# STAT 3450: Basic Statistics for Engineers
## Spring 2022

**Instructor:** Michelle Duda
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**Office Hours:** Tuesdays and Thursdays 2:00 to 3:00 PM via Carmen Zoom
**Class Time/Location:** Virtual – Asynchronous
**Course Website:** Canvas (access through https://carmen.osu.edu/)

**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.

**Homework Assignments**
There will be weekly homework assignments due on Fridays 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 two homeworks will be dropped. Thus, there are no extensions for homework. If you miss a homework, it will count as one of your dropped scores.

**Quizzes**
There will be weekly quizzes due on Mondays at 11:59PM through McGraw-Hill Connect. The lowest three quizzes will be dropped. Thus, there are no extensions for quizzes. If you miss a quiz, it will count as one of your dropped scores.

**Exams**
Due to the uncertainty of the Covid – 19 pandemic, all exams will be completed remotely. Two midterm exams will be given: the first is on **Thursday, February 17** and the second is on **Thursday, March 31**. The final exam is scheduled for **Monday, May 2.**

Important things to know about exams:

- Both midterms and final exam will be comprised of a timed portion through Carmen, and a short answer portion where students will show their work and upload a pdf file to Carmen within a 24 hour window.
- 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. A TI 83/84/Nspire is preferred and will discussed throughout the course.

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

| Component | Percentage |
|---|---|
| **Homework** | 13% |
| **Quizzes** | 12% |
| **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 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 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 **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**.

**Tentative Course Schedule**

| Date | Section(s) of Book | Topic |
|---|---|---|
| **Jan 11** | 1.1-1.3 | Sampling, numerical, and graphical summaries |
| **Jan 13** | 3.1 | Probability rules, equally likely outcomes |
| **Jan 18** | 3.2 | Conditional probability, independence |
| **Jan 20** | 3.3 | Discrete RVs, probability mass functions |
| **Jan 25** | 3.3 | Expected values, variances |
| **Jan 27** | 3.3 | Continuous RVs, density and distribution functions |
| **Feb 1** | 3.3 | Means and variances of continuous RVs |
| **Feb 3** | 4.1 | Binomial distribution |
| **Feb 8** | 4.1 | Binomial distribution |
| **Feb 10** | 4.3 | Normal distribution |
| **Feb 15** | 4.3, 4.7 | Linear comb. of normal RVs, normal probability plots |
| **Feb 17** | **EXAM I** | **EXAM I** |
| **Feb 22** | 4.8 | Central Limit Theorem |
| **Feb 24** | 5.1-5.2 | CI for mean (known variance) |
| **Mar 1** | 5.2 | Sample size calculation |
| **Mar 3** | 5.4 | t-intervals for mean (unknown variance) |
| **Mar 8** | 6.1 | Hypothesis tests for population means |
| **Mar 10** | 6.1 | Hypothesis tests for population means |
| **Mar 14-18** | | **SPRING BREAK – NO CLASSES** |
| **Mar 22** | 6.2, 6.6 | Significance levels, p-values |
| **Mar 24** | 6.4 | t-tests |
| **Mar 29** | 6.7 | Power |
| **Mar 31** | **EXAM II** | **EXAM II** |
| **Apr 5** | 7.1, 7.3 | Two sample t-tests |
| **Apr 7** | 9.1 | One factor experiments, randomization, F-tests |
| **Apr 12** | 9.1 | ANOVA |
| **Apr 14** | 9.2 | Pairwise comparisons |
| **Apr 19** | 9.3 | Two factor experiments, balanced vs. unbalanced |
| **Apr 21** | 9.4 | Randomized complete block designs |
| **May 2** | **FINAL** | **FINAL** |

**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!**