

Statistics 3460
Principles of Statistics in Engineering
Autumn 2018 (Section 12599) Syllabus

Class Schedule: MWF: 8:00 - 8:55am Page Hall (PA) room 010

Instructor: Dr. Judit Bach **Office:** Cockins Hall (CH) 212C

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Office Hours: MWF: 11:30 am – 12:15 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.**

Assumed Background Knowledge and 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.

Enrollment:

ADD and SECTION CHANGES will be processed (if space is available) starting at 7:30 AM on Monday, August 27th on a first-come, first-served basis in room 332 Cockins Hall. The instructor does not sign any add or section change forms; these must be taken to Jean Scott in 332 Cockins Hall for a signature.

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).

Format of Instruction:

Lecture, 3 contact hours per week.

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.

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 on Carmen.

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 10 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. Please, go to the **TopHat** Home page (<https://tophat.com/>) and either **login** (<https://app.tophat.com/login>) or **signup for an account** (<https://app.tophat.com/register/>), which is free for students at The Ohio State University. **Important:** please, **use your first (given) and last (family) name, exactly as you are listed on Carmen along with your OSU name.# e-mail account. Join Code** for our class (within TopHat): **598866**.

Grading:

The final course grade will be based on:

Homework (best 5 out of 8, 3.6% each)	18%
Attendance	2%
Exam 1 (Monday, October 1)	25%
Exam 2 (Friday, November 16)	25%
<u>Final Exam (Monday, December 10)</u>	<u>30%</u>
	100%

Percentage Grading Scale:

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

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.**

E-mail Correspondence:

In order to protect your privacy, all course e-mail correspondence must be done through a valid OSU name.# account. If you have not activated your OSU email account, you can activate your account at <https://my.osu.edu/> . **All e-mail correspondence regarding the class must have “Stat 3460” in the subject field.**

Drop Date:

The last day to drop the course without a ‘W’ appearing on your record is Friday, September 14, 2018.
The last day to drop the course without petitioning is Friday, October 26, 2018

Receiving an ‘I’ for the Course

You cannot receive an incomplete for the course unless 65% of the work in the course has been completed. Extenuating circumstances will be handled on a case-by-case basis.

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