

Math 314 Fall 2022
Probability and Statistics

Instructor: Dr. Kathy Temple

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Office Hours: MW 10 - 10:50AM, TTh 1- 1:50PM, and by appointment. Office hours are available either in-person (mask required!) or over Zoom.

Meeting times: MTThF and some W 9 - 9:50AM in SAMU 116; most W 9 - 9:50AM in SAMU 138.

Course Prerequisites: Math 173, or permission of the instructor.

Course Goals: This course is a calculus-based introduction to probability and statistics. At the end of the course, you will be able to:

- Apply the basic rules of probability to calculate probabilities.
- Calculate probabilities and moments for continuous (calculus here!) and discrete distributions.
- Use sampling distributions and limit theorems to calculate probabilities for sample means and proportions.
- Apply confidence intervals, hypothesis tests, and other statistical tools to real data sets.
- Choose the appropriate statistical tool for a given situation.
- State statistical problems and results clearly and correctly (yes, this means writing!).

Required Text: Diez, et. al. *OpenIntro Statistics*, 4th edition. The text is available for free as a PDF download, or can be ordered as an inexpensive paperback if you would prefer a paper copy. Note that while there is a suggested price, you can set the price to zero using the slider and get the book for free. In addition, we will be using sections of *Miller & Freund's Probability and Statistics for Engineers* for some of the calculus-based material; I will provide those sections.

Sections Covered: The following is a list of sections we will cover, in the order I expect to cover them in. I have abbreviated *OpenIntro Statistics* as OS below, and *Probability and Statistics for Engineers* as PSE.

- OS 1.2 (Data Basics).
- OS 2.1 and 2.2 (Summarizing numerical and categorical data).
- PSE 3.1, 3.3, 3.4, 3.5, and a bit of 3.6 (Basics of probability).
- PSE 4.1, 4.2, 4.4, and some of 4.6 and 4.8 (Discrete random variables and some special families).
- PSE 5.1, 5.2, 5.5, and 5.7 (Continuous random variables and some special families).
- OS 3.4 (some of) (Rules for means and variances).
- OS 5.1, 5.2, and 5.3 (Introduction to statistical inference and sampling distributions; sampling distributions and inference for a population proportion).

- OS 6.1 and 6.2 (Inference for one and two proportions).
- OS 7.1 and 7.2 (Inference for population means).
- OS 8.1, 8.2, and 8.3 (Regression).
- OS Selected topics.

Calculator: You will need a calculator that performs at least the standard scientific functions.

Evaluation and Grading: Grades will consist of the following components: weekly lab write-ups (25%), homework assignments (25%), two midterm exams (15% each), and a comprehensive final exam *or* final project (20%). Tentative exam dates are Wednesday, October 19 and Wednesday, November 9. If you choose to do the final exam, the in-class portion will be given from 8 - 10AM on Wednesday, December 7. You will have the option of replacing the final exam with a final project; some detail is below and more information will be provided later. Grades will be assigned according to the following scale:

		A	100-93%	A-	92.99-90%
B+	89.99-87%	B	86.99-83%	B-	82.99-80%
C+	79.99-77%	C	76.99-73%	C-	72.99-70%
D+	69.99-67%	D	66.99-63%	D-	62.99-60%
		F	59.99%		and below

Details concerning course components

Lab Assignments

The lab each Wednesday will include questions to be answered, including relevant statistical analyses. Your lab write-ups must be submitted through Canvas by 5PM on Mondays. Lab write-ups must be typed, written in complete sentences, and follow the general guidelines for written work given below.

We will be making use of the statistical software R in class, and you will be using R for labs and exams. R is a free, open-source software package that is incredibly powerful. I strongly recommend the interface R Studio and this is what I will be using and demonstrating in class. R has a bit of a learning curve, but it's well worth working through! We typically use R in the advanced statistics courses in this department, and it's becoming more and more of a standard in industry and other disciplines.

Homework There will be two types of homework for this class. The first will be reading assignments from the text, which will include a few questions to be answered, posted as a graded discussion on Canvas. Your assignment is to answer these questions by the due date (generally 7AM of the day that I want to discuss that section in class). These assignments may be given with a turnaround time of a day or two. The second type of homework will be homework assigned from the text. Homework assigned from the *previous Thursday* through the *current Tuesday* will be due by 5PM on Friday. I'll remind you about due dates as things are assigned! There may be some exceptions to this pattern for exam weeks and the first and last weeks of class.

Exams

There will be two mid-term exams, with tentative dates Wednesday, October 19 and Wednesday, November 9. Each exam will have two parts: an in-class component and a take-home lab component. The in-class component will be given in-class on the day stated. Guidelines for the exams, including what you are allowed as resources, will be given closer to the first exam.

The lab component will require use of R and RStudio. It will become available after class on the day of the in-class exam and is due by 5PM on the day after the exam (Thursday). This component will not have a time limitation beyond the time that it is due, but you should expect it to take you around an hour. For the lab portion of the exam, you may use written or online resources, but *may not consult with any other people, virtually or otherwise*.

Any changes to the tentative exam schedule will be announced in advance. Make-up arrangements must be made prior to an exam unless you can document an unexpected circumstance beyond your control that prevented you from taking the exam. All make-up exams must be requested as early as possible. Exams requested more than 24 hours after the scheduled exam will be given only in extreme extenuating circumstances (e.g. hospitalization, jail . . .) When a make-up exam cannot be taken in a timely manner, typically before exams are returned to the class, I reserve the right to instead replace that portion of the course grade with the final exam grade.

Final Exam/Project

The final exam will be cumulative and in a similar format to the midterm exams. The in-class portion will be given on Wednesday, December 7 from 8 - 10AM. The lab portion will be released at 10AM on Wednesday, Dec. 7 and will be due by 5PM on Thursday, Dec. 8. *If you know that you will not be able to complete an exam during these dates/times, you should plan on doing the final project instead.* Both in-class and lab components will have guidelines similar to the midterms.

You will have the option of replacing the final exam with a final project. This will involve writing a proposal, conducting an experiment to gather data, and analysing the data using the tools from this class. More details about this will be given as the quarter progresses, but expect some interim deadlines during the quarter (proposal, collection of data) and then the final project to be due by 5PM on Wednesday, Dec. 7.

General Course Policies: Come to class. Do your own work. Work really hard; this is not going to be an easy course, but you will leave it with a useful set of skills, and a better understanding of statistics!

Masks: Masks are welcome and encouraged at all course activities, and I will likely be masking throughout the quarter. Please note that I am *requiring* masks for in-person meetings in my office, since it's a small space. If you would prefer not to wear a mask, I would be happy to set up a Zoom appointment with you.

COVID Vaccinations: In accordance with Proclamation 21.14.1, CWU requires COVID vaccination for all current employees and students. Medical and/or religious accommodation requests will be considered. All employees and students are strongly encouraged to receive whatever boosters they are eligible for. There will be vaccination and booster clinics on Friday, Sept. 23 from 9AM - 1PM and Friday, Oct. 21 from 11AM - 3PM, both in SURC 137 A/B.

Written Work: All work handed in for the course must be written neatly, legibly, clearly, using correct mathematical notation, and with sufficient explanation. A good rule of thumb is to write your solution so that a classmate who knows roughly what's going on in the course but doesn't know how to do this particular problem can understand your solution. As a side benefit, this makes it much more likely that you will be able to understand your solution when you go back to study for exams! The bottom line: for any written work handed in for the course, including lab write-ups, exams, and homework, *you must show your work*.

Late Work: No late homework will be accepted, but the lowest two homework scores will be dropped, because life happens. Lab assignments can be submitted late with a 20% penalty per 24-hour period, up until the time that graded labs are returned to the rest of the class. Labs submitted after graded work is returned to the rest of the class will not receive credit, however, the lowest lab score will be dropped. See the Exams section above for the make-up policy for exams.

Submitting Work Electronically: All work for this course aside from in-class exams will be submitted electronically through Canvas.

- Labs write-ups and the lab components of exams are required to be typed and may be in .doc, .docx, or .pdf formats only. If you are using an alternate word processing program, please make sure that you know how to generate one of these formats.
- R scripts (labs, lab components of exams, and projects) are to be submitted as either RStudio scripts (.r files) or RMarkdown files (.rmd). They may not be submitted as text files.
- Homework can be submitted in pdf format ONLY.
- If you choose to hand-write your homework, you have a few options:
 - You can scan it to a PDF document using a cell phone camera. Some apps that do this (there are many others if you don't like these): Adobe (free) or CamScanner (free version) for Android phones; the Notes App (built-in) or CamScanner (free version) for iPhone.
 - You can take a well-lit, easy-to-read photograph, insert it into a Microsoft Word or OpenOffice Writer document, make sure that the photo is oriented correctly and easy to read, and then save the document as a .pdf file for upload to Canvas.
 - For any handwritten work (homework, quizzes, or exams), if your work is multiple pages, please upload as a SINGLE file.

Whichever method you choose, please double-check that your image is oriented correctly. Images not oriented correctly or images that are not easy to read will lead to the assignment being returned without being graded.

Contingency Planning: In the event that we are unable to meet in person (this could be due to the university shifting entirely to remote coursework, inclement weather or wildfire smoke closures, or because I need to isolate), this course will convert for the necessary time period to a *synchronous* online course using Zoom. This means that you will be expected to continue attending class at the scheduled times, but we will meet using Zoom rather than in-person. In the event that a period of remote learning includes a course assessment, I may change the format of the assessment if necessary.

Illness: If you are feeling unwell for any reason, *please, please, please stay home*. Being vigilant about this will help prevent the spread of COVID-19 (and other bugs!) and allow us to continue in-person classes.

Academic Honesty: Consult university policies (CWUP 5-90-040(22), CWUR 2-90-040(22), and WAC 106-125-020) for student conduct, cheating, plagiarism, and other academic expectations. CWU's policies and recommendations for academic misconduct will be followed, leading to disciplinary action up to and including failing the course.

Inclusivity Statement: As a member of a peer learning community, a high degree of professionalism is necessary. **CWU expects every member of the university community to contribute to an inclusive and respectful classroom culture.**

Classroom Conduct: Students in this class are expected to interact with students and the professor professionally. Instances of disruptive conduct, obstructive conduct, or harassment (see definitions below from the Washington Administrative Code: WAC 106-125-020) will be referred to the Dean of Student Success.

Disability Support Services: Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations: Hogue Hall 126, 509.963.2214, DS@cwu.edu

Is my absence excused? Excused absences will not lower your overall grade in this class and are determined on a case-by-case basis. Excused absences include illness, bereavement, and school-related activities. With the exception of illness, documentation is required. Excused absences do not include travel for holiday breaks, work, or non-emergency travel delays. In compliance with RCW 28B.137.010, Central Washington University makes every effort to deal reasonably and fairly with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Students must present written notice to their instructor within the first two weeks of class listing the specific dates on which accommodations are required. Contact the Dean of Student Success at (509) 963-1515 for further information or questions.

Communication: While we all hope for a smooth quarter, we know that best-laid plans can go awry! Some of us may need to quarantine or isolate in the middle of the quarter. We all may need to shift entirely remote on short notice (and it may be worth thinking in advance about how you would make that work, both in terms of technology and in terms of being able to attend class and complete work remotely). In all things, communication is going to be key. If you have something going on, please let me know (no details you don't feel comfortable sharing, of course, just a general heads-up). As things need to change during the quarter, I will do my best to let you know as soon as I can. In all things, please extend grace to me and your classmates, and I will do my best to do the same.

I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.