

STATS 345

Elements of Mathematical Statistics and Probability

BASIC COURSE INFORMATION

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|-----------------------|--|---|--------|--------------|
| Course: | STATS 345 | DSH 127 | TuTh | 12:30–1:45pm |
| Instructor: | Fletcher Christensen | Assistant Professor of Statistics | | |
| Contact: | ronald@stat.unm.edu | http://www.stat.unm.edu/~ronald/ | | |
| Office Hrs: | SMLC 328 | Tu 2–3 | Th 2–3 | Fr 11–12 |
| Websites: | http://www.wileyplus.com/class/626794 http://learn.unm.edu/ | | | |
| Prerequisites: | MATH 163 or MATH 181 (Integral Calculus) | | | |

COURSE SUMMARY

This is a course about uncertainty: how to express it, how to understand it, and how to deal with it.

Probability is a mathematical technique for quantifying uncertainty. Statistics teaches us how to draw reliable conclusions when faced with uncertainty. Together, these elements form the foundation of modern scientific inquiry. We will spend the first half of the semester learning about probability rules and common probability distributions. In the second half of the semester, we will apply what we've learned about probability to real-world data. We will finish the semester by discussing how probability and statistics can be applied to quality control.

TEXTS AND TOOLS

The primary resource we will be using for this class is the WileyPLUS online course tools associated with our textbook. You can access our course webspace for WileyPLUS by visiting the website:

<http://www.wileyplus.com/class/626794>

The textbook associated with this course is *Applied Statistics and Probability for Engineers*, 6th ed. by Montgomery & Runger. The textbook is available from the UNM Bookstore, but also through the WileyPLUS course tools. When you purchase / register for WileyPLUS, you'll also have an option to purchase the textbook in eBook format, or in looseleaf format. It can be useful to have a permanent resource for probability distributions, and you may find it easier to complete reading assignments if you have the textbook—but as long as you have access to the text through WileyPLUS, it is not necessary for you to also have the printed textbook.

COURSE CALENDAR

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|-----------------|-----------|------------|----------------------------------|-----------------------|
| Tuesday | 16 | Jan | Course introduction | |
| Thursday | 18 | Jan | Thinking about Data | Chapter 1 |
| Tuesday | 23 | Jan | Basics of Probability | Chapter 2.1–2.2 |
| Thursday | 25 | Jan | Probability Rules | Chapter 2.3–2.6 |
| Tuesday | 30 | Jan | Bayes Theorem & Random Variables | Chapters 2.7–3.1 |
| Thursday | 1 | Feb | Probability Distributions | Chapter 3.2–3.4 |
| Tuesday | 6 | Feb | Discrete Distributions I | Chapter 3.5, 3.6, 3.9 |
| Thursday | 8 | Feb | Discrete Distributions II | Chapter 3.7–3.8 |
| Tuesday | 13 | Feb | Continuous Random Variables | Chapter 4.1–4.4 |
| Thursday | 15 | Feb | Continuous Distributions I | Chapter 4.5–4.7 |
| Tuesday | 20 | Feb | Continuous Distributions II | Chapter 4.8–4.12 |
| Thursday | 22 | Feb | Joint Distributions I | Chapter 5.1 |
| Tuesday | 27 | Feb | Joint Distributions II | Chapter 5.2–5.3 |
| Thursday | 1 | Mar | Joint Distributions III | Chapter 5.4–5.6 |
| Tuesday | 6 | Mar | Midterm exam | |
| Thursday | 8 | Mar | Fun with Probability | |
| Tuesday | 13 | Mar | Spring Break – No class | |
| Thursday | 15 | Mar | Spring Break – No class | |
| Tuesday | 20 | Mar | Descriptive Statistics I | Chapter 6.1–6.3 |
| Thursday | 22 | Mar | Descriptive Statistics II | Chapter 6.4–6.7 |
| Tuesday | 27 | Mar | LLN & CLT | Chapter 7.1–7.2 |
| Thursday | 29 | Mar | Point Estimation | Chapter 7.3–7.4 |
| Tuesday | 3 | Apr | Interval Estimation I | Chapter 8.1–8.2 |
| Thursday | 5 | Apr | Interval Estimation II | Chapter 8.3–8.5 |
| Tuesday | 10 | Apr | Decision Theory | Chapter 15.10 |
| Thursday | 12 | Apr | Statistical Testing I | |
| Tuesday | 17 | Apr | Statistical Testing II #3 | |
| Thursday | 19 | Apr | Statistical Testing III | |
| Tuesday | 24 | Apr | Quality Control | Chapter 15.1 |
| Thursday | 26 | Apr | Control Charts | Chapter 15.2–15.4 |
| Tuesday | 1 | May | <i>TBD</i> | |
| Thursday | 3 | May | <i>TBD</i> | |
| Thursday | 10 | May | Final Exam at 3:15pm | |

ASSESSMENT

There will be four components to your grade in this class:

1. Reading Quizzes (15%)

You will be expected to read the sections of the textbook associated with each lesson *before class*. This makes it easier for you to ask questions and expand your understanding of the material we're covering. To reinforce this expectation, there will be a reading quiz on WileyPLUS before each class, due by the start of class, covering the textbook readings. Reading quizzes will begin in Week 2. There will be approximately 20 reading quizzes during the semester.

2. Homework (25%)

We will have six homework assignments for this class, which will also be conducted through WileyPLUS. These will correspond with the primary topics of the class: basic probability rules, discrete probability distributions, continuous probability distributions, summarizing data, estimating parameters, and statistical testing. You can expect one assignment about every two weeks—we'll take a break from assignments for the midterm and Spring Break around the middle of the class.

3. Midterm Exam (25%)

The midterm exam will be held on **Tuesday, March 6th**, and will cover material from Chapters 1-5 in the textbook. The focus of this exam will be on the basic laws of probability and probabilistic modeling of random variables. In all likelihood there *will not* be a practice exam to look at, but the quizzes and homework assignments should give you a good idea of what topics I think are important to cover.

4. Final Exam (35%)

The final exam will (probably) be held on **Thursday, May 10th, from 3:15pm to 5:15pm**. You will be expected to know the material on probability from Chapters 1-5, but the exam will primarily deal data summaries, estimation, testing, and quality control. Again, it is unlikely that there will be a practice exam to look at, but you should be able to get a sense for what the exam will cover by reviewing the quizzes, homeworks, and midterm. I expect to be attending a conference in Iowa on May 10th, so you will likely have a substitute proctor for this exam.

POLICIES AND EXPECTATIONS

Class attendance:

You are responsible for knowing material covered in the book and in class. These two elements of the course complement each other, but they will not overlap completely. For example, the book will cover some topics that I won't discuss in class but that you may see on quizzes and exams. My classes will cover some topics in statistical thinking and some special topics that the book doesn't get into—and elements of those may show up on assignments and exams as well.

Be respectful to your fellow students in class. Keep your cell phones and laptops muted. If you know you'll have to arrive to class late or leave early, try to sit near the doors so you can minimize the disturbance you cause.

Students with disabilities:

In accordance with University Policy 2310 and the American Disabilities Act (ADA), students who need academic accommodations and/or assistance in emergency evacuations should contact me as soon as possible to ensure their needs are met in a timely manner.

Missed quizzes, assignments, and exams:

With twenty quizzes, six homework assignments, and 50 students, some of you may miss a quiz or assignment at some point. I will drop your lowest homework assignment score, and your two lowest reading quiz scores, in calculating your grade. I strongly encourage you to complete every reading quiz and homework assignment, even if you know your scores on your completed assignments are good. Except for a brief submission grace period around deadlines, *late homework and quizzes will not be accepted.*

If you miss an exam, you're out of luck—we're not tossing out exam scores. If you're in danger of missing an exam (e.g. if you're sick, or if you get into a car accident on the way to school), *contact me by email ASAP.* If I'm aware of the issue, I can make arrangements for you to take the exam at an alternate time. But if you miss the exam without contacting me about your situation, I *will* give you a zero on the exam.

Academic misconduct:

For the purposes of this class, academic misconduct is defined as submitting someone else's work and pretending it's your own. More detail on academic misconduct is provided by the Dean of Students' (<https://dos.unm.edu/images/dean-of-students-academic-integrity-guidelines.pdf>) and in the UNM Student Code of Conduct (<http://pathfinder.unm.edu/code-of-conduct.html>).

Don't cheat. If I catch you—and I catch students regularly—I will give you a zero for the assignment or exam I caught you on, and I will report you to the Dean of Students' Office. Depending on whether you've been reported before, that can result in something as small as a confidential note being placed on your record that will be expunged when you graduate, or something as large as dismissal from the university.

All that said, cheating usually happens when a student feels like he or she can't succeed and tries something desperate. If you feel like you're getting into that position, talk to me. If you've done something you think might be cheating, tell me about it and I'll be much more understanding and lenient than if I catch it myself. If you're not sure whether something constitutes cheating or not, ask me. There can be a lot of gray area, and I understand that. I want you to succeed in this course, but doing your own work is a critical part of successful learning.