questions about the course material or the section problems.

QUIZZES
We will give quizzes during lecture this term (not during section). The default is that the quizzes will be unannounced. The quizzes are closed-note quizzes (can't use any of your notes or devices). Bring your calculator to every class. Make sure you keep up with the course material.

EVALUATION
Here are the assessments that will be used to determine your final grade:

> Problem Sets/ Quizzes
> Exam #1
> Exam #2
> Final Exam

We will drop your lowest problem set score. We will drop your lowest quiz score. At the end of the term, we will do this calculation:

> [(your PS points + your quiz points)/(total PS points + total quiz points)]×100%

This percentage score will constitute 13% of your final grade.

Your final grade will be determined by whichever calculation is highest (method *a*, *b*, or *c*):

a) 13%×(Problem Sets/Quizzes) + 29%×(Exam #1) + 29%×(Exam #2) + 29%×(Final Exam)
b) 13%×(Problem Sets/Quizzes) + 0%×(Exam #1) + 29%×(Exam #2) + 58%×(Final Exam)
c) 13%×(Problem Sets/Quizzes) + 29%×(Exam #1) + 0%×(Exam #2) + 58%×(Final Exam)

EXAM DATES
Exam #1 will be given in class on Friday, February 2.

Exam #2 will be given in class on Friday, March 1.

The Final Exam will be given on Thursday, March 14 from 3:00 PM – 5:00 PM.

You must take the Final Exam in our classroom on the date and time specified above.

EXCUSED ABSENCES/ MAKEUP POLICIES/ INCOMPLETES

Canvas Problem Sets

There are no makeup Canvas problem sets. If you miss the deadline for submitting your answers (for any reason), you will not receive credit for that problem set.

Quizzes

If you miss a quiz for an excused reason, such as illness, a family emergency, or travel with a University sports team, then you need to fill out the excused absence form on Canvas, staple your documentation (form stating you went to the Student Health Service, for example) to the back of the excused absence form, and hand everything in to me during the next lecture.

In the absence of documentation, an absence will be considered unexcused. If you miss a quiz for an unexcused reason, you will receive a 0 on that assessment. Missing class for a job interview, a

job-related activity, an internship interview, an internship-related activity, any activity related to another class, or a family event would not constitute an excused absence.

We are going to drop your lowest quiz score. If you only miss one quiz and you miss that quiz because of an excused reason, that score will just be dropped. If you only miss two quizzes and you miss both quizzes for excused reasons, your first missing score will be dropped and your second missing score will be replaced with your Final Exam score. If you only miss two quizzes, and you miss one quiz for an excused reason and one quiz for an unexcused reason, your score from your excused absence will be dropped and your score of 0 from your unexcused absence will be counted.

Exam #1 and Exam #2

There are no makeup exams for Exam #1 or Exam #2.

If you miss Exam #1 (for any reason), but do take Exam #2 and the Final Exam, then your final grade will be determined by whichever calculation is highest: method *a*, *b*, or *c*.

If you miss Exam #2 (for any reason), but do take Exam #1 and the Final Exam, then your final grade will be determined by whichever calculation is highest: method *a*, *b*, or *c*.

If you miss both Exam #1 (for any reason) and Exam #2 (for any reason), but do take the Final Exam, then your final grade will be determined by whichever calculation is highest: method *a*, *b*, or *c*. (Please note that if you miss both Exam #1 and Exam #2, then withdrawing from the class might be your best option.)

Final Exam

<u>If you take the Final Exam, or start to take the Final Exam, can you receive an excused absence for that exam?</u>

No. If you take the Final Exam, or start to take the Final Exam, then you cannot receive an excused absence for that assessment. Your exam score will count, and it will be used to determine your final grade in the class. If you feel that you are too unwell to take the exam, do not take the exam. Instead, you should report in person to the Student Health Service or CAPS prior to the time of the exam.

Incompletes

If you take the Final Exam, or start to take the Final Exam, then you cannot receive an excused absence for that assessment. Your exam score will be recorded. You wouldn't qualify for an Incomplete.

If you miss the Final Exam for an excused reason (such as an illness or family emergency), then you would need to email me and then petition for an Incomplete through the Dean's Office.

To qualify for an Incomplete if you do not take the Final Exam:

1) The Dean's Office would have to approve your Incomplete petition.

2) You would have to have taken either Exam #1 or Exam #2. (If you miss both Exam #1 (for any reason) and Exam #2 (for any reason), then you would not qualify for an Incomplete.)

3) It has to be possible for you to receive a final course grade of at least 63% if you take the makeup Final Exam.

If you receive an Incomplete, then you would take the makeup Final Exam during finals week of the next term.

GRADING POLICIES

For questions on how to deal with rounding on problem sets and exams, read the policy_rounding handout on Canvas (under Policies folder). If a grading mistake was made on your exam, you need to give me your exam during the lecture following the lecture in which the exams were initially returned. Final grades will be decided on the following scale:

A	93.0-100		C+	77.0-79.99
A-	90.0-92.99		C	73.0-76.99
B+	87.0-89.99		C-	70.0-72.99
B	83.0-86.99		D	63-69.99
B-	80.0-82.99		F	Below 63

CLASSROOM POLICIES

Do not have your phone out during class. Do not have your computer open during class. Shut down your computer before we start class. Do not put your head down on the desk during class. If you are feeling unwell, you should report in person to the Student Health Service or CAPS.

If, through ANU, you are permitted to use a computer or tablet to take notes during class, have ANU email me that information as soon as possible at the beginning of the term.

If you want to take notes in class on a tablet, that's fine. You can do so.

OPTIONAL MENTORING

Quarter-Long Study Group Opportunity – Registration Required:
If you would like to study with other students in this class, consider joining a Peer-Guided Study Group. Participants will meet weekly with about 5 to 8 other students and a peer facilitator, a student who has already taken and done well in the course. During sessions, students review concepts, work through practice problems, bring their questions, and work together to develop answers. Students register for the full quarter on CAESAR, and attendance is expected weekly. Study Group sessions are listed on CAESAR below course lecture and discussion sections (when searching for study groups, enter "SG" in the Course Number field in CAESAR to get a complete list of sections). Feel free to contact Borislava at *pgsg@northwestern.edu* with any questions.

Drop-In Peer Tutoring – No Appointment Needed:
Students are welcome to stop by Drop-In Peer Tutoring to get support with a specific question or issue, or just talk through course materials with others. Check specific times, courses, and locations on the Drop-In Peer Tutoring website. Feel free to contact Valerie at *valerie.wolf@northwestern.edu* with any questions.

NORTHWESTERN SYLLABUS STATEMENTS

Academic Integrity

Students in this course are required to comply with the policies found in the booklet, "Academic Integrity at Northwestern University: A Basic Guide". All papers submitted for credit in this course must be submitted electronically unless otherwise instructed by the professor. Your written work may be tested for plagiarized content. For details regarding academic integrity at Northwestern or to download the guide, visit: https://www.northwestern.edu/provost/policies-procedures/academic-integrity/index.html

Disability Accommodations

Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic

setting, please contact AccessibleNU to move forward with the university's established accommodation process (e: accessiblenu@northwestern.edu; p: 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

COVID-19 Classroom Expectations Statement

Students, faculty and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the COVID-19 Expectations for Students. With respect to classroom procedures, this includes:

- Policies regarding masking, social distancing and other public health measures evolve as the situation changes. Students are responsible for understanding and complying with current University, state and city requirements.
- In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student in the class even when not generally required on campus. In such cases, the instructor will notify the class.

If a student fails to comply with the COVID-19 Expectations for Students or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.

Exceptions to Class Modality

Class sessions for this course will occur in person. Individual students will not be granted permission to attend remotely except as the result of an Americans with Disabilities Act (ADA) accommodation as determined by AccessibleNU.

Prohibition of Recording of Class Sessions by Students

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact AccessibleNU. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's Copyright Policy, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Support for Wellness and Mental Health

Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Students can access confidential resources through the Counseling and Psychological Services (CAPS), Religious and Spiritual Life (RSL) and the Center for Awareness, Response and Education (CARE). Additional information on all of the resources mentioned above can be found here:

https://www.northwestern.edu/counseling/
https://www.northwestern.edu/religious-life/
https://www.northwestern.edu/care/

Course Details Subject to Change

Please note that the specifics of this course syllabus are subject to change in the case of unforeseen circumstances. Instructors will notify students of any changes as soon as possible. Students will be responsible for abiding by the changes.

TOPICS COVERED

Chapter 1- Describing Data: Graphical
bar graphs, histograms, and scatter plots

Chapter 2- Describing Data: Numerical
mean, median, percentiles, quartiles, IQR, outliers, variance, standard deviation, covariance, correlation

Chapter 3- Probability
probability rules, conditional probability, independence, Bayes' Theorem

Chapter 4- Discrete Random Variables and Probability Distributions
expected value and mean of discrete random variable, linear functions of discrete random variables, binomial distribution, covariance and correlation

Chapter 5- Continuous Random Variables and Probability Distributions
uniform distribution, normal distribution, normal approximation for binomial distribution

Chapter 6- Sampling and Sampling Distributions
central limit theorem, sample mean, sample proportion

Chapter 7- Estimation: Single Population
t distribution, confidence interval for population mean (population variance known and unknown), confidence interval for population proportion

Chapter 8- Estimation: Additional Topics
confidence interval for difference between two population means (population variances known and unknown), confidence interval for difference between two population proportions

Chapter 9- Hypothesis Testing: Single Population
significance test for population mean (population variance known and unknown), significance test for population proportion

Chapter 10- Hypothesis Testing: Additional Topics
significance test for difference between two population means (population variances known and unknown), significance test for difference between two population proportions

Regression
OLS coefficient estimators, R^2, total sum of squares (TSS), explained sum of squares (ESS), sum of squared residuals (SSR)

Randomized Trial
RAND Health Insurance Experiment