

STAT 1151 – Section 1060 (24572)

Introduction to Probability

Fall 2020

Mon, Wed, and Fri 1:15 to 2:05 Online or in Victoria Hall 229

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COURSE SUMMARY

This course presents, at both a theoretical and applied level, the basic probability concepts required for statistical inference. The concepts to be discussed include the following: set theory and basic probability; independence and Bayes' Theorem; discrete random variables and their distributions, (e.g., Bernoulli, binomial, Poisson, and geometric); continuous random variables and their distributions, (e.g., uniform, exponential, gamma, beta, and normal); transformations of random variables; moments and moment generating functions; multivariate discrete distributions; marginal and conditional distributions; independent random variables; functions of random variables.

Note: The material in this course is naturally cumulative in nature. Thus, it is important to not fall behind in your reading or assignments or you will find yourself lost. If you are confused, see me for help.

Prerequisites: Two terms of Calculus (e.g. MATH 0220 and 0230)

Required Text: Miller, I. and M. Miller, *John E. Freund's Mathematical Statistics*, 8th ed., Pearson Education, Inc., 2014 or 2019.
On reserve in the Engineering Library.
If purchasing the text, avoid the "International Edition".

You can get an e-text from the publisher (or from VitalSource.com) for about \$40. See <https://www.pearson.com/store/p/john-e-freund-s-mathematical-statistics-with-applications-classic-version-/P100001149456>

or

<https://www.vitalsource.com/products/john-e-freund-39-s-mathematical-statistics-with-irwin-miller-v9780134291673?term=John+E.+Freund%E2%80%99s+Mathematical+Statistics>

GRADING

Homework	20%	
Three Midterm Exams	55%	(15%, 20%, 20%)
Final Exam	25%	

You will submit your homework in PDF format through Canvas and the grader will grade it and enter the score in the grade book in Canvas.

I think exams will be conducted online also. My intention is for you to use a “real” calculator (**not** the one on your cell phone) and an 8-½” by 11” sheet of notes for each of the exams. You are not to use any other resources or discuss the exam with anyone. No make-up exams will be given.

COURSE POLICIES

Late Assignments

Homework submitted up to one day late will earn at most half of the available points. After that, late homework earns no credit.

Academic Integrity

Students in this course will be expected to comply with the [University of Pittsburgh’s Policy on Academic Integrity](#). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. To learn more about Academic Integrity, visit the [Academic Integrity Guide](#) for an overview of the topic. For hands-on practice, complete the [Understanding and Avoiding Plagiarism tutorial](#).

You are encouraged to discuss homework problems with your classmates. However, you must write your own solutions. **Show your work.** If you include computer output, annotate or summarize it to communicate your results.

Copyright Notice

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See [Library of Congress Copyright Office](#) and the [University Copyright Policy](#).

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student’s own private use.

Diversity and Inclusion

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see:

<https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/policies-procedures-and-practices>.

I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing titleixcoordinator@pitt.edu. Reports can also be filed online: <https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/make-report/report-form>. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and [Disability Resources and Services](#) (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Accessibility

The Canvas LMS platform was built using the most modern HTML and CSS technologies, and is committed to W3C's Web Accessibility Initiative and [Section 508](#) guidelines. Specific details regarding individual [feature compliance](#) are documented and updated regularly.

Health and Safety Statement

In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. While in class, at a minimum this means that you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members.

Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

Take Care of Yourself

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep, and taking time to relax. Despite what you might hear, using your time to take care of yourself will actually help you achieve your academic goals more than spending too much time studying. All of us benefit from support and guidance during times of struggle. There are many helpful resources available at Pitt. An important part of the college experience is learning how to ask for help. Take the time to learn about all that's available and take advantage of it. Ask for support sooner rather than later – this always helps. If you or anyone you know experiences any academic stress, difficult life events, or difficult feelings like anxiety or depression, we strongly encourage you to seek support. Consider reaching out to a friend, faculty or family member you trust for assistance connecting to the support that can help.

The University Counseling Center is here for you: call 412-648-7930 and visit their website.

If you or someone you know is feeling suicidal, call someone immediately, day or night: University Counseling Center (UCC): 412 648-7930

University Counseling Center Mental Health Crisis Response: 412-648-7930 x1

Resolve Crisis Network: 888-796-8226 (888-7-YOU-CAN)

If the situation is life threatening, call the Police:

On-campus: Pitt Police: 412-268-2121

Off-campus: 911

How Flex@Pitt Will Be Implemented in this Course

As the semester begins, the University is in the “Elevated Risk” operational posture. That means that all of our classes will be remote. I plan to conduct a “flipped” class this semester. You will need to carefully read the relevant sections in the textbook and study the examples in the text **before** we discuss the topics in class. With this approach, students (hopefully) will be more actively involved and more responsible for their own learning. Mondays may be a theoretical lecture (recorded with Panopto and posted in Canvas) with examples online. This can be viewed either synchronously or asynchronously. Some students prefer a regular schedule which follows the assigned class times. Wednesdays and Fridays will be more problem-solving sessions (online and synchronous using Zoom). These sessions will be recorded and posted in Canvas for remote students who are not able to participate synchronously.

If and when the operational posture improves to “Guarded Risk”, you will have the opportunity to attend Wednesday or Friday classes in-person and interact with your classmates. But you aren’t required to attend any classes in-person. You can remain remote and participate synchronously on Wednesday and/or Friday using Zoom. Because the classroom we were assigned cannot accommodate all enrolled students at once (while allowing social distancing), I am currently planning on separate cohorts of students having the opportunity to attend in-person on Wednesday **or** Friday of most weeks. In “Guarded Risk”, you may optionally attend class in-person on Wednesday if your last name begins with A through K. If your last name begins with L through Z, you may optionally attend class in-person on Friday. Attending class in-person gives you the opportunity to interact with some classmates, work at the white boards or on paper, or other active learning processes. If it is not “your day”, you may participate remotely and synchronously using Zoom or watch the recorded session (posted later in Canvas) asynchronously. The University installed some new technology in many classrooms to facilitate the links between those in the classroom and others participating through Zoom. There may be some growing pains as everyone (including me) learns how to effectively use this new technology.

Despite all my planning, I may have missed something. We may have to adapt and adjust as circumstances change. I ask for your understanding and flexibility. We are all doing the best we can to accomplish our shared educational mission under difficult circumstances.

How to Succeed in this Course

1. **Repetition.** We learn through repetition. Pre-reading is practice for lecture; lecture is practice for homework; and homework is practice for exams. Therefore, by the time you take exams, you should have experienced the material at least three different ways. But, if you weaken the chain by not reading ahead, by skipping lecture, or by copying someone else's homework, your exam scores will reflect the weakness.
2. **Homework.** You would not expect to build your muscles by watching someone *else* lift weights. You would not expect to train your fingers by watching someone *else* play the piano. Similarly, just being able to follow when someone *else* does the math on the board does not afford *you* the training to solve the problem when faced with a blank sheet of paper. Expertise is a two-step process: Conceptual understanding is the necessary first step, but that must be followed by the actual doing.
3. **Study Groups.** Although many aspects of learning are necessarily solitary, a University should be a vibrant community of people interacting. You are encouraged to get together in groups to discuss the course topics and homework. This gives you the advantages of:
 - a. Forcing you to look at the exercises before the last minute;
 - b. Checking your answers before you turn in homework (but don't assume that your friend's answer is necessarily correct);
 - c. Seeing the material in different ways; and
 - d. Simply making learning more fun.

Tentative Syllabus and Readings

<i>Week of</i>	<i>Topics</i>	<i>Readings</i>
Aug 19	Introduction, Counting methods, Permutations, Combinations	Ch 1
Aug 24	Basic Probability, Probability Rules, Conditional Probability, Independence	Ch 2
Aug 31	Independence, Bayes' Theorem Review, Exam 1 on Fri, Sep 4	Ch 2 Ch 1 and 2
Sep 7	Random Variables, Probability distributions and densities	Ch 3
Sep 14	Multivariate, marginal, and conditional distributions	Ch 3
Sep 21	Expectation, Moments	Ch 4

<i>Week of</i>	<i>Topics</i>	<i>Readings</i>
Sep 28	Moment Generating Functions	Ch 4
Oct 5	Review, Exam 2 on Wed, Oct 7 Named Probability Distributions	Ch 3 and 4 Ch 5
Oct 12	Named Probability Distributions No Class on Oct 14; Student Self-Care Day.	Ch 5
Oct 19	Named Probability Distributions	Ch 5
Oct 26	Named Probability Densities	Ch 6
Nov 2	Named Probability Densities Review, Exam 3 on Fri, Nov 6	Ch 6 Ch 5 and 6
Nov 9	Functions of Random Variables, Cumulative Distribution Function Technique, Transformation Technique	Ch 7
Nov 16	Functions of Random Variables, Transformation Technique, Moment Generating Function Technique, Review	Ch 7
TBD	Final Exam	Ch 1 through 7