Syllabus for Math 15, "Introduction to Statistics"

Course Information

Semester & Year: Fall, 2022
Course ID & Section #: Math 15 (D2998, D3361, D3362)
Instructor's name: Levi Gill
Course units: 4

Catalog Description

An introduction to basic concepts of descriptive and inferential statistics, with emphasis on the meaning and use of statistical significance. Students will use probability techniques to make decisions via hypothesis testing and will estimate parameters using confidence intervals. The course includes applications from a variety of technical and social science fields.

Course Student Learning Outcomes

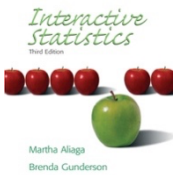
1. Accurately communicate statistical ideas using correct statistical notation, graphs, and vocabulary.
2. Use descriptive and inferential statistics to better understand real-world problems.
3. Demonstrate appropriate use of technology in making decisions based upon real-world data.
4. Read and interpret information that contains statistical analysis and be able to communicate these results.
5. Judge the validity of research reported in the mass media and peer reviewed journals.

Welcome to Class!

Statistics is an incredibly relevant topic in our society. It is used in news, business, politics, academic research, and in every field that uses data. Understanding statistics will not only further your educational and career goals, but help you be an informed citizen and consumer.

Textbook

Interactive Statistics by Aliaga and Gunderson



This is also a new addition to the Pelican Bay Scholars Program to help facilitate correspondence study. This is a classic and amazing textbook (at least as far as textbooks are concerned). Unfortunately, the authors have passed away and it's now forever immortalized in the 3rd edition, which you will be able to tell is a little dated based on some of the data that you'll be looking at. There are a few things I want you to know up front before you panic looking at the textbook!

- It is written as an *advanced* "beginners" textbook and goes into great depth in many topics. **There are times I'm going to tell you to skim a section**, which is my way of indicating that you need to get the gist of the section but don't get bogged down in the details (unless you want to, then by all means enjoy all it has to offer).

- One advantage of its age is that it still presupposes that you are using a TI-83/84+ calculator, which the Pelican Bay Scholars Program still does. **Calculator instructions will be demonstrated in both the weekly packets and the Calculator Handout**. One of the distinct disadvantages of correspondence is my inability to quickly teach and troubleshoot the calculator. Hopefully, those instructions will help alleviate some of that.

- There are **answers to most of the odd questions in the very back of the book**. That's a resource for you to use. There is a difference between *answers* and *solutions*. I want you to submit solutions that works out the problems which get you to the answer.

Additional Readings

In addition, these books will serve as supplemental resources to our textbook. You will find the assigned readings from these books under the *"Additional Readings"* heading in your weekly schedule.

Naked Statistics by Charles Wheelan

Naked Statistics is a New York Times Best Seller and seeks to explain statistics to people who haven't taken a statistics class – so you have an advantage over his target audience. Charles Wheelan uses modern examples and has a quirky sense of humor, and it provides a good overview of statistics and demonstrates its value to our modern context.

Statistics Done Wrong by Alex Reinhart

Statistics Done Wrong is written for those who have been introduced to the basics of statistics, and carefully explains the strengths and limits of the concepts we're learning. The limitations of statistics are something most textbooks rarely spend any time on, and that can be a problem. It's important to know you can only go *this* far and no farther. In my professional estimation, I wish everyone in academic study read this book. Additionally, Alex Reinhart provides oodles of examples of professional academic study from a wide variety of fields which also provides you a window into how statistics is being applied.

Weekly Homework

Lectures

Every week I will be sending in a packet my lectures and other materials. My lectures will be my way of navigating you through our textbook, and should *not* be used to skip reading the textbook. I will give you a ten-thousand-foot view of the material we're covering, work out some examples, and provide you with my personal musing about statistics in general. My lectures are way more entertaining in person, but I'll try my best on paper.

Textbook Readings

After you have read my lecture on the topic, you will be assigned portions of the textbook to read. This is going to be your main learning resource. You may have to read the sections a couple times for it to fully sink in. Also, the worked out examples are gold. Make sure you understand them.

There will be times the book may get a little too technical, and I'll let you know when and where you should skim. But by skimming, I still mean that you need to get the main point and the gist of how it works.

Homework

I have two types of homework. **General practice** and **challenge problems**. What's the difference? You'll have answers and solutions to the general practice in the back of the book, and the challenge problems won't have solutions – at least, not until return them.

I expect you to write up and submit full solutions to both types, but I'm going to grade **general practice** mostly for *completeness* (i.e., you did it), and **challenge problems** for completeness and *correctness*. In other words, I'm mostly trusting that you worked out the general practice problems and got the answer that matched the back of the book. In most cases the challenge problems are very similar to the general practice problems, so I'm going to be paying the most attention to those.

Answers and Solutions: How to use them for learning

There are **answer** to odd problems **in the back of the textbook**. There will be **solutions** in the **weekly packets**. These are written by textbook authors and will usually explain things in more detail. **These are tools for learning, so I expect you to use them**! But you want to use them in a way that helps you learn.

Learning is a physiological process, because your brain has to engage, build, and grow as you are learning. You know that feeling of being really tired when you study for a long period of time? That's literally because your brain is physically engaged in the process. Effective learning uses a process we call "productive struggle." If you aren't wrestling through problems, then your brain is probably not highly engaged. Think about it: if all you did was read a textbook and look at problems they worked out, the chances are you aren't actually learning in a deep and meaningful way. But if you read and look at problems, then tried it yourself, your brain engages – that's why it's hard! So to learn, to actually grow physiologically, you need that struggle.

But at the same time we want a *productive* struggle. It does no good to struggle in the dark, not knowing the goals or having help. So there's necessary balance between too hard and too easy. Having answers and solutions help maintain that balance – **but for this process to work, it takes a commitment from you**.

Here's how to approach the practice problems:

1) **Try it without looking at solutions or answers**, but make sure that you are fresh and familiar with the portions of the textbook that the question comes from. Look at examples.

2) Once you've tried it, check the answer in the back of the book. See how you did. If something is wrong, don't automatically jump to the solutions, but try to think about how your answer is different and see if you can fix it yourself.
3) If you can't figure out why you got a different answer, then look at the solutions in the homework packet.

After you've completed the problem, give yourself a moment to reflect on the process from the 10,000 foot view. What was the sticking point? Do you understand it now? This "post-game" analysis is almost as vital as the original productive struggle.

Reading Report

For the additional readings from *Naked Statistics* and *Statistics Done Wrong*, I'm going to provide a writing prompt in each week's packet that will ask you to respond to the ideas presented. The reading reports will be graded separately from homework problems.

Exams

I've broken up the class into Units. Roughly for every three chapters there will be an exam. This keeps the material from piling up into massive exams. The Final Exam will be cumulative, but emphasize material covered in the last unit. I am giving you two weeks for each exam, but you can submit them earlier if they are complete. Exams are open notes and open book(s), but you need to work on the problems individually.

Grading

Exams	**70%**
Homework	**20%**
Reading Reports	**10%**

A	$92 \leq Grade$
A-	$90 \leq Grade < 92$
B+	$87 \leq Grade < 90$
B	$82 < Grade < 87$
B-	$80 \leq Grade \leq 82$
C+	$78 \leq Grade < 80$
C	$70 \leq Grade < 78$
D	$60 \leq Grade < 70$
F	$Grade < 60$

Rubrics

Homework Problems

Completeness	**5 pts Excellent** All problems are complete and have full solutions	**4 pts** **Almost** All problems are complete, but some are missing full solutions.	**3 pts** **Missing Work** Some problems are missing.	**2 pts** **Needs Help** Some problems are missing, and/or *most* submitted problems are missing full solutions.	**1 pt** **Missing a Lot** I mostly see answers without solutions.
Correctness	**5pts** **Excellent** Your solutions are correct, or if you have mistakes, they are small miscalculations.	**4pts** **Technical Mistakes** Your problems have some errors, but they are driven by small conceptual misunderstandings of new material.	**3 pts** **Small Conceptual** The mistakes you are making are driven by small conceptual misunderstandings of old material.	**2 pts** **Serious Conceptual** The mistakes you are making are conceptual mistakes of material that has been well-covered.	**1 pt** **Point for Trying** You made a good-faith attempt on the problem, but there is a lot wrong.

Total Points: ___ /10

Reading Responses

Completeness	**5 pts** **Excellent** The prompt is fully answered, and if a page count was included, it was met.	**3 pts** **Mostly** The prompt was not fully answered, or if a page count was included, it was not met.	**1 pt** **Not Quite** The prompt was not fully answered, and if a page count was included, it was not met.

Total Points: ____ / 5

Getting Stuck, Getting Help

Here's where we strategize. The turnaround time between you getting stuck and then getting help is going to be slow. It's unfortunate, but it's the reality.

But I've built in some ways to mitigate it.

1) **How I grade the homework.** If you get stuck, the best thing is to still attempt the problem to the best of your ability, submit it, and let me know. It will be vastly easier for me to help you if I have more to work with. In the grading this works in your favor. If you look at the Rubric carefully, if you write up as much as you can for the problem and yet land in the wrong spot because of misunderstanding **new** concepts, you'll still get 70-80% on that homework assignment. In other words, I'm intentionally rewarding noble efforts even when you're making mistakes and reaching wrong answers… because that's an essential part of learning!

2) **Mastery is for the exam.** Your homework is about practice and feedback. Even the challenge problems are about learning the material, just with less information to go off of when you start. However, what you need to do is complete the loop. When you get the feedback, you need to make sure you take it in. This might be a crazy idea, but you might even try the problem again now that you know more just to make sure. Because at the end of the day, I don't expect mastery in the homework. I expect mastery to be demonstrated on the exam. Also, I give you *two weeks* to work on the exam.

3) **You don't need perfect mastery to pass the class.** You need a 70% to pass this class. Here's the bare minimum. If you do all the reading reports well (+20%), average 70-85% on all the homeworks, when it comes to the tests you need to average a 65% between the all of them to pass the class. But here's what I know from a lot of experience. If you are putting in a genuine effort, you are probably going to do better than 70% on the homework, and you're probably going to do better than 60% on the exams, which means you're going to do better than *just* passing. Keep that big picture in mind!

So here's my point: by raw effort you're probably going to do ok. Getting stuck is part of the learning process and I have built in a *ton* of room to get stuck and still be ok. So let me know what you're struggling with and let's get you ready in time for the exams.

Keep Notes!

Statistics is notorious not for its depth of topics but for **how much there is to remember**. Here's my advice, as you learn, create your own personal Statistics Reference Book. In your Reference Book, summarize what you are learning *and where it's at* (book titles with page numbers). Write definitions, examples, and instructions of things that you learn in this course.

Also, on the somewhere towards the front or back – somewhere easily findable – dedicate a page to making a *variable dictionary,* where you write down the weird symbols with a definition next to it.

For example, "Σ – *capital sigma* means to add up all the values to get the sum." As we go through the class, I'll try to remember to indicate which things should go in there.

What Constitutes Cheating (please read!)

This is something I really wish I didn't have to write, but this is my fourth semester using the correspondence modality, and every semester I have had to address serious issues of students copying each other's work.

Copying
If you are lucky enough to find someone taking this class with you, that is great! *You should take advantage of having someone to work with*. However, here's what I expect: you each do your own work.

What I mean is that I do **not** want you to **copy** another person's work. You can talk about it, but your work should be your own. Even though it will *feel* like you're learning something, you won't be learning as much as you think you are and will create a cycle of dependence on someone else's work.

- If two people are **copying homework**, I'll send a note saying that I feel that the work is too closely aligned. After that, I'll start giving zeros on the homework. However, there are zero reasons for reading reports to be copied or look similar. Every person should be reading it and writing it on their own, not copying someone else's work. Copying reading reports will result in zeros without a warning.
- If two people **copy exams**, I'm going to give zeros on both exams.

Academic dishonesty, as defined by College of the Redwoods, includes copying someone else's work *and letting your work get copied*. So don't let yourself be copied!

Using Solutions from the Previous Semester
You may know someone who has already taken this class. That person may have solutions from the previous semester for the *Challenge Problems* and have offered them to you. You are not supposed to have solutions to the Challenge Problems until after you have tried them. This is the only way for me to know what you do and do not know leading up to the exam. If you're copying my old solutions, and you actually don't understand something, you're going to have a hard go on the exams.

- If your homework follows my previous semester's solutions, I'll send a note saying something to that effect. After that, I'll start giving zeros.

If this becomes a widespread issue, then I'm going to having to start assigning more problems than I have in previous semesters.

Benefit of the Doubt
In most cases where I see vague similarities between two students, I give it the benefit of the doubt because similarities can happen. There really has to be something that stands out as significant for me to start acting on it.

About Your Instructor

I am a College of the Redwoods alumni! I have been teaching for College of the Redwoods for 12 years, and I joined the Pelican Bay Scholars Program in 2017. I like teaching *a lot*. In my estimation, there's really nothing quite as rewarding than helping people grow and achieve their goals.

I have Bachelor's degree (B.A.) in Mathematics, a Masters of Science (M.S.) in Mathematical Modeling, and a Masters of Divinity (I'm also a pastor). Basically, I've spent a lot of time in higher education. I have academic experience in what are considered "pure" and "applied" mathematics. In applied mathematics, my research was in using advanced statistical models to forecast the spread and damage of forest fires, but I ultimately left a very short tenure in research to teach. Since then, that field of study has become a really hot topic (yes, pun intended!) because of the increase of wildfires due to local policy practices, naturally occurring global weather patterns, and the effect of pollution on our environmental systems.

Alongside teaching, I am a regular speaker and workshop presenter for the California Acceleration Project (CAP), a non-profit organization seeking to remove structural barriers in the community college system that have negatively impacted student success.