Winter, 2020

Stat 301 – Statistics I

Instructor: Beth Chance
Class Time: Section 1:   2:10-3:00, M, W (10-215), T, R (10-222)
                     Section 2:   3:10-4:00 M, W (10-215), T, R (10-222)
Office: Faculty Office Building East 25-235
Phone: 756-2961 (×62961 on campus)
Email: bchance@calpoly.edu   (a very good way to reach me)
Office Hours: M 12-1, T 10-11am, W 1-2pm, Th 9-10am, 7-8pm (online), by email, by
                     appointment, and anytime my door is open
Course Webpages: PolyLearn (http://my.calpoly.edu)
                                       http://www.rossmanchance.com/stat301/
                                       http://www.rossmanchance.com/iscam3/
Course Listserv: stat-301-01-2202@calpoly.edu, stat-301-02-2202@calpoly.edu

Co-requisite: Math 141

Course Objectives: To gain an understanding of statistical principles and their uses. This course addresses issues in data collection, including sampling and experimental designs, graphical and numerical techniques for exploring and modeling data, and statistical inference. You will learn how to make inferences from samples to populations and between treatment groups in an experiment.

Texts/Materials:
Required: *Investigating Statistical Concepts, Applications, and Methods* (ISCAM)
                     Chance and Rossman (2019), third edition

It is very important that you bring the book to every class meeting, and you are encouraged to write directly in your book. You should also have a USB drive, a scientific calculator, an email address, and a large three-ring binder. You will need out-of-class access to R, applets, and Excel. Additional lecture handouts may be supplied in class, you are responsible for receiving and keeping these materials. PowerPoint slides and handouts from previous lectures will be available on the course web pages.

Statistical Package/Calculators: We will primarily be using the *R* and *JMP* software packages for data analysis and exploration. You will be given instructions for how to use Excel, Word, R, and javascript applets as needed for this course. You will need access to these packages outside of class as well. You are also encouraged to use a scientific calculator.

Grading:
Quizzes	5%
Homework (Extension assignment)	20%
Three Mini-projects	20%
Two exams	30% (15% each)
Final exam	25%

Coursework:

- *Reading quizzes* will be given between class periods and must be submitted before the next class meeting. These may cover key points from the practice problem or ask you to read the background and answer the first few questions of the next investigation. They will generally be short, multiple-choice questions to help assess your current understanding of the material and allow us to work more efficiently during class. You will drop your 10% lowest scoring quiz scores (depends how many we take).

- *Homework problems* will be assigned roughly once per week. You will generally have one week to complete the assignments. The intention is for you to work on this assignment throughout the week. If you wait until the evening before, you will not have enough time to complete the assignment. You are encouraged to work with other people in the class and to submit questions to the course alias/discussion board, **but the work you turn in must be written up individually**. If I determine write-ups are too similar, the score will be divided among the matching papers. No late homework assignments will be accepted. You will be allowed to drop your lowest homework grade. Remember to always include relevant computer output.

- *Extensions assignment* This will be worth one homework assignment. There are several ways to increase your Extensions grade such as: submitting good questions to the listserv/PolyLearn, submitting reviews of uses of statistics from outside the course that you find interesting (like HW 1), reviewing selected talks on campus. I will periodically offer suggestions for outside applications possibilities.

- There will be 3 *data collection/analysis mini-projects*. For the first two, you will be asked to collect data and then use the techniques discussed in class to analyze the data. You will be asked to work in groups of 2-3 people and it is the group's responsibility to make sure everyone participates equally. Reports will be graded on originality of topic, quality of the written report, quality of data collection methods, correctness of statistical methods, and appropriateness of interpretation and conclusions. Each person's grade will be 75% group grade and 25% individual grade. Individual grades will be determined by the instructor and team member evaluations.

Exams: There will be two in class exams and one comprehensive final. Graded exams will be returned in class or can be picked up from the instructor.

Advice:

1. **Come to class.** Student evaluations reinforce my conviction that there is no substitute for attending class, seeing and hearing the material and examples presented, and having the chance to ask questions and to practice solutions. I do present some material that is not covered in the text and cover some material in different ways than the text, as well. You can also often pick up hints and advice about studying and homework problems.

2. **Participate in class.** Coming to class only contributes to your learning if you are willing to participate actively. During many class periods you will be asked to work on activities designed to help you learn the material and to explore the concepts and methods of probability and statistics. Please engage yourself fully with these activities.

3. **Work together.** Many of the in-class activities will ask you to work collaboratively with your peers. Please do so freely, as I believe that you will be able to help each other with your learning. I also encourage you to work and study together outside of class.

Just remember that unless specified otherwise, solutions to homework problems are to be written up individually.

4. **Ask questions.** Please do not hesitate to ask questions when you don't understand something presented in class or on a homework problem. Don't necessarily wait until after class or during office hours; you can ask questions during class time as well. Feel free to give me other sorts of feedback as well: if the pace is too fast, etc.

5. **Review your notes often.** My intention is to enable you to put together a very extensive and useful set of class notes. I urge you to keep thorough notes and to review them often, particularly before starting homework assignments and while studying for exams.

6. **Check the course webpage and email list regularly.** Many students often have similar questions and additional insights that you can learn from. This is a good place to check for late breaking news and late night inspirations.

7. **Start the assignments early.** You will usually be given at least one week to complete each assignment. Please avoid the temptation to put the assignments off until the last day; you should start early enough to be able to ask questions when they arise. It is also helpful to have the homework problems in mind when we cover the relevant material in class. Keep in mind that the material in this course builds cumulatively over the quarter.

8. **Take the course seriously.** This course should not be approached casually. One aspect of the course is that you will have to do a fair bit of writing, explaining, and presenting your results. It is important to practice the terminology and concepts frequently. I will be fairly demanding of your work under the belief this will improve your overall understanding and end-of-course performance.

9. **Have fun with the material.** This may seem to contradict the previous point, but I do think that statistics is a very fun, entertaining subject. We will be analyzing genuine data from a variety of real-world applications and diverse disciplines. Allow yourself to enjoy these aspects of the course, and feel free to suggest other applications that appeal to you.

10. **Think!** Do not treat the course as an exercise in mere "plug-and-chug" number-crunching, and do not try to apply formulas by rote to solve problems. (That's not what statistics is about!) Think about what you are doing, recognizing that there are often several ways to solve a problem and that one clever thought might eliminate the need for pages of painful calculations. Use your intuitive sense to check your results.

Above all, **you are responsible for your own learning.** As your instructor, my role is providing you with contexts and opportunities to facilitate the learning process. Please call on me to help you with this learning in whatever ways I can.

Stat 301 - Tentative Schedule

	Day	Date	Inv	Topic	HW Due
1	M	1/6	Inv A	Data distribution	Initial course survey
2	T	1/7	Inv B	Probability model	See HW 1 page
Chapter 1: Analyzing Statistical Processes					
3	W	1/8	1.1	Statistical significance	
4	R	1/9	1.1 cont	Mathematical Model	F: HW 1
5	M	1/13	1.2	Binomial test	
6	T	1/14	1.3	Application	
7	W	1/15	1.4, 1.5	Two-sided p-values, Confidence	
8	R	1/16	1.6	Power	F: HW 2
	M	1/20		**No Class**	
9	"M"	1/21	1.7	Normal approximation (CLT)	MP1 Proposal
10	W	1/22	1.8, 1.9	Standardizing (z-procedures)	
11	R	1/23	1.10	Confidence intervals	F: HW 3
12	M	1/27	1.12, 1.13	Sampling	
13	T	1/28	1.17, 1.18	Cautions/**Review**	
14	W	1/29		**Exam 1, Ch. 1**	
Chapter 2: Quantitative data					
13	R	1/30	2.1	Quantitative data	
16	M	2/3	2.4	Sampling distributions for means	Mini-project 1
17	T	2/4	2.5	Mathematical model (t-dist)	
18	W	2/5	2.6	Prediction intervals	
19	R	2/6	2.2, 2.7	Alternative methods	F: HW 4
Chapter 3: Comparing Proportions					
20	M	2/10	3.1, 3.2	Comparing two proportions	
21	T	2/11	3.3, 3.4	Types of studies	
22	W	2/12	3.6	Randomization test	
23	R	2/13	3.7	Fisher's Exact Test	F: HW 5
24	M	2/17		**No Class**	MP2 Proposal
25	T	2/18	3.8	Large sample procedure	
26	W	2/19	3.9	Relative Risk	
27	R	2/20		Inference for relative risk	F: HW 6
Chapter 4: Comparisons with Quantitative Variables					
28	M	2/24		**Review**	
29	T	2/25		**Exam 2, Ch. 2 and 3**	
30	W	2/26	4.1	Comparing groups	
31	R	2/27	4.2	Comparing population means	Mini-project 2
32	M	3/2	4.4	Comparing treatment means	
33	T	3/3	4.5	Two-sample t-tests	
34	W	3/4	4.7	Data transformations	
35	R	3/5	4.8	Paired designs	F: HW 7
37	M	3/9	4.9	Paired t-tests	
38	T	3/10		Sign test	
39	W	3/11	4.11	McNemar's test	
40	R	3/12		**Review**	F: HW 8
Final Exams: (1) Monday 10:10-1:00; (2) Wednesday 1:10-4:00					Mini-Project 3