

Math 314 Fall 2020
Probability and Statistics

Instructor: Dr. Kathy Temple

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Office Hours: MTTh 10 - 10:50 AM, W 12:30 - 1:30 PM, and by appointment.

Meeting times: If you choose to attend in person, MTThF 11 - 11:50 in Samuelson 251; W 10 - 12:30 (or any subset of that window) in Samuelson 138 Computer Lab (unless otherwise announced). Otherwise, plan on being on Zoom from 11 - 11:50 on MTThF.

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: *Exploring the Practice of Statistics*, Moore, McCabe, and Craig; Freeman. Any version of this text is fine, and you do not need an access code. 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 *Exploring the Practice of Statistics* as EPS below, and *Probability and Statistics for Engineers* as PSE.

- EPS 3.1, 3.1 (One-variable descriptive statistics).
- EPS 4.1, 4.2, 4.3, and 4.4 (Two-variable descriptive statistics and regression).
- 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).
- EPS 5.4 (some of) (Rules for means and variances).
- EPS 6.1 and 6.2 (Introduction to statistical inference and sampling distributions; sampling distributions and inference for one and two population proportions).
- EPS 7.1 and 7.2 (Sampling distributions and inference for one and two population means).

- EPS Chapter 8 - selected topics.
- EPS Chapter 9 - 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 (20%), three check-in quizzes (5%) two midterm exams (15% each), and a comprehensive final exam *or* final project (20%). Tentative exam dates are Tuesday, October 6 and Tuesday, October 27. If you choose to do the final exam, the written component will be on Thursday, Nov. 19. 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 above.

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

I'll assign homework from the text as we finish each section. 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 week and the first and last weeks of class.

Quizzes

There will be three check-in quizzes during the course of the quarter, tentatively on September 22, October 20, and November 12 (all Tuesdays). These are really designed to let you practice the mechanics of doing a timed written assessment in a lower-stakes way, before we get to exams! The quizzes will be set up using the quiz feature in Canvas. There will be a 12-hour window during which you can take the quiz, and once you start it you will have 30 minutes to complete it. The quiz itself will be a pdf document that you can either print and write on or write on your own paper. The actual problems should only take 10-15 minutes - the goal is to have time to practice downloading/saving/uploading, in addition to giving me a quick check on what you know! For the quizzes, you may use your text and any of your personal notes, but *no other resources*. See course policies, below, for requirements for submitting handwritten work.

Exams

There will be two mid-term exams, with tentative dates Tuesday, October 6 and Tuesday, October 27. Each exam will have two parts, a written component and a lab component. For the written component, you will have a two-hour window in which you can take the exam (beginning 30 minutes before the scheduled class time and ending 30 minutes after the scheduled class time), and once you start you will have 50 minutes to complete it. As with the quizzes, the exam will be a pdf document that you can either print and write on or write on your own paper. For this component of the exam, you may use your text and any of your personal notes but *no other resources*. See course policies, below, for requirements for submitting handwritten work. For the written component, *provided that it is permitted by public health guidelines*, you can take the exam in-person during the scheduled meeting time.

The lab component will require use of R and RStudio. It will become available after the end of the window for the written component and is due by 5PM on the day after the exam (Wednesday). 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*.

Final Exam/Project

The final exam will be cumulative and in a similar format to the midterm exams. The written portion will be given on Thursday, November 19, between 8 and noon (allow a 2-hour block within that span for completing the final). The lab portion will be released at noon on Thursday, November 19 and due by 5PM on Friday, November 20. *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 written 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 noon on Thursday, November 19.

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!

Face Coverings and Social Distancing: Due to COVID-19, and under the directive and mandate of public health officials and the president of Central Washington University, students must adopt face covering protocol before entering any classroom or building at CWU until further notice. Students must also follow the social distancing placement marks in buildings and classrooms. If you do not have a face covering Central Washington University can provide one for you. If you have not yet received your CWU-supplied facial covering, please go the SURC Information Desk. Please do so prior to the start of your first class. Face coverings must cover both the mouth and nose. Your mask protects me; my mask protects you. Masks with one-way valves for exhalation don't have the protective value for others - please don't use them as your face covering for any in-person components. Thank you for helping keep all of us safe!

Class Recordings: Lecture/discussion will be recorded and posted on Canvas for those who can't attend synchronously on a given day. Please plan on attending synchronously on an ongoing basis, however. We all benefit from the conversations in-class, and they will be richer for having you there!

If you are attending virtually, please turn on your camera if that is reasonable given your situation, bandwidth issues, etc. If you cannot turn on your camera, please use a profile picture on Zoom that matches your profile picture on Canvas (and please put one up on Canvas) so that we don't have to look at a sea of initials!

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 homework score 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. If you have extenuating circumstances around the quizzes, midterms or final, I encourage you to communicate with me as soon as possible; see the section on communication, below. In cases where a make-up midterm is warranted and cannot be completed before graded work is returned to the rest of the class, I reserve the right to replace that portion of your final grade with the final exam.

Submitting Work Electronically: All work for this course 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, and projects) are to be submitted as either RStudio scripts (.r files) or RMarkdown files (.rmd). They may not be submitted as text files. This applies to code submitted with labs and take-home exams and to your R Journal.
- If you choose to type your homework, it should be in one of the formats for lab write-ups, above.
- If you choose to hand-write your homework, and for hand-written quizzes and exams, you have a couple of options for submission:
 - 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 .doc, .docx, or .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.

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: This is going to be an unusual quarter in many ways. Some of you are completely remote. Some of us may need to quarantine 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.