STAT 3450: Basic Statistics for Engineers
Autumn 2024

Overview

Instructor: Patrick McHugh
Email: mchugh.118@osu.edu
Office Hours: Mondays 12-12:55pm, Tuesdays 2-2:55pm in Cockins Hall room 217. Also generally available in person immediately after lecture.
Class Time/Location: T/Th 4:10-5:05pm, EA 160 (in person)
Course Website: Canvas (access through https://carmen.osu.edu/)
Teaching Assistants: Wentao Jiang (jiang.3122), Chenze Li (li.13074)

Course Description: STAT 3450 provides an introduction to probability and statistics targeted mainly toward students studying mechanical, welding, and biomedical engineering. Topics covered include probability, random variables, the normal and binomial distributions, confidence intervals for means, hypothesis tests for means, multi-factor experiments, and experiments with blocking.

Goals: Students develop skills in drawing conclusions and critically evaluating results based on data.

Expected Learning Outcomes: This course satisfies the General Education (GE) requirement in Data Analysis.
ELO1: Understand basic concepts of statistics and probability.
ELO2: Comprehend methods needed to analyze and critically evaluate statistical arguments.
ELO3: Recognize the importance of statistical ideas.

STAT 3450 helps students achieve these ELOs by teaching students the basic concepts and techniques of statistics, including populations and samples, probability, expectations and variances, the binomial and Normal distribution, the Central Limit Theorem, confidence intervals and hypothesis testing, type I and II errors, power, factorial experiments, numerical summaries, and graphical summaries of data.

Course Prerequisites: Calculus, integration, exponential function, finite and infinite sums, union and intersection of sets. Prerequisite courses are Math 1152 (153), 1161.xx, 1172 (254), or 1181.

Textbook: Principles of Statistics for Engineers and Scientists, 2nd Edition, by William Navidi Available digitally via McGraw Hill Connect.

Additional Appointments and Help: I am available by appointment for 1-on-1 meetings to discuss things like overall grade/course concerns or questions, personal issues affecting your academics, etc. Unfortunately, due to time and schedule constraints, I am not able to hold additional office hours by appointment beyond the times listed above to assist you with course content/homework assignments. The MSLC tutor room (described below) is a great resource available for additional help.

MSLC Tutor Room: In addition to my regularly scheduled office hours, help is available from the Mathematics and Statistics Learning Center (MSLC) five days a week. Help from the MSLC is available in person in Cockins Hall room 122, and on Zoom. I will also refer to the MSLC as the "tutor room"

throughout the semester. During the posted MSLC hours, there will always be a statistics graduate student there who is available to help you with the course content as needed. You are also welcome to go to the MSLC and work quietly alone and ask questions you have to the tutor as you think of them. It's a great place to go get some help and some work done!

MSLC Schedule: https://mslc.osu.edu/tutoring/statistics-shared-office-hours (link will be updated with the new schedule shortly after the start of the semester)

Zoom Link: Coming soon, will be posted on "Syllabus" page on Carmen

Communication

Communication Method
All class announcements, date changes, and other important updates will be announced on the Announcements page of the Carmen course module.

Students are strongly recommended to enable both push and email notifications for course announcements. This can be done at https://osu.instructure.com/profile/communication

Contacting Me
I am available to students any time via email at mchugh.118@osu.edu or by Carmen message. A response can generally be expected within 24 hours on business days.

Lectures

Lecture Format
This is an in-person class, and lectures are delivered in person on the scheduled days at the scheduled times. If you miss class or still have questions, you are more than welcome to get help from me in office hours, immediately after future classes, or via email, or visit the MSLC.

Lecture Recordings / Annotated Notes
A blank copy of each day's notes is generally posted to Carmen before each lecture. A completed copy of the notes that includes everything I've written is generally posted to Carmen at some point after each lecture. Additionally, lectures for this course are generally recorded live via Zoom, and then recordings are posted to Carmen. The recordings and annotated notes are posted to help you if you would like to rewatch something to better understand, if you have to miss class due to an emergency, etc.

However, this course is fully in person. Recorded lectures and annotated notes are often posted as a courtesy but are not an entitlement. I reserve the right to stop posting recorded lectures and/or annotated notes at any time during the semester. Additionally, watching the recorded lectures or downloading the annotated notes is not intended to be a substitute for coming to class. I very strongly recommend that you plan to come to every lecture. I occasionally do not post recordings or notes due to technological mistakes on my part or for other reasons, in which case you can come to my office hours if you want to catch up on course content or for additional help.

Assignments

Homework Assignments
There will be weekly homework assignments through McGraw-Hill Connect, generally due on Mondays at 11:59PM. Periodically, there will be hand-written homework where students will be expected to show their work and upload a pdf file to Carmen. The lowest three homework scores will be dropped. If you do not turn in a homework, it will count as a 0. Three attempts will be given on each homework problem.

For homework assignments, quizzes, and exams, students are expected to adhere to the University's policies on academic integrity. For homework assignments specifically, students are permitted to use most resources available to them, including the class notes, textbook, other general statistics sources on the internet, and working in groups where everyone contributes and does their own work.

Students are not permitted to use websites or other sources containing exact solutions to this class or textbook's specific homework problems, copy another student's answers without contributing, or use AI-powered large language models (LLMs) such as ChatGPT, Gemini, Copilot, etc. to solve problems.

Quizzes
There will be weekly quizzes due on Wednesdays at 11:59PM through McGraw-Hill Connect. Quizzes have a 90-minute time limit. The lowest two quiz scores will be dropped. If you do not turn in a quiz, it will count as a 0. **One attempt** will be given on quizzes. **Please note – on MHC quizzes, some students have reported not being able to return to a question once they've moved past it, even if they did not submit an answer, so be careful.**

Quizzes are open-note and open-book, and students are permitted to use the class notes, textbook, homework solutions, and other general statistics sources on the internet.

Students must complete quizzes entirely on their own. Like homework assignments, on quizzes students are not permitted to use websites or other sources containing exact solutions to this class's specific quiz problems or use AI-powered large language models (LLMs) to solve problems.

Late Assignments
For homework assignments and quizzes, the Carmen countdown clock system will be used. The countdown clock deducts 5% from the assignment grade every hour past the deadline.

Missed Assignments/Extensions
The course policy on missing assignments and extensions is detailed in the "Missed Assignments Policy" document posted on Carmen. Please refer to that document for details on how missed assignments are handled in this class.

Exams
Exams will be administered in person at our regular class time and location. Two midterm exams will be given: the first is on Thursday, September 26 and the second is on Thursday, November 7. The final exam is scheduled for Wednesday, December 11 from 4:00-5:45pm, in our regular class location.

Important things to know about exams:
- The final exam will be cumulative, with an emphasis on those topics covered after the second midterm.

- At a minimum, a basic calculator will be necessary for all exams.

Grading
Your final grade will be based on the following weighting structure:

Component	Percentage
Homework	10%
Quizzes	10%
Exam 1	25%
Exam 2	25%
Final Exam	30%

Grade Disputes
Grade disputes are welcome and will be handled on a case-by-case basis. To be considered for credit, any dispute must be submitted to me in writing via email or Carmen message within **one week** of the first date of return to the class of the graded assignment/quiz/exam. A dispute must contain:
- An image (or images) of the assignment/quiz/exam problem(s) being disputed
- A written explanation of what each mistake you made was
- A written explanation of why you believe you deserve more points than you received

Final Grades
Final course grades will be assigned based on the standard grading scale:
A: 93-100; A-: 90-92; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 73-76; C-: 70-72; D: 60-69; F: below 60

This grading scale is subject to adjustment if it appears necessary due to overall class performance. These adjustments will only raise a student's grade, not lower it.

Resources

Academic Misconduct
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Special Accommodations
The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish

reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

Sexual Misconduct/Relationship Violence Statement
Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity Statement
The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Mental Health
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Religious Accommodations
It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Schedule

Tentative Course Schedule

Date	Sections of Book	Topic
Aug 20	1.1-1.3	Sampling, numerical and graphical summaries
Aug 22	3.1	Probability rules, equally likely outcomes
Aug 27	3.2	Conditional probability, independence
Aug 29	3.3	Discrete random variables, probability mass functions
Sep 3	3.3	Expected values, variances
Sep 5	3.3	Continuous random variables, density and distribution functions
Sep 10	3.3	Means and variances of continuous RVs
Sep 12	4.1	Binomial distribution
Sep 17	4.1	Binomial distribution
Sep 19	4.3	Normal distribution
Sep 24	4.3, 4.7	Linear combinations of normal RVs, normal probability plots
Sep 26		**EXAM 1**
Oct 1	4.8	Central Limit Theorem
Oct 3	5.1-5.2	Confidence interval for mean (known variance)
Oct 8	5.2	Sample size calculation
Oct 10		FALL BREAK (NO CLASS)
Oct 15	5.4	t-intervals for mean (unknown variance)
Oct 17	6.1	Hypothesis tests for population mean
Oct 22	6.1	Hypothesis tests for population mean
Oct 24	6.2, 6.6	Significance levels, p-values
Oct 29	6.4	t-tests
Oct 31	6.7	Power
Nov 5	7.1, 7.3	Two sample t-tests
Nov 7		**EXAM 2**
Nov 12	9.1	One-factor experiments, randomization, F-tests
Nov 14	9.1	ANOVA
Nov 19	9.2	Pairwise comparisons
Nov 21	9.3	Two-factor experiments, balanced vs. unbalanced
Nov 26	9.4	Randomized complete block designs
Nov 28		THANKSGIVING BREAK (NO CLASS)
Dec 3	9.4	Randomized complete block designs
Dec 11		**FINAL EXAM (4:00-5:45pm, usual class location)**

Disclaimer

I reserve the right to change items on this syllabus – any changes as well as official due
dates and exam dates will be announced in Carmen!