

SIE 305- Introduction to Engineering Probability and Statistics Fall 2023, University of Arizona

- Instructor:** Dr. Mike Kwinn
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Office Hours: by appt
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Office Hours: T&Th 3-4pm via Zoom or in person by appt
- Class meetings:** Mon, Wed, Fri, 1:00–1:50am, Education Room 211
- Catalog description:** Axioms of probability, discrete and continuous distributions, sampling distributions. Engineering applications of statistical estimation, hypothesis testing, confidence intervals.
- Prerequisite(s):** MATH 129
Each student must be able to:
1. Differentiate (derivatives of exp., log, and polynomial, etc.)
2. Integrate (single integrals, simple double integrals)
- Textbook (required):** Devore, Jay L. *Introduction to Engineering Probability and Statistics*, CENGAGE Learning. (On-Line through D2L)
- Software packages:** MS Excel, “R”, and/or Minitab (optional, but encouraged)
- Outcome Related Course Learning Objectives:**
- Describe basic probability
 - Identify and apply discrete, continuous and joint probability distributions
 - Describe the use of point estimation
 - Analyze confidence intervals and hypothesis testing for a single sample
 - Analyze confidence intervals and hypothesis testing for two samples
 - Conduct Goodness-of-Fit tests
- Topics covered:**
- Descriptive statistics.
 - Basic probability
 - Discrete and continuous random variables
 - Joint random variables
 - Point estimation
 - Statistical intervals based on a single sample
 - Test of hypothesis based on a single sample
 - Inferences based on two samples
 - Goodness-of-Fit tests

D2L Website:

You will access this site by going to <http://d2l.arizona.edu> and logging in with your UA Net ID. If you need assistance with D2L you should contact D2L Help (<http://help.d2l.arizona.edu>); you may also try the 24/7 IT Support center on campus (<http://the247.arizona.edu>), which is available 24 hours a day, 7 days a week. When you log on to D2L, this course will be listed on the welcome page under “My Courses”.

Announcements, class notes, PowerPoint files, spreadsheets used in class, homework assignments and solutions, and links to news items of interest will be posted to this website. You must be registered for the class to be permitted entry to the site.

Weekly Assignments

- a. All assignments will be taken from the etext book, (Figure 1). This will be available on the D2L website described above. You will have purchased the license to use the text automatically as a part of the fees that you realize when you enroll in the class.
- b. Reading assignments are listed in the lesson plan and should be completed prior to class.
- c. Each student will be responsible for completing 10 homework assignments on-line through WebAssign. Due dates for assignments are as indicated on the schedule on page 5. If you need an extension on the homework, you must notify me ahead of time via the extension tool in WebAssign and via email. No late homework will be accepted. If you have a valid reason for handing in late homework, you must let me know in advance. Emergencies will be considered on a case-by-case basis.
- d. Academic integrity: Students are expected to uphold the University of Arizona academic integrity policy.
- e. Quality: Although the homework answers are submitted through WebAssign, it is a good practice to work through the homework in a spiral notebook. That way, you can review your work with the professor or a TA if you are having problems understanding the assignment. Always write legibly and write out each step of the process indicating your answers clearly at the end.

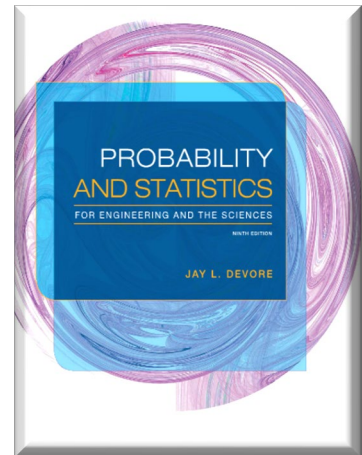


Figure 1: Devore, Jay L. *Introduction to Engineering Probability and Statistics*

Exams

- a. There will be two midterm exams during the semester and a final exam at the end of the semester. The final exam will be comprehensive.

- b. Exams are closed book, but you may bring two sheets of paper with useful information **handwritten** on both sides and with your name printed on it for the midterm. You will be allowed the three note sheets on the final exam.
- c. Calculators may not be programmed unfairly or connect wirelessly to internet or to each other.
- d. All cellphones must be OFF and put away during exams. This applies to class time, too.
- e. No one will be allowed to leave the room once the exam starts unless they've handed in their exam.
- f. Anyone caught acting against UA Code of Academic Integrity, will receive a non-droppable grade of zero on an exam.
- g. If you are stuck on a problem and write a verbal explanation of how you might approach it and what concepts apply, you will get partial credit. Partial credit is better than no credit!
- h. Exam scope. Tests and exams will never cover probability/statistics topics far beyond the realm of topics covered in class or addressed on related textbook pages. Some questions that are similar, yet not identical, to homework exercises may appear on examinations.

Course Project:

There will be a course project that will be conducted in small groups. This project will be a comprehensive review of the course material and is designed to show a real-world application of the material presented. More specific information about the project will be shared later in the semester in a separate document.

Grading:

The final grades will be given based on homework assignments on Web Assign, 2 exams (also through D2L>Quizzes), a final project, and a final exam.

Homework assignments	15%
Exam 1	20%
Exam 2	20%
Course Project	20%
Final	25%
Total	100%

Attendance policy:

Attendance for all exams is mandatory. To miss a scheduled exam, you must have a Deans

Excuse and notify the instructor ahead of time. Class time is the best time to interact with the instructor and clarify information presented. It also helps make the class better when there are students there with whom to collaborate and learn. There will be material that is not in the text that will be presented in class. In class examples are performed, demonstrations will be done with the computer, and discussions will be conducted on the material. All material from the class is fair game on the exams. The webpage can be used as a backup for a missed class and for additional help, but it is not a substitute for class activities, discussions, demonstrations, and performed examples. Missed announcements that may pertain to exam schedules, modifications in syllabus, handouts, and homework assignments are your responsibility if you miss a class.

- All holidays of special events observed by organized religions will be honored for those students who have affiliation with that religion. Please work with the instructor to ensure awareness of the holiday. It is not the instructor's responsibility to track all the holidays.
- Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Classroom Behavior Policy:

Cell phones and other communication devices are to be turned off during class and during examinations. Exams will be taken on laptops, but you will not be allowed to visit other sites during the exam. Visiting other sites, using Excel macros/prepared workbooks, or checking other material on the laptop is prohibited and will be handled in accordance with the Academic Integrity Policy described below.

Threatening Behavior Policy:

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety, or welfare. The Arizona Board of Regents (ABOR) Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to oneself. Threatening behavior can harm and disrupt the University, its community, and its families.

Academic Integrity Policy:

Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the Student Code of Conduct and disciplinary procedures established by **ABOR Policies 5-308 through 5-404** (see chapter 5), all provisions of which apply to all University of Arizona students. This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by **ABOR Policy 5-403.A.4** and otherwise to supplement the Student Code of Conduct as permitted by **ABOR Policy 5-308.C.1**.

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work, exercises, homework, and exams must be the product of independent effort unless otherwise instructed. Students are expected to know and to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.

See:

- <http://catalog.arizona.edu/2011-12/policies/aaindex.htm>
- <https://deanofstudents.arizona.edu/policies/code-academic-integrity>

Any violation of the academic integrity code will be dealt with using the procedures detailed in the code.

Nondiscrimination and Anti-Harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex (including pregnancy), national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes they have been the subject of discrimination to report the matter immediately as described in the section below, “Reporting Discrimination, Harassment, or Retaliation.” All members of the University community are responsible for participating in creating a campus environment free from all forms of prohibited discrimination and for cooperating with university officials who investigate allegations of policy violations.

Accessibility and Accommodations:

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

If you qualify for special accommodations, please coordinate with the instructor to make sure we support all your accommodations. An exam taken in the DRC testing center is to be taken at the same time the exam is given in class.

Revisions:

Modifications may occur in this syllabus. The instructor will share any changes as soon as practical in class and through class announcements on D2L.

Student feedback:

Students may be asked to provide written feedback on the course and its contents.

Monday	Wednesday	Friday
21 Aug – Lesson 1	23 Aug – Lesson 2	25 Aug – Lesson 3
Chapter 1		
Read 1.1 Populations, Samples and Processes	Read 1.2 Pictorial and Tabular Methods in Descriptive Statistics	Read 1.3 and 1.4 Measures of Location and Measures of Variability
28 Aug – Lesson 4	30 Aug – Lesson 5	1 Sep – Lesson 6
Chapter 2		
Read 2.1 and 2.2 Sample Spaces, Events, and Properties of Probability Homework 1 due	Read 2.3 Counting Techniques	Read 2.4 and 2.5 Conditional Probability and Independence
4 Sep	6 Sep – Lesson 7	8 Sep – Lesson 8
Labor Day No Classes	Introduction to R	
11 Sep – Lesson 9	13 Sep – Lesson 10	15 Sep – Lesson 11
Chapter 3		
Read 3.1 and 3.2 Random Variables and Discrete Probability Distributions Homework 2 due	Read 3.3 and 3.4 Expected Values and the Binomial Probability Distribution	Read 3.5 and 3.6 Hypergeometric, Negative Binomial and Poisson Probability Distributions
18 Sep – Lesson 12	20 Sep – Lesson 13	22 Sep – Lesson 14
Chapter 4		
Read 4.1 and 4.2 Probability Density and Cumulative Distribution Functions Homework 3 due	Read 4.3 and 4.4 The Normal Distribution and the Exponential and Gamma Distributions	Read 4.5 and 4.6 Other Continuous Distributions and Probability Plots
25 Sep – Lesson 15	27 Sep – Lesson 16	29 Sep – Lesson 17
Chapter 5		
Review Chapters 1-4 Homework 4 due	Exam 1	Read 5.1 Jointly Distributed Random Variables
2 Oct – Lesson 18	4 Oct – Lesson 19	6 Oct – Lesson 20
Chapter 5		
Read 5.2 Expected Values, Covariance, and Correlation	Read 5.3 Statistics and their Distributions	Read 5.4 and 5.5 Distribution of the Mean and the Distribution of a Linear Combination
9 Oct – Lesson 21	11 Oct – Lesson 22	13 Oct – Lesson 23
Chapter 6		Chapter 7
Read 6.1 Some General Concepts of Point Estimation Homework 5 due	Read 6.2 Methods of Point Estimation	Read 7.1 and 7.2 Confidence Intervals and Large-Sample Confidence Intervals for a Population Mean and Proportion

16 Oct – Lesson 24	18 Oct – Lesson 25	20 Oct – Lesson 26
Chapter 7		Chapter 8
Read 7.3 Intervals Based on a Normal Population Distribution Homework 6 due	Read 7.4 Confidence Intervals for the Variance and Standard Deviation of a Normal Population	Read 8.1 Hypotheses and Test Procedures
23 Oct – Lesson 27	25 Oct – Lesson 28	27 Oct – Lesson 29
Chapter 8		
Read 8.2 Tests About a Population Mean Homework 7 due	Read 8.3 Tests Concerning a Population	Read 8.4 P-Values
30 Oct – Lesson 30	2 Nov – Lesson 31	4 Nov – Lesson 32
Review Homework 8 due	Exam 2	Course Project Kick-off
6 Nov – Lesson 33	8 Nov – Lesson 34	10 Nov
Chapter 9		Veteran's Day No classes
Read 9.1 z Tests and Confidence Intervals for a Difference Between Two Population Means	Read 9.2 The Two-Sample t-Test and Confidence Interval	
13 Nov – Lesson 35	15 Nov – Lesson 36	17 Nov – Lesson 37
Chapter 9		
Read 9.3 Analysis of Paired Data Project Proposal Due	Read 9.4 Inferences Concerning a Difference Between Population Proportions	Read 9.5 Inferences Concerning Two Population Variances
20 Nov – Lesson 38	22 Nov – Lesson 39	24 Nov
Chapter 14		Thanksgiving Weekend No classes
Read 14.1 Goodness-of-Fit Tests When Category Probabilities are Completely Specified Homework 9 due	Read 14.2 Goodness-of-Fit Tests for Composite Hypotheses	
27 Nov – Lesson 40	29 Nov – Lesson 41	1 Dec – Lesson 42
Course Project Workday	Course Project Workday	Course Project Workday
4 Dec – Lesson 43	6 Dec – Lesson 44	8 Dec
Poster Session for Final Project Homework 10 due	Review for Final	Finals Start No Classes
11 Dec	13 Dec	15 Dec
Final Exam 1-3pm		