

# STAT 3450: Basic Statistics for Engineers

## Spring 2020

**Instructor:** Michelle Duda

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**Office Hours:** Tuesdays 2:00-4:00 PM in Cockins Hall (CH) 212B

**Class Time/Location:** T/R 4:10-5:05 PM in Scott Lab – Room E040

**Course Website:** Canvas (access through <https://carmen.osu.edu/>)

**Course Description:** STAT 3450 provides an introduction to probability and statistics targeted toward students studying mechanical and welding 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:** Students understand basic concepts of statistics and probability, comprehend methods needed to analyze and critically evaluate statistical arguments, and 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 and power, experiments and 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, 1<sup>st</sup> Edition*, by William Navidi

- The book is available on reserve in the 18th Avenue Library.

### Homework Assignments

There will be approximately 11 homework assignments throughout the semester. Assignments along with due dates will be announced in class and posted on Carmen.

Important things to know about homework:

- You are encouraged to discuss problems with each other in general terms, but you must write your own homework solutions.
- Homework must be submitted in hardcopy (NO e-mailed copies).
- You must show your work for all homework problems; do NOT just write the final answer.
- Since solutions will be posted on Carmen shortly after the deadline, **late submissions will NOT be accepted.** I understand that illness and other unplanned emergencies often come up during the semester, and so I will drop your lowest homework score. Homework is due by the **beginning of lecture** on the due date.
- I will select a subset of assigned problems to grade and check the others to make sure you attempted a solution. Solutions to all problems will be posted on Carmen, so it is your responsibility to check the answer key and make sure you understand the correct solution to all problems.

## Exams

Two midterm exams will be given in class: the first is on **Thursday, February 13** and the second is on **Thursday, March 26**. The final exam is scheduled for **Monday, April 27** from 6:00 - 7:45 PM.

Important things to know about exams:

- For each midterm, you may bring one 8.5" x 11" sheet of paper (both sides) with whatever handwritten facts, formulas or explanations you find helpful; for the final exam, you may bring two 8.5" x 11" sheets of paper.
- The final exam will be cumulative, with a slight emphasis on those topics covered after the second midterm.
- A basic calculator will be necessary for all exams (no cell phone calculators or PDAs).
- Cellphones must be silenced during class and are not allowed to be on the desk or otherwise accessible during exams.
- **No make-up exams will be given unless extenuating circumstances exist.**

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

Component	Percentage
Homework	20%
Exam 1	25%
Exam 2	25%
Final Exam	30%

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

Our TAs hold office hours every day of the week in the Mathematics and Statistics Learning Center in Cockins Hall 122 starting on Tuesday, January 14. The hours during which Stat TAs will be available is posted at <http://mslc.osu.edu/courses/stat/3450>.

## 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**

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, [slds@osu.edu](mailto:slds@osu.edu); [slds.osu.edu](http://slds.osu.edu).

### **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, Kellie Brennan, at [titleix@osu.edu](mailto: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](http://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](http://suicidepreventionlifeline.org).

## Tentative Course Schedule

Date	Section(s) of Book	Topic
Jan 7	1.1-1.3	Sampling, numerical, and graphical summaries
Jan 9	3.1	Probability rules, equally likely outcomes
Jan 14	3.2	Conditional probability, independence
Jan 16	3.3	Discrete RVs, probability mass functions
Jan 21	3.3	Expected values, variances
Jan 23	3.3	Continuous RVs, density and distribution functions
Jan 28	3.3	Means and variances of continuous RVs
Jan 30	3.4	Random sample, sample mean, propagation of error
Feb 4	4.1	Binomial distribution
Feb 6	4.3	Normal distribution
Feb 11	4.3, 4.7	Linear comb. of normal RVs, normal probability plots
Feb 13	<b>EXAM 1</b>	<b>In class</b>
Feb 18	4.8	Central Limit Theorem
Feb 20	5.1-5.2	CI for mean (known variance)
Feb 25	5.2	Sample size calculation
Feb 27	5.4	t-intervals for mean (unknown variance)
Mar 3	6.1	Hypothesis tests for population means
Mar 5	6.1	Hypothesis tests for population means
	<b>NO CLASS</b>	<b>Spring Break (March 9-13)</b>
Mar 17	6.2, 6.6	Significance levels, p-values
Mar 19	6.4	t-tests
Mar 24	6.7	Power
Mar 26	<b>EXAM 2</b>	<b>In class</b>
Mar 31	7.1, 7.3	Two sample t-tests
Apr 2	9.1	Experiments, randomization, F-tests, ANOVA
Apr 7	9.3	Two factor experiments, balanced vs. unbalanced
Apr 9	9.4	Blocking
Apr 14	9.5	2 <sup>p</sup> factorial experiments
Apr 16	Notes	Fractional factorial designs
Apr 27	<b>FINAL</b>	<b>6:00 PM - 7:45 PM</b>

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 class!