# STAT 3470: Introduction to Probability and Statistics for Engineers
# Spring 2025

**Instructor:** Michelle Duda
**E- Mail:** duda.35@osu.edu **(NOT @buckeyemail.edu)**
**Office Hours:** Tuesdays and Thursdays 1:00 to 2:00 PM via Carmen Zoom
**Class Time/Location:** Virtual – Asynchronous
**Course Website:** Canvas (access through https://carmen.osu.edu/)

**Course Description:** This 3 credit hour course is an introduction to probability and statistics for engineers. Topics covered include probability, Bayes Theorem, discrete and continuous random variables, probability distributions, expected values, sampling distributions, point estimation, confidence intervals, hypothesis testing, and least squares regression models.

**Expected Learning Outcomes:**

This course satisfies the General Education foundation requirement in *Mathematical and Quantitative Reasoning or Data Analysis* which has the following goals and expected learning outcomes:

**Goals:** Successful students will be able to apply quantitative or logical reasoning and/or mathematical/ statistical methods to understand and solve problems and will be able to communicate their results.

**Expected Learning Outcomes (ELOs):** Successful students are able to:

1.1 Use logical, mathematical and/or statistical concepts and methods to represent real-world situations.
1.2 Use diverse logical, mathematical and/or statistical approaches, technologies and tools to communicate about data symbolically, visually, numerically and verbally.
1.3 Draw appropriate inferences from data based on quantitative analysis and/or logical reasoning.
1.4 Make and evaluate important assumptions in estimation, modeling, logical argumentation and/or data analysis.
1.5 Evaluate social and ethical implications in mathematical and quantitative reasoning.

This course also satisfies the Legacy General Education requirement in *Data Analysis*. which has the following goals and expected learning outcomes:

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

**Expected Learning Outcomes:**

1. Students understand basic concepts of statistics and probability.
2. Students comprehend methods needed to analyze and critically evaluate statistical arguments.
3. Students recognize the importance of statistical ideas.

**Course Prerequisites:** Math 1152, 1161.xx, 1172, 1181H, or equiv, or permission of instructor. Not open to students with credit for 3440, 3450, 3450.01, 3450.02, 3460, 3470, or 3470.01.

**Textbook and WebAssign:** The required textbook for this course is *Probability and Statistics for Engineering and the Sciences,* (9th edition) by Jay L. Devore, and will be provided through CarmenBooks. This course will utilize the WebAssign resources associated with the textbook for homework assignments. A link to the host website for WebAssign is accessible from the course website in Carmen.

### Homework Assignments

Homework will be administered via WebAssign, with assignments due every week. Each homework will cover one major topic area. Homework due dates will be on Mondays except when we need to work around a holiday or exam. It is the students' responsibility to check Carmen and WebAssign regularly and be aware of deadlines.  The lowest two homework assignments will be dropped, so there are no late assignments.

Homeworks will be automatically graded based on final solutions, but I highly recommend writing out full solutions to the problems as if you were submitting a written homework assignment to ensure a complete understanding of the material. Three attempts are allowed for each problem without penalty, with a 10% penalty for each additional attempt, to encourage carefully solving problems and asking for help when necessary rather than attempting to solve problems by brute force.

### Exams

There will be 3 **in person** exams for this course. You are permitted one page (two-sided, 8.5"x11") of **hand-written** notes during the first two exams, and two such pages on the final exam.  Two midterm exams will be given: the first is on **Wednesday, February 12 (6:00 – 8:00 PM in HH0180)** and the second is on **Wednesday, April 2 (6:00 – 8:00 in HH0180)**. The final exam will occur during finals week **(Time and location TBD).**

The coverage of the exams will be as follows: the first exam will cover probability; the second exam will focus on estimation and hypothesis testing, but will be cumulative since this material relies heavily on probability; the final exam will be comprehensive with an emphasis on regression.

At a minimum, a basic calculator will be necessary for all exams. A TI 83/84/Nspire is preferred and will be discussed throughout the course.

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

| Component | Percentage |
|-----------|------------|
| Homework | 25% |
| Exam 1 | 25% |
| Exam 2 | 25% |
| Final Exam | 25% |

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 (a curve) if it appears necessary due to overall class performance. These adjustments will only raise a student's grade, not lower it.

**Tutor Room and Help Hours**
The Mathematics and Statistics Learning Center (MSLC) will be offering both in person and online tutoring via Zoom.  More details will be shared on Carmen once available.

**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; **slds.osu.edu**; 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 **614292-5766**. 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 1-800-273TALK 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.

Tentative Course Schedule:

| Week | Topic | Textbook Reading |
|------|-------|------------------|
| 1 | Sample spaces and events, axioms and properties of probability, counting techniques, conditional probability | 1.1-1.4, 2.1-2.4 |
| 2 | Bayes' theorem and independence, discrete random variables, probability distributions, expectation and variance of (functions of) random variables | 2.5, 3.1-3.3 |
| 3 | Binomial, Poisson probability distributions | 3.4, 3.6 |
| 4 | Continuous random variables, density and distribution functions, percentiles and expected values, the Normal distribution | 4.1-4.3 |
| 5 | Exponential, Gamma distributions, joint probability distributions, conditional distributions, conditional expectation, covariance and correlation | 4.4, 5.1-5.2 |
| 6 | Sampling distribution of a statistic, distribution of the sample mean and central limit theorem | 5.3-5.5 |
| 7 | Populations and parameters, samples and statistics, concepts of estimation and inference <br> **Exam 1: Wednesday, February 12 (6:00 – 8:00 PM in HH0180)** | 6.1 |
| 8 | Point estimation, including method of moments and maximum likelihood | 6.2 |
| 9 | Confidence intervals, large sample intervals for means and proportions | 7.1-7.2 |
| 10 | Confidence intervals for means of normal populations, hypotheses and testing procedures | 7.3, 8.1 |
| 11 | Hypothesis testing, tests for population means and proportions | 8.2-8.4 |
| 12 | Simple linear regression <br> **Exam 2: Wednesday, April 2 (6:00 – 8:00 PM in HH0180)** | 12.1-12.2 |
| 13 | Simple linear regression, estimation and inference | 12.3-12.4 |
| 14 | Simple linear regression, model checking, transformations | 13.1-13.2 |
| 15 | Multiple regression, goodness of fit tests <br> **Final Exam (Time and Location TBD)** | 13.4, 14.1 |

**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!**