

Statistical Methods in Engineering and Science, STAT 390

This is a fluid syllabus, so check frequently for changes in **colors**

Course webpage: <http://www.stat.washington.edu/marzban/390/spring21/>

Section	Name (Office)	Email	Off. hours
.	Caren Marzban (PDL B318)	marzban at uw.edu	M 10-11, Th 2:30-3:30
A(8:30) & B(9:30)	Jerry Wei	zwei5 at uw.edu	M 12:30-1:30, Th 9:30-10:30
C(1:30) & D(2:30)	Qiliang Chen	qlchen at uw.edu	M 11:30-12:30, Th 10:30-11:30
Grader	Sandy Yang	yang21 at uw.edu	M. 9-10

Textbook: *Applied Statistics for Engineers and Scientists (3rd Edition)*, by Devore, Farnum, and Doi. Check www.cengagebrain.com (we will not cover Chs 4, 6 and 10.)

Buzz words/concepts: Data, histogram vs. distribution, mean vs. expected value, sample standard deviation vs. population standard deviation, sampling distribution, distributions (binomial, Poisson, exponential, normal/gaussian, chi-squared, etc.), scatterplot, correlation, regression and classification, neural networks, estimation, prediction, inference, confidence interval, prediction interval, hypothesis/significance testing, 1-way anova, and more, **involving calculus**.

The On-line World:

With online/recorded classes, we now live on one more slippery slope: You will be tempted to skip lectures at their regular times with the hope that you'll watch them at a later time. That is a dangerous practice and will most likely lead to a back-log of lectures that you'll have to watch in a short period of time. Then, you'll start fast-forwarding, cutting corners, etc., all of which will hurt you. **So, please attend your lectures during their regular times.**

Grading:

The final 4-point-scale grade is based on a "Score" defined as the weighted sum of the following, each one in percent:

Homework	10% (after dropping ONE lowest grade; some hws may get combined)
Quizzes	15% (after dropping ONE lowest grade)
Test 1	23% (mostly comprehensive)*
Test 2	25% (mostly comprehensive)*
Test 3	27% (mostly comprehensive)*

* I may assign the highest weight to the highest test score.

The final grade will be based on a "curve"; I will explain this in class, but an explanation is given on the course website, as well. **Completing all 5 items is an absolute requirement for passing.**

If a significant number of hw/qzs is missing, the final grade will be divided by 2.

Homework: There are TWO sources: 1) book problems, 2) lecture problems.

- Most of the former will be selected from a "master list" which is already posted (along with solutions) on the course website; the latter will appear in each lecture.
- To assure you don't miss anything **check the bottom of the course website on a daily basis.**
- Problems will be assigned daily (MWF) after class, and are **due every Monday 2:20pm**. Only the assignments from the previous week are due: M,W,F \rightarrow M; etc.
- Begin working on the assignments as soon as they are posted, to assure they don't accumulate; the hw load in this class is **quite heavy**.
- Hws are open note/book/web/everything, but I do NOT encourage collaboration.
- After you turn in your HW, **consult the posted solutions**. That will give you a sense of **how** we want you to answer problems on the HWs and tests.

Quizzes and Lab/Pre-Lab:

- This class involves computing in (and only) R/Rstudio (see course website).
- INSTALL R/Rstudio ON YOUR COMPUTER BEFORE YOUR LAB/QZ SESSION ON T.
- R is not a pre-req, but you'll have to learn it.
- Many of the hws and all of the lab/quizzes will require R.
- Every Friday, a pre-lab will be posted on the course website (these prelabs are extracted from the "lab book" which is already posted on the course website; so you can work ahead if you'd like).
- You must go over prelab on your own BEFORE your lab session.
- The first ~ 5 min. of the lab session is for Q&A on the pre-lab, followed by a quiz.
- The quizzes are open-everything (including lab book and past quizzes); **BUT**
- **CLOSED to collaboration with others.**
- You must attend your own lab session.

Tests: The three tests

- are **open everything - except for communicating with someone else**, and are intended to fill the allotted time. As such, you should not waste time on searching the web, etc. Instead, make sure you are organized (e.g., with a note sheet) before starting the test.
- will be taken on Canvas/Zoom, and **you may have to turn on your camera during the test.**
- involve a mix of multiple-choice and proof/derivation problems. In the latter, it is the **shown work** that gets graded; a correct answer without shown work will get no credit.
- **All past tests and solutions are already posted on canvas.** A good way to study for tests is 1) do problems from past tests, 2) do hw problems, 3) read the text book and lecture notes, and 4) attend lectures. Items 3 and 4 are important for the conceptual part of the tests.

General Policy: You'll find me reasonably flexible, with emphasis on *reasonably*. I don't want this syllabus to look like a legal contract. Just do what you are supposed to, and don't do what you are not supposed to; and you know what those are! In general

- No makeups. In case of emergency, provide 2-week prior notice.
- No late homeworks/quizzes/tests.
- **No cheating/collaboration on tests/quizzes (I'm quite inflexible on this one).**

Final comment 1: This course is NOT a math course, but it has a lot of math. It involves a lot of words, qualitative, fuzzy, almost-ambiguous, nonlinear thinking. In fact, I will show data from previous quarters suggesting that mathematical ability is NOT correlated with performance.

Final comment 2: I will follow the text book closely. You are expected to have read the material of the day before I go over it in class. As such, the purpose of my lectures is to review, and to highlight some of the more important but less obvious issues. **Following and understanding the book and the lectures is necessary but NOT sufficient for understanding the material; you also need to do more problems from the master list and past tests.**

Final Comment 3: At the risk of being rude, let me propose one thing for your consideration. Learning and teaching both require complex trade-offs which are best left for the respective participants. So, I propose that we leave learning to you guys, and teaching to me. It suggests that students should focus on learning, and not on making suggestions for how teachers should teach. I really do believe this approach serves the students better. That said, I will be asking for your feedback at various times through the quarter; so, save your suggestions until then.

Standard paragraphs about accommodations, and Code of Conduct ...

<https://registrar.washington.edu/staffandfaculty/syllabi-guidelines/>

<https://www.washington.edu/studentconduct/conduct-code-and-policy/>

Daily schedule for the whole quarter: **It is tentative, so CHECK FREQUENTLY!**

Lecture	Date	Reading	Topics	Notes
1	3/29	1.1-1.2	Deal with ambiguity	In 1.2 skip stem-and-leaf.
-	3/30	Lab 1	Ch. 1 in text book.	
2	3/31	1.2-1.3	Random variable	
3	4/2	1.2	types of variables/data Histogram & probability	Skip 1.5
4	4/5	1.3, 2.3	Distribution & probability	and quantile, boxplot
-	4/6	Lab 2	Ch. 1,2 in text book.	
5	4/7	1.3-1.4	Normal distr.	Skip “Boxplots That Show Outliers”
6	4/9	1.4, 1.6	Discrete distributions	
7	4/12	2.1, 2.2	Binomial distr	
-	4/13	Lab 3	Ch. 1,2 in text book.	
8	4/14	2.2, 2.4	sample mean & variance	
-	4/16	TEST 1	Up to lecture 6 (inclusive)	
9	4/19	2.2, 2.4	distr mean & variance	and qq-plot
-	4/20	Lab 4	Ch. 2	
10	4/21	3.1-3.2	scatterplot and correlation	
11	4/23	3.3	regression	Skip “Smoothing a Scatterplot” (p.137)
12	4/26	3.3	ANOVA decomposition	R^2, s_e
-	4/27	Lab 5	Ch. 2,3	
13	4/28	3.4	polynomial & transformation	and overfitting
14	4/30	3.5 & 11.4	Multiple regression (interaction/collinearity)	Skip “General Additive ...” (p.146), & 3.6
15	5/3	5.5-5.6	Sampling dist.	
-	5/4	Lab 6	Ch. 3,5.	
16	5/5	7.1-7.2	CI for distr/pop mean	
17	5/7	7.2-7.3	CI for distr/pop proportion	Skip pages 321-324, & 7.6
18	5/10	7.4	t-based CI for μ_x	
-	5/11	Lab 7	Ch. 5,7	
19	5/12	7.5	2-sample CI	and paired designs.
-	5/14	TEST 2	emphasis on lects 7-17.	
20	5/17	8.1-8.2	p-value	Skip 8.4 and subsecs on p. 403 and on 405
-	5/18	Lab 8	Ch. 7,8	
21	5/19	8.2	2-sample test	
22	5/21	8.3	chi-squared tests	
23	5/24	9.1-9.2	1-way ANOVA	We may do 9.3 in the lab.
-	5/25	Lab 9	Ch. 8,9	
24	5/26	11.1-11.2	inference on coeffs	Skip “Qualitative...” p.539, “Eliminating ...” p.
25	5/28	11.2 and 11.5	F-test of model utility	
-	5/31	NO CLASS	Memorial Day	
-	6/1	Lab 10	Ch. 8,9,11	
26	6/2	11.3	CI & PI for $y(x)$ & y^*	Skip 11.6 except “Model Sel...” p.559 don’t skip “Multicoll...” p.563
-	6/4	off hr for last hw set	Neural Nets canceled	
-	6/8	TEST 3	emphasis on lects 18-26	Tues. 2:30-3:20