CE 93
ENGINEERING DATA ANALYSIS

FALL 2016
LECTURE: TUESDAY AND THURSDAY 9:00-10:00 AM @ 20 BARROWS HALL
LAB: WEDNESDAY 1-3 3-5 5-7@ 345 DAVIS HALL

INSTRUCTORS

Professor Mark Hansen

Department of Civil and Environmental Engineering
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Office hours: Tuesday 12:30 - 2:00 PM @ 114 McLaughlin
*   Thursday 10:00 - 11:30 AM @ 114 McLaughlin*

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Graduate Student in Computer Science
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Office hours: Thursday 2:30 – 3:30 @ BLVC 5th Floor Soda Hall (Or by appointment)

CATALOG DESCRIPTION

Application of the concepts and methods of probability theory and statistical inference to Civil and Environmental Engineering (CEE) problems and data; graphical data analysis and sampling; elements of set theory; elements of probability theory; random variables and expectation; simulation; statistical inference. Applications to a wide range of CEE problems involving real data will be developed, using both pre-existing and student-prepared MATLAB codes.
Prerequisites: E7 and Math 1B (or concurrent enrollment)
Units: 3 (No credit will be given after taking Stat25.)

COURSE OBJECTIVES

- Introduce the concepts and methods of probability theory and statistical inference by way of their application to CEE problems involving real data.
- Gain experience with MATLAB for performing computational and graphical processing.
- Introduce a variety of CEE problems and data through their statistical/probabilistic analysis.

REQUIRED TEXTBOOK

William Navidi, *Statistics for Engineers and Scientists*, Fourth Edition, McGraw Hill.

COURSE WEBSITES

bCourses.berkeley.edu (with Piazza)

HOMEWORK

Weekly homework assignments will be given, distributed via bCourses. The homework will typically be distributed each Thursday and due the following Thursday (see the schedule for any exceptions). Unless explicitly noted, assignments are due in hardcopy by 5 PM on the day they are due. They can be submitted in class or in Professor Hansen's mailbox (106 McLaughlin). Any electronic submissions (only when explicitly stated) are due to bCourses by 5 PM on the day they are due. Late homework will not be accepted, but the two homeworks with the lowest grades will not be counted toward the final course grade. In addition to the traditional statistics problems to work through, you will also be asked in your homeworks to complete short essays to help you explore the application of statistics in civil engineering, including interviewing civil engineers and attending academic seminars.

LABS

There are 2 hours of lab per week. The labs use Matlab and work with real data. The objectives are to reinforce concepts and methods covered in lectures and reading and also to give you skills to work with real datasets. Matlab commands will be reviewed in lab, although a good refresher is http://www.mccormick.northwestern.edu/docs/efirst/matlab.pdf (chapters 1-3).

The intention of the lab is NOT to introduce an additional homework assignment. Therefore, you are to complete the lab assignment within the lab period and turn in your writeup at the end of the lab period. They will be checked for completion (but not graded) and figure into the class/lab participation portion of the final grade. The first 8 labs will be specific assignments, of which one may be dropped and not counted toward the final grade. In labs 9-11 you will work on a group project you define yourself and present the results in lab on Nov 30.

GRADING & EXAMS

Two different grading schemes will be used for this class.

The first incorporates scores from pop-quizzes:
15%   Homework - no late assignments, 2 lowest scores of 12 assignments will be dropped.
 7%   Lab participation (turn in labs #1-8 at end of lab, checked not graded, 1 lab can be dropped)
 8%   Lab creative project (2-3 people/group, labs #9-11, presentation in lab #11 on Wed Dec 7)
15%   Pop-quizzes at beginning of class ($1/3^{rd}$ chance on any given day, 1 can be dropped)
15%   Midterm Exam (October 25 in class) (one 5"x8" index card, both sides, allowed for notes)
40%   Final exam (December 13 3-6 PM) (two 5"x8" index cards, both sides, allowed for notes)

The second does not incorporate scores from pop-quizzes:
15%   Homework - no late assignments, 2 lowest scores of 12 assignments will be dropped.
 7%   Lab participation (turn in labs #1-8 at end of lab, checked not graded, 1 lab can be dropped)
 8%   Lab creative project (2-3 people/group, labs #9-11, presentation in lab #11 on Wed Dec 7)
25%   Midterm Exam (October 25 in class) (one 5"x8" index card, both sides, allowed for notes)
45%   Final exam (December 13 3-6 PM) (two 5"x8" index cards, both sides, allowed for notes)

Whichever calculation gives you the highest score will be used to calculate your final grade. Note that the pop quizzes are intended to give you a nudge to stay on top of the material and to not ignore your alarm. These are going to be the easiest points in the class to get...

You will need a non-smartphone, non-graphing calculator for the exams.

ACADEMIC INTEGRITY

Berkeley Campus Code of Student Conduct (http://sa.berkeley.edu/student-code-of-conduct):

> *"The Chancellor may impose discipline for the commission or attempted commission (including aiding or abetting in the commission or attempted commission) of the following types of violations by students, as well as such other violations as may be specified in campus regulations:*
>
> *102.01 Academic Dishonesty: All forms of academic misconduct including but not limited to cheating, fabrication, plagiarism, or facilitating academic dishonesty."*

For CE93, instances of academic dishonesty include, and are not limited to, the following:

- **Homework and labs**: You may discuss problems together, but all written work must be original and each student must do their own matlab programming. Copying of solutions from any source IS NOT acceptable (and... not in your interest.) Be very careful about plagiarism, particularly; all text must be in your own words and properly cited. See http://www.plagiarism.org for more information.
- **Exams**: Pop-quizzes, midterm and final exam are closed book other than the cheat sheet. No discussion, collaboration, or copying allowed.

SCHEDULE (MAY BE ADJUSTED AS NECESSARY)

WEEK (DATE)	SPECIAL EVENTS	TOPIC	READING	HOMEWORK DUE (always THUR)	LAB (always WED)
1 (8/24 - 8/26)		Introduction	1.1	NONE!	NONE!
2 (8/29 - 9/2)		Graphical and Numerical Summaries of Data	1.2 - 1.3	NONE!	1
3 (9/5 - 9/9)		Probability	2.1 - 2.2	1	2
4 (9/12 - 9/16)		Conditional probability	2.3	2	3
5 (9/19- 9/23)		Random variables	2.4 - 2.5	3	4
6 (9/26 - 9/30)		Joint Random Variables & Common Distributions	2.6, 4.1 - 4.4	4	5
7 (10/3 - 10/7)		Common Distributions	4.5 - 4.8	5	6
8 (10/10 - 10/14)		Point estimation, Probability plots, Central Limit Theorem	4.9 - 4.12	6	7
9 (10/17 - 10/21)		Confidence intervals	5.1 - 5.6	7	8
10 (10/24 - 10/28)	Exam on Tue!	Exam! + No class Thursday		NONE!	NONE!
11 (10/31 - 11/4)		Confidence Intervals & Hypothesis testing	5.7 - 5.8, 6.1 - 6.4	8	9
12 (11/7 - 11/11)	Holiday Wed!	Hypothesis Testing	6.5 - 6.11	9	NONE!
13 (11/14 - 11/18)		Correlation and Linear Regression	7.1 - 7.3	10	10
14 (11/21 - 11/23)	Holiday Wed&Thur!	Linear Regression & HOLIDAY!	7.4	NONE!	NONE!
15 (11/28 - 12/2)		Multiple Regression	8.1 - 8.2	11	11
16 (12/5 - 12/9)	RRR	No lectures; Review session on Thursday			
TUESDAY DEC 13	Final Exam 3-6 PM				