

Statistics 3460
Principles of Statistics for Engineers
Autumn 2019 (Section 23521) Syllabus

Class Schedule: MWF: 8:00 - 8:55am Journalism Building (JR) room 0270

Instructor: Dr. Judit Bach **Office:** Cockins Hall (CH) 212C
E-mail: bach.20@osu.edu **Phone:** (614) 292-7164 (primary communication is e-mail !)
Office Hours: MWF: 11:30 am – 12:30 pm and by appointment

Course Description:

The course provides an introduction to probability and statistics targeted toward students studying biomedical engineering. Topics covered include probability, random variables, the normal and binomial distributions, confidence intervals for means, hypothesis tests for means, multi-factor experiments, experiments with blocking, and regression. A more detailed list of topics can be found on the sample schedule below. **Students are responsible for all material covered in class, in the assigned readings and in homework problems.**

College of Arts and Sciences GEC Statement:

Statistics 3460 satisfies the General Education (GE) requirement in Data Analysis.

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.

Methods: The focus of this course includes understanding of theoretical concepts, as well as problem solving applications of probability models and statistical inference. Examples include sampling, computing confidence intervals, hypothesis testing, statistical modeling using regression, ANOVA, and factorial designs.

Assumed Background Knowledge and Prerequisites:

Calculus, differentiation as well as integration, exponential function, finite and infinite sums, basic set operations. Prerequisite courses are Math 1152 (153), 1161.xx, 1172 (254), or 1181H or equivalent.

Format of Instruction: Lecture, 3 contact hours per week.

Topics: We will be covering all or parts of chapters 1, 3, 4, 5, 6, 7, 8, 9.

Textbook:

Principles of Statistics for Engineers and Scientists by William Navidi 1st ed. ISBN 978-0-07-337634-9 MHID 0-07-337634-5. The book is available on reserve in the Science and Engineering Library as well as at the Mathematics & Statistics Learning Center (MSLC).

Website: Canvas at <http://www.carmen.osu.edu/>. Check periodically for announcements about the class and other class material.

Homework:

There are tentatively scheduled 8 graded homework assignments throughout the semester. You must show your work for all homework problems; do not just write the final answer. Policy regarding homework assignments is: **late homework will not be accepted** (no excuses). I understand that illness and other unplanned emergencies may pop up during the semester, and so I will drop your **three lowest** homework scores. I highly recommend that you save these “freebies” until you really need to use them! More details on homework assignments including **required format** are posted in the Homework module on Carmen. Homework must be submitted in hardcopy (**not** e-mailed).

Exams:

The two exams during the semester and the final exam are all **closed book exams** with about 4-7 essay questions (6-12 for the final exam) **similar** in style and difficulty level to the suggested and turn-in homework problems and to the lecture examples. For each exam, you will be permitted one sheet of 8.5” x 11” **handwritten paper with formulas** you find helpful. (both sides of the paper may be used). The final exam is on Monday, December 9 from 8:00-9:45am. For the final exam, two sheets of 8.5" x 11" paper (same rules as above) may be made. The final exam will be cumulative, with a slight emphasis on those topics covered after the second midterm. **A calculator should also be brought to all exams** (no cell phone calculators or PDAs). Full credit for each exam problem can only be earned through showing your justification for or work on each problem. Answers without work will **not** receive full credit.

Expectations:

You will be assessed on your learning of ideas, concepts, and achievement of skills presented during lecture, on the course website, and in assigned readings. You should expect that **some** ideas, concepts or skills in assigned reading may **not** be reiterated in the lecture.

Attendance:

We use **TopHat** for attendance. It is required to bring a **portable device** (e.g. tablet, cell phone, laptop, or clicker) to the classes to access the TopHat classroom participation system. TopHat home page: <https://tophat.com/> login page: <https://app.tophat.com/login> or signup for an account page: <https://app.tophat.com/register/>. **Important: your TopHat account should include your name exactly as it is listed on Carmen.** TopHat is free for students at The Ohio State University. Detailed information can be found at <https://resourcecenter.odee.osu.edu/top-hat/using-top-hat-students>. It is **your responsibility to get any and all material covered from a classmate if you miss class.**

Join Code for our class (within TopHat): **811347**.

Grading:

The final course grade will be based on:

Homework (best 5 out of 8, 3.6% each)	18%
Attendance2%
Exam 1 (Monday, September 30)25%
Exam 2 (Friday, November 15)	25%
Final Exam (Monday, December 9)30%
	<hr/>
	100%

Percentage Grading Scale:

93% A 90% A- 87% B+ 83% B 80% B- 77% C+ 73% C 70% C- 67% D+ 60% D

E-mail Correspondence:

In order to protect your privacy, **all course e-mail correspondence must be made from a valid OSU name.# account and must have a subject field starting with the phrase "Stat 3460 8:00 am"**. If you have not activated your OSU email account, you can activate your account at <https://my.osu.edu/>.

Study Rooms and Help Hours - MSLC (Mathematics and Statistics Learning Center):

Our TAs hold office hours in the Mathematics and Statistics Learning Center in Cockins Hall room 122 starting the second week of classes. More details are on the MSLC webpage at <http://mslc.osu.edu>

Communication Devices:

Other than the above listed TopHat activities, please otherwise refrain from using portable devices during class as a courtesy to those sitting around you. **All electronic devices other than a calculator must be shut off and put away during examinations.**

Drop Date:

The last day to drop the course without a 'W' appearing on your record is Friday, September 13, 2019. The last day to drop the course without petitioning is Friday, November 15, 2019

Advice:

1. A **tentative** lecture schedule is given in this syllabus. Give a first reading to scheduled text sections **before** the lecture that covers that material. **Announcements made in class or on Carmen supersede information in this syllabus. It is your responsibility to be up to date about the announcements.**
2. The course moves rather quickly. If you are having difficulty, please **get help** as soon as possible. Homework assignments can be difficult if you wait until the last minute before trying any problems.
3. It is important that you provide sufficient details in writing up solutions to the problems for grading. It is also important that your solutions be **presented in a clear, easy to read** format. No credit will be given for work that is too sloppy or difficult to read.
4. The material becomes more complex as it moves along. **Keep working along** as the semester progresses.
5. Having the opportunity to use formula sheets on the exams also means that you are not given formulas and it is **your responsibility** to create your formula sheet and gather the necessary formulas you may need on an exam. Collecting important formulas along the way as we learn them is a good organized way to prepare your formulas sheet.
6. If you have a re-grade request on an exam, the request needs to be **written** on a sheet of paper attached to your original paper, within one week of the date the paper was first returned to class. If you are absent the day a graded paper is first returned to the class, it is your responsibility to come to me to get it in less than a week if you want to have a re-grade option available to you.

Academic Misconduct:

Please, help maintain an academic environment of mutual respect and fair treatment. You are expected to produce original and independent work on the exams. Although students are often encouraged to work together on homework assignments, all students must submit their own work in their own words.

Academic Misconduct Statement:

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/>.

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.

Addressing Issues of Differing Abilities:

The University strives to make all learning experiences as accessible as possible. 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.

Mental Health Statement:

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](tel: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](tel: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.

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.

Note: This syllabus and the calendar listed below **ARE SUBJECT TO CHANGE**.

Tentative Class Schedule and Reading assignments

	Date	Topic	Section
1	W-Aug 21	Sampling, Summary measures, Graphical Plots	1.1-1.3
2	F-Aug 23	Probability Rules, Equally likely outcomes	3.1
3	M-Aug 26	Conditional Probability, independence	3.2
4	W-Aug 28	Discrete Random Variables, pmf, cmf	3.3
5	F-Aug 30	Expected Values & variances	3.3
	M-Sep 2	No class — Labor Day	
6	W-Sep 4	Continuous RVs, density & distribution functions	3.3 Hw 1 due (1.1-3, 3.1-2)
7	F-Sep 6	Means and variances of continuous RVs	3.3
8	M-Sep 9	Functions of RVs, Linear combinations	3.4
9	W-Sep 11	Random sample, sample mean, propagation of error	3.4
10	F-Sep 13	Binomial distribution	4.1
11	M-Sep 16	Normal (Gaussian) distribution	4.3 Hw 2 due (3.3-4)
12	W-Sep 18	Lin Comb of normal RVs; normal prob plots	4.3, 4.7
13	F-Sep 20	Central Limit Theorem; Normal approx to binomial	4.8
14	M-Sep 23	Confidence int. for the mean, sample size calc	5.1-5.2
15	W-Sep 25	More Examples on CIs, Normal Approximation to Binomial	4.8, 5.1-5.2
16	F-Sep 27	Large sample CIs for props	5.3 Hw 3 due (Ch 4)
17	M-Sep 30	EXAM 1	Ch. 1-4
18	W-Oct 2	t intervals for means of normal pop	5.4
19	F-Oct 4	Prediction intervals, tolerance intervals	5.5
20	M-Oct 7	Hypothesis tests for pop means; large sample	6.1
21	W-Oct 9	Significance levels; p-values	6.2, 6.6 Hw 4 due (Ch 5)
	F-Oct 11	No class — Autumn Break	
22	M-Oct 14	t-tests	6.4
23	W-Oct 16	Power	6.7
24	F-Oct 18	Two-sample t-tests and confidence intervals	7.3
25	M-Oct 21	Paired t-tests and confidence intervals	7.4 Hw 5 due (Ch 6)
26	W-Oct 23	Practice: paired vs. two-sample	7.3-7.4
27	F-Oct 25	Scatter plots; Basics of Simple Linear Regression	2.1-2.3
28	M-Oct 28	Inference about slope and intercept	8.1
29	W-Oct 30	Inference for E[Y]; prediction intervals	8.1 Hw 6 due (Ch 7, Ch 2)
30	F-Nov 1	Computer output; Assumption checking; Transformations	8.2
31	M-Nov 4	Multiple Regression; Computer output; Assumptions	8.3
32	W-Nov 6	Model selection; Forward, stepwise, subset selection	8.4
33	F-Nov 8	Experiments; Randomization, F-test; ANOVA	9.1
	M-Nov 11	No class — Veteran's Day	
34	W-Nov 13	Experiments; Randomization, F-test; ANOVA	9.1 Hw 7 due (Ch 8)
35	F-Nov 15	EXAM 2	Ch. 5-8
36	M-Nov 18	Two factor experiment; Balanced vs. Unbalanced	9.3
37	W-Nov 20	Two factor experiment; Balanced vs. Unbalanced	9.3
38	F-Nov 22	Blocking	9.4
39	M-Nov 25	2 ^P Factorial Design	9.5
	W-Nov 27	No class — Thanksgiving break	
	F-Nov 29	No class — Thanksgiving break	
40	M-Dec 2	Fractional Factorial Design	handouts
41	W-Dec 4	Designs for response surfaces, Review	handouts Hw 8 due (Ch 9)
	M-Dec 9	Monday 8:00-9:45am FINAL EXAM	Cumulative