CE 2251: Probability and Statistics in Civil Engineering
Spring 2019
MWF (2:30-3:20 PM) CAST 212

Instructor
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Communication

When using email to communicate with your UA, TA or Instructor, put CE-2251 in the subject
of the email.

Course Objective
The objective of the course is to introduce concepts and approaches from the field of probability
and statistics that can be applied to the analysis of problems in civil engineering.

Course Outcomes
Students are expected to be able to do the following at the successful completion of the course:

1) Quantitatively and qualitatively describe data from experiments
2) Identify random variables for a given experiment and properties of random variables
   including mean, variance, and probability of events
3) Select appropriate distributions to represent the population being analyzed in an experiment
4) Identify appropriate statistics for summarizing data from experiments: subsequently
   estimate confidence intervals, and test hypothesis
5) Estimate relationships between dependent and independent variables and interpret results

Prerequisite
Recommended preparation: MATH1122 or 1132 (or approved substation) – generally it is required that the students have a background in calculus.

Textbook(s)
Primary Textbook: Probability and Statistics in Civil and Environmental Engineering, customized for UConn Students, available at the campus bookstore.

Supplementary Textbook: Navidi, W. Statistics for Engineers and Scientists, 4th Edition, McGraw-Hill, 2015

Other Course Materials
In class lectures, videos, and other materials will be made available on the HuskyCT course website.

Course Format
Hybrid/blended course design meaning that the course content is delivered using two modes:

1) In-class lectures and activities (reviews, practice); class meetings on Mondays and Fridays
2) Online video lectures and other online materials; on-line class material will be available on Wednesdays

Grading
The assessment will be based on class participation, homework assignments, two midterm exams and a final exam. I will provide feedback on your grades after each exam.

Component	Weight
In-Class Quizzes	8%
Homework	12%
Exam 1	20%
Exam 2	20%
Final Exam	40%
Total	**100%**

The final project will allow the students to receive a maximum of 2% extra credits.

Homework
- There will be a total of 10 homework assignments. Homework assignments open on HuskyCT after class on the date they are assigned and are due by 6:00PM on the due date noted in the class schedule.
- Homework format:
  - Write your name on your homework set
  - Use only letter sized paper, or engineering notebook paper
  - Clearly identify the problem number before writing up the solution for the problem
  - Solutions to homework problems must be written-up following the assigned order of problems
  - Include statistical software output as appropriate
  - Write neatly or type up your solutions to ensure they are legible when scanned! If illegible, your homework will not be graded!!

- o Submit your HW in .docx or pdf format; please DO NOT submit your homework scanned upside down or in .jpeg format; this allows us to write comments on your submitted homework
- Homework grading:
  - o Grading is going to be conducted by the UA
  - o Each question that does not receive full credit will be marked with a note providing the correct answer to that question and the number of points deducted.
- Homework submission:
  - o Because solutions are automatically released on HuskyCT after the due date, <u>late submissions will not be graded</u>
- While we encourage collaboration, copying and/or any form of cheating will not be tolerated and <u>will result in a zero</u> on the assignment for every student involved. See *Academic Integrity* section below

Quizzes

In-Class: There will be four (4) in-class quizzes throughout the semester as shown on the schedule. These quizzes are intended to test your understanding of the material and help the instructor identify problem areas that might need additional review.

Project

There will be one **optional** project during the semester based on a topic of your choice. The project requires use of Matlab or Excel; we will have Matlab tutorial section(s) to review Matlab commands and options. I will be available to answer questions and guide you through the project. All you need to do is ask!

The project will allow the students to receive a maximum of **2%** extra credits. Completing the project will also help you understand more in detail the course material, and prepare for the final exam.

Exams

- There will be two midterm exams and a final exam
- <u>No make-up exams will be offered without prior arrangement with the instructor.</u>
- The final exam is going to be three parts:
  - <u>First part</u> covers same subjects covered in midterm 1,
  - <u>Second part</u> covers same subjects covered in midterm 2,
  - <u>Third part</u> covers subjects taught after midterm 2.

  If you are satisfied with your grade on a midterm, you have the option not to take that part in the final exam and use the grade from your midterm.
- Students must adhere to University regulations regarding final exams.

Class Conduct

- This course is fast-paced and cumulative! Keep current with the course content—do not fall behind or if you do, catch up quickly!
- Attend classes, view the online course content, prepare for class, participate in classroom exercises and discussions, and ask questions!
- This is a large class so please be respectful of your fellow students, and your instructor's time. All students that participate in the class are expected to be respectful towards others

and their views. <u>Distracting behavior will not be tolerated and will lead to a deduction of up to 20 points from the final grade.</u>

- Use of technology and devices including laptop computers, cellphones or tablets during exams and lectures is not allowed. Please turn your cellphones to silent mode at the beginning of the class.
- Students are expected to conduct themselves in accordance with UConn's Student Conduct Code (http://community.uconn.edu/the-student-code/).

Academic Integrity Statement

This course expects all students to act in accordance with the Guidelines for Academic Integrity at the University of Connecticut. Because questions of intellectual property are important to the field of this course, we will discuss academic honesty as a topic and not just a policy. If you have questions about academic integrity or intellectual property, you should consult with your instructor. Additionally, consult UConn's guidelines for academic integrity.

Students with Disabilities

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the UConn's Center for Students with Disabilities (486-2020 or at http://csd.uconn.edu/) as soon as possible to better ensure that such accommodations are implemented in a timely fashion. In addition to contacting CSD, please do not hesitate to talk with the course instructor so he/she may work together with CSD to implement accommodations.

Collaboration Policy:

Students are encouraged to work together (in groups of 2 or 3) on homework assignments in the interest of gaining better understanding of the material. However, any evidence of direct copying will result in a zero homework grade for all involved parties.

Copying from solutions manuals will also result in a zero homework grade. Collaborating on exams will result in an F for the course for all parties involved.

Final Exam Policy:

In accordance with UConn policy, students are required to be available for their final exam and/or complete any assessment during the time stated. If you have a conflict with this time you must obtain official permission to schedule a make-up exam with the Office of Student Support and Advocacy (OSSA). If permission is granted, OSSA will notify the instructor. Please note that vacations, previously purchased tickets or reservations, graduations, social events, misreading the assessment schedule, and oversleeping are not viable reasons for rescheduling a final.

Tentative Class Schedule

L = in-class lecture

V = on-line vide lecture (HuskyCT)
L/R/P = in-class lecture, review & practice

PR = project
QUIZ = in-class quiz
HW = homework

Week	Class	Date	Topic	Textbook Section (s)	HW Open	HW Due
1	1	1/23	L: Introduction	1.1 - 1.2		
1	2	1/25	L: Sampling/Summary Stats Intro			
2	3	1/28	L: Matlab Tutorial V: Summary Statistics V: Graphical Summaries	1.2 - 1.3		
2	4	1/30	V: Probability: Basic Ideas & Counting Methods	2.1 - 2.2		
2	5	2/01	L: Conditional Probability & Independence	2.3	HW #1	
3	6	2/04	L: Random Variables	2.4		
3	7	2/06	V: Continuous Random Variables V: Linear Combination of Random Variables	2.5		
3	8	2/08	L/R/P: Bring ideas/concepts together: Practice		HW #2	HW #1 DUE
4	9	2/11	*In-Class QUIZ-1 = Probability & Random Variables* L: Propagation of Error L: Distributions Intro & Bernoulli Distribution	3.1 – 3.2 4.1		
4	10	2/13	V: Binomial Distribution V: Poisson Distribution	4.2 – 4.3	HW #3	HW #2 DUE
4	11	2/15	L/R/P: Bring ideas/concepts together: Practice			
5	12	2/18	L: Normal Distribution	4.5		
5	13	2/20	L: Lognormal & Exponential	4.6 – 4.7	HW #4	HW #3 DUE
5	14	2/22	V: Principle of Point Estimation	4.9		
6	15	2/25	*In-Class QUIZ-2 = Distributions* L: Central Limit Theorem	4.11		HW #4 DUE
6	16	2/27	Review for Exam 1			
6	17	3/01	EXAM 1 (Ch. 1, Ch. 2, Ch. 3 and Ch. 4)			
7	18	3/04	L: Confidence Intervals Introduction and Intro to Confidence Interval for Population Mean	5.1, 5.3		
7	19	3/06	V: Confidence Intervals for Population Proportion V: Confidence Intervals for Difference between Means and Proportions	5.2, 5.4, 5.5	HW #5	
7	20	3/08	L/R/P: Bring ideas/concepts together: Practice			
8	21	3/11	L: Hypothesis Testing Fundamentals	6.1		
8	22	3/13	L: Hypothesis Testing for Population Mean & Proportion	6.2 – 6.3		HW #5 DUE

8	23	3/15	L: Hypothesis Testing Small Samples	6.4	HW #6	
9		3/17-23	Spring Recess - No Class			
10	24	3/25	L: Hypothesis Testing for Difference between Means and Proportions	6.5 – 6.6		
10	25	3/27	L: Hypothesis Testing for Small Samples & Paired Data	6.7 – 6.8	HW #7	HW #6 DUE
10	26	3/29	V: F-test for equality of Variance V: Chi-Square Test	6.10 – 6.11		
11	27	4/01	*In-Class QUIZ-3 = Confidence Intervals & Hypothesis Testing* L/R/P: Bring ideas/concepts together: practice			HW #7 DUE
11	28	4/03	Review for Exam 2			
11	29	4/05	EXAM 2 (Ch. 5 & 6)			
12	30	4/08	L: Linear Regression	7.2		
12	31	4/10	V: Correlation	7.1	HW #8	
12	32	4/12	L/R/P: Bring ideas/concepts together: practice Matlab (Correlation/Linear Regression) Demo			
13	33	4/15	L: Linear Regressions: Uncertainties in Least Square Coefficients	7.3		
13	34	4/17	V: Confidence Interval for Slope V: Estimating Predictors	7.3		HW #8 DUE
13	35	4/19	L/R/P: Bring ideas/concepts together: practice Matlab (Linear Regressions) Demo			
14	36	4/22	L: Linear Regression: Checking Assumptions and Transforming Data	7.4	HW #9	
14	37	4/24	L: Multiple Linear Regression	8.1		
14	38	4/26	*In-Class QUIZ-4 = Statistical Relationships & Regression Analysis* L/R/P: Bring ideas/concepts together: practice Matlab (Multiple Linear Regression) Demo			HW #9 DUE
15	39	4/29	V: Multiple Linear Regressions: Confounding V: Multiple Linear Regression Collinearity	8.2	HW #10	
15	40	5/01	L: Model Selection	8.3		HW #10 DUE
15	41	5/03	Review *for FINAL*			*Project DUE
		TBD	**FINAL EXAM – Cumulative – Time TBD Location TBD			