

STAT 3450: Basic Statistics for Engineers

Spring 2024

Overview

Instructor: Patrick McHugh

Email: mchugh.118@osu.edu

Office Hours: 11:15am-12:15pm on Tuesdays, 1-2pm on Fridays 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: Jiwon Hong (hong.1069), Yeming Lin (lin.4466)

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.

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 spring 2024 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.

Assignments

Homework Assignments

There will be weekly homework assignments due on Mondays at 11:59PM through McGraw-Hill Connect. 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 miss a homework, it will count as one of your three dropped scores. Three attempts will be given on each homework problem.

For homework assignments, 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) 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 miss a quiz, it will count as one of your dropped scores. **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.

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 tentative plan is to adopt the Carmen countdown clock system, which 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, February 15 and the second is on Tuesday, April 2. The final exam is scheduled for Monday, April 29 from 6:00-7:45pm, 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 return of the graded assignment/quiz/exam.

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
Jan 9	1.1-1.3	Sampling, numerical and graphical summaries
Jan 11	3.1	Probability rules, equally likely outcomes
Jan 16	3.2	Conditional probability, independence
Jan 18	3.3	Discrete random variables, probability mass functions
Jan 23	3.3	Expected values, variances
Jan 25	3.3	Continuous random variables, density and distribution functions
Jan 30	3.3	Means and variances of continuous RVs
Feb 1	4.1	Binomial distribution
Feb 6	4.1	Binomial distribution
Feb 8	4.3	Normal distribution

Feb 13	4.3, 4.7	Linear combinations of normal RVs, normal probability plots
Feb 15		EXAM 1
Feb 20	4.8	Central Limit Theorem
Feb 22	5.1-5.2	Confidence interval for mean (known variance)
Feb 27	5.2	Sample size calculation
Feb 29	5.4	t-intervals for mean (unknown variance)
Mar 5	6.1	Hypothesis tests for population mean
Mar 7	6.1	Hypothesis tests for population mean
Mar 12		SPRING BREAK (NO CLASS)
Mar 14		SPRING BREAK (NO CLASS)
Mar 19	6.2, 6.6	Significance levels, p-values
Mar 21	6.4	t-tests
Mar 26	6.7	Power
Mar 28	7.1, 7.3	Two sample t-tests
Apr 2		EXAM 2
Apr 4	9.1	One-factor experiments, randomization, F-tests
Apr 9	9.1	ANOVA
Apr 11	9.2	Pairwise comparisons
Apr 16	9.3	Two-factor experiments, balanced vs. unbalanced
Apr 18	9.4	Randomized complete block designs
Apr 29		FINAL EXAM (6:00-7:45pm)

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!