

**Instructor:** [Allan Rossman](#)

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**Office Hours:** M 1-2, W 1-2, Th 9-10, F 9-10, and by appointment, and by chance

**Class Meetings:** MTWR 3:10-4pm (section 74), 4:10-5pm (section 75) in room 14-250

**(Recommended) Text:** *Applied Statistics for Engineers and Scientists* (3<sup>rd</sup> edition), by Devore, Farnum, and Doi

**Course Webpage:** <http://statweb.calpoly.edu/arossman/stat312/>

**Overview:** Statistics is the science of reasoning from data. It is both an exciting intellectual discipline and a powerful scientific tool. Statistics is a mathematical science, in the sense that it makes use of mathematics extensively, but it is not a branch of mathematics.

The practice of statistics involves collecting data, analyzing data, and drawing inferences from data. The mathematical foundations of statistical inference lie in probability, the study of randomness and uncertainty. This course introduces you to fundamental ideas and methods of probability and statistics.

I like to believe, and I'll try to demonstrate to you, that statistics is both an extremely important discipline in today's world and also a very exciting one. Statistics is also very relevant and applicable in all engineering disciplines.

**Goals:** By the conclusion of the course, I hope that you have improved your ability to:

- **apply and interpret** the results of a variety of **statistical techniques**, including both descriptive and inferential methods;
- **understand** many of the **fundamental ideas of statistics**, such as variability, distribution, association, causation, sampling, experimentation, confidence, and significance;
- **understand and apply** basic ideas and methods of **probability**;
- **analyze and assess statistical arguments**, such as those found in the popular press as well as in scholarly publications;
- **use statistical software to analyze data**;
- **communicate** your knowledge of statistical ideas effectively.

You can see the expanded course outline (at <http://statistics.calpoly.edu/content/courses>) for more specific learning objectives and a more detailed outline of topics.

**Grading Policies:** Your course grade will be determined by the following components, with relative weights as indicated:

- quizzes (10%)
- investigation assignments (10%)
- three midterm exams (15% for lowest score, 20% for each of other two scores)

- final exam (partially cumulative, 25%)

**Quizzes:** We will have *lots* of quizzes. I will encourage and reward you for class preparation and participation by collecting and grading some aspect of your work, formulated as a quiz, in most class periods. We will even have multiple quizzes in some class periods. Specific rules for each quiz (individual or group, open- or closed-notes, in-class or take-home, based on what we've done that day or from previous days) will vary and will be announced as we go. Missed quizzes cannot be made up or excused, but you may drop your lowest *two* quiz scores before calculating your overall score. (So, for example, if you miss two quizzes due to illness or any other reason, those will be the two that you drop.) These quizzes, and their solutions, will be posted on our course website so you can check your work afterward.

**Investigation Assignments:** Investigation assignments ask you to investigate a concept or application in some depth. These will be assigned occasionally, roughly an average of one per week. These assignments are often fairly open-ended, requiring both writing and computer work. You may work with a group of as many as 3 students on these investigations, submitting one report with all names, provided that all of you genuinely contribute to the work. Word-processed reports of investigations are preferred to hand-written ones, and computer output should be integrated into the report as appropriate. Investigations are due at the beginning of class on the indicated day. Late investigations will not be graded, and missed investigations cannot be made up. You may drop your lowest investigation score. The investigation assignments will be posted on our course website, and no hard copies of these assignments will be distributed.

I will also specify optional exercises from the text for you to work on. You are encouraged to solve these to benefit your learning, but these will not be turned in for grading. Answers to these exercises appear in the back of the book. A listing of these optional homework assignments will be maintained on our course website.

The purposes of these assignments are to:

- further your discovery and exploration of course material,
- give you the problem-solving practice necessary to learn, understand, and apply the concepts and techniques presented,
- provide you with feedback regarding your understanding of the material, and
- prepare you for the kinds of questions that will be on the exams.

**Exams:** We will have three midterm exams and a comprehensive final exam. These will be open-book and open-notes. Dates will be announced at least one week in advance, and detailed preparation advice will be posted on our course website before each exam. One thing to keep in mind is that interpretations and explanations will be as important as calculations. Exams may be made up only with a valid, written medical excuse. Dates for the exams are:

**Advice:** I offer the following suggestions for learning the course material well and succeeding in this course:

**1. Organize handouts and notes.** I suggest obtaining a three-ring binder for storing and organizing your handouts/notes, in addition to obtaining the textbook. I think you'll find your handouts/notes to be your most valuable study materials, so please keep them well organized and refer to them often. Some topics will be covered in the handouts that are not covered in the text.

**2. Print handouts in advance.** I will post 1-2 handouts per week on our course website. I will make these handouts available by 3pm on the previous day, usually much earlier than that. These handouts consist of activities and questions that I design to help you learn and understand the course material. I think you'll find it very helpful to bring these handouts to class each day and take notes directly on these handouts.

**3. Come to class.** Please come to class every day. Especially with our class only meeting twice per week, missing one class means missing a lot of material. I'll do my best to make every class period interesting and worthwhile. You are responsible for heeding all announcements made in class, whether you are in attendance that day or not.

**4. Participate in class.** Coming to class is of little value if you do not participate. Please think about and respond to the questions asked in class. Try to stay focused on course material, and by all means do not distract others from remaining on task.

**5. Don't get behind.** The material in this class builds on itself progressively throughout the entire quarter. As a consequence, it can be very hard to get caught up if you allow yourself to fall behind. This is especially important because our class only meets twice per week. Please feel free to ask questions as they occur to you, and make use of office hours.

**6. Pay attention to context.** Statistics is about data. Data are numbers with a context. I spend a good bit of time and effort on finding genuine studies and real data to present in class and on assignments, in part to show you some of the broad applicability of statistics. When working on assignments and quizzes and exams, be sure to express your conclusions in context. In other words, say "most students in our class got at least seven hours of sleep last night" instead of "most of the dots on the graph are at the values seven and above."

**7. Expect more than number-crunching.** Statistics is about much more than performing calculations. I also expect you to understand statistical concepts and interpret results from applying statistical methods. Try not to concentrate so much on a specific task that you lose sight of the big picture. You really will be expected to *think* in this course.

**8. Make use of online resources.** I will post lots of information and resources on our course website. There you'll find daily handouts, quizzes and solutions, investigation assignments and solutions, exam information and preparation advice, and more. Please make frequent use of these resources. You can also monitor your grade information

using PolyLearn. I may also occasionally distribute announcements via email. You are welcome to ask questions of me via email as well.

**9. Use technology.** We'll use computer software both for exploring statistical concepts and also for analyzing data. We'll use two kinds of software: java applets that can be run from any computer that can access the internet, and Minitab statistical software. The good news is that through a site license with the university, you can download Minitab for free from the [my.calpoly.edu](http://my.calpoly.edu) portal; instructions are provided on our course website. The bad news (for some of you) is that Minitab does not run on Macintosh computers. One consolation is that PC labs on campus, including in the library, have Minitab on their computers.

**10. Study together.** Please feel free to study together and help each other to learn the course material. The policy on investigation assignments is that you can work with a group of as many as 3 students and hand in one report with all names, provided that all of you contribute substantially to the work. On some quizzes you will be invited to work with one or more partners. You can always work together on optional problems from the text and to study for exams.

**11. Invest time.** There's no reason that you can't do very well in this course, but you will need to spend time outside of class working on it. Your out-of-class activities should consist of reading the textbook, reviewing your notes, working on assignments, solving optional problems, and preparing for exams.

**12. Take pride in your work.** Please do your best with all aspects of the course. Do not turn in sloppy, half-hearted work. Take pride in what you produce, make your work look nice as well as convey substance. Express yourself clearly.

**13. Have fun with the material.** We'll be examining many interesting studies, some of which are meant to be entertaining and perhaps even silly. Please enjoy the fun aspects of the course.

**14. Think!** I believe you'll find that you really are expected to think in this course. You'll need to figure some things out for yourself and wrestle with some challenging ideas. Please be prepared to think hard as well as work hard. Of course, developing the ability to think well is what a Cal Poly education is all about.

A common theme emerges from this list of advice, important enough that I'll put it in both bold and italics: ***You are responsible for your own learning.*** As your instructor, I view my role as providing you with contexts and opportunities that facilitate the learning process. Please call on me to help you with this learning in whatever ways I can.

**Courtesy:** I ask you to please observe some common courtesies, specifically to:

- arrive to class on time;
- do not talk to others in class when I am talking;
- do not allow your cell phone to ring or send text messages during class;

- staple pages together when you hand in a multi-page assignment;
- include your section number on all quizzes and assignments;
- include your name at the end of the message when you send me an e-mail message.

**Academic Honesty:** Please conduct yourself with honesty and integrity. Do not submit others' work as your own. For assignments and quizzes that allow you to work with a group, only put your name on what the group submits if you genuinely contributed to the work. Work completely independently on exams, using only the materials that are indicated as allowed. Failure to observe academic honesty results in substantial penalties that can include failing the course.

**Disabilities:** If you have a disability and would like to request accommodation, please contact me and the Disability Resource Center (124-119) as soon as possible.

**Schedule:** The following schedule is tentative and always subject to change, but it should give you a sense for what topics we will cover and when:

<i>Week</i>	<i>Dates</i>	<i>Topics</i>	<i>Sections</i>
1	Sept 21 – 24	Statistical studies, categorical data	1.1 – 1.2
2	Sept 28 – Oct 1	Graphs, numerical summaries, least squares regression	2.1 – 2.3, 3.1 – 3.4
3	Oct 5 – 8	Sampling and experiments, EXAM 1	4.1 – 4.3
4	Oct 12 – 15	Probability basics, conditional probability	5.1 – 5.3
5	Oct 19 – 22	Random variables, continuous distributions	5.4, 1.3 – 1.6
6	Oct 26 – 29	Sampling distributions, EXAM 2	5.5 – 5.6
7	Nov 2 – 5	Quality control, confidence intervals	6.1 – 6.5, 7.1 – 7.3
8	Nov 9 – 12	Hypothesis testing	8.1 – 8.4
9	Nov 16 – 19	More on hypothesis testing, EXAM 3	8.5
10	Nov 23 – 24	Chi-square tests	
11	Nov 30 – Dec 3	Analysis of variance, inference for regression	9.1 – 9.2, 11.1 – 11.3
	Mon Dec 7 (4:10-7) Fri Dec 11 (1:10-4)	FINAL EXAM	