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CE 93

# ENGINEERING DATA ANALYSIS

## INSTRUCTOR

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## 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.

Students are required to register a *Connect* account with McGraw Hill (MH) for access to the homework assignments (see handout).

## COURSE WEBSITES

[connect.mheducation.com/class/jwalker](http://connect.mheducation.com/class/jwalker) (for some homework problems and review materials)

[bCourses.berkeley.edu](http://bCourses.berkeley.edu) (for everything else)

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## HOMEWORK

Weekly homework assignments will be given, distributed via bCourses and/or the MH connect site. The homework will typically be distributed on Tuesday and due the following Tuesday (see the schedule for some exceptions). **Anything that is submitted electronically (via either the MH Connect site or bCourses) is due at 11:59 PM on the day it is due. Anything that is submitted in hardcopy is due at the beginning of class on the day it is 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. These will consist of the following 5 tasks:

- Interview one Civil Engineer who uses probability and statistics in his/her work. (Anyone not associated with the class, and each individual can only provide an interview to one student in the class.)
- Attend and summarize **two** academic seminars related to the application of statistics in civil engineering (at least one must be a seminar that is NOT oriented towards undergraduates).
- Review one popular press news article that discusses the application of statistics in civil engineering
- Review one technical paper (from a research journal or other scholarly source) that discusses the application of statistics in civil engineering.

## 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 Dec 3.

## EXAMS

There will be three exams:

Exam 1 in class Thursday October 2 (one 5"x8" index card allowed for notes)

Exam 2 in class Thursday November 6 (two 5"x8" index cards allowed for notes)

Final Exam Tuesday December 16 from 3-6 PM (three 5"x8" index cards allowed for notes)

Other than the index cards, these exams are closed book and note.

## GRADING

- 14% Homework - no late assignments, 2 lowest scores of 12 assignments will be dropped.
- 8% 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 3)
- 15% Exam I (October 2 in class)
- 15% Exam II (November 6 in class)
- 40% Final exam (December 16 3-6 PM)

## 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:** You may discuss problems together, but all written work must be original. Copying of solutions from any source IS NOT acceptable. (And... not in your interest.) Be very careful about plagiarism in the short essays; all text must be in your own words and properly cited. See <http://www.plagiarism.org> for more information.
- **Exams:** Closed book (i.e., no external sources at all). No discussion, collaboration, or copying allowed.

## SCHEDULE (MAY BE ADJUSTED AS NECESSARY)

WEEK (DATE)	SPECIAL EVENTS	TOPIC	READING	HOMEWORK DUE (always TUE)	LAB (always WED)
1 (8/28 - 8/29)		Introduction	1.1	NONE!	NONE!
2 (9/1 - 9/5)		Graphical and Numerical Summaries of Data	1.2, 1.3 and suppl 1	1	1
3 (9/8 - 9/12)		Probability	2.1 and 2.2	2	2
4 (9/15 - 9/19)		Conditional probability	2.3	3	3
5 (9/22 - 9/26)		Random variables	2.4 and 2.5	4	4
6 (9/29 - 10/3)	Exam on Thur!	Jointly distributed random variables & EXAM	2.6	5	NONE!
7 (10/6 - 10/10)		Commonly used distributions	4.1-4.8	NONE!	5
8 (10/13 - 10/17)		Point estimation, Probability plots, CLT	4.9-4.12	6	6
9 (10/20 - 10/24)		Confidence intervals for means and proportions	5.1-5.3	7	7
10 (10/27 - 10/31)		Confidence Intervals for population differences	5.4-5.7	8	8
11 (11/3 - 11/7)	Exam on Thur!	Hypothesis testing and EXAM	6.1-6.4	9	NONE!
12 (11/10 - 11/14)	Holiday on Tue!	HOLIDAY! + Hypothesis Testing	6.5-6.11	NONE!	9
13 (11/17 - 11/21)		Correlation and Linear Regression	7.1-7.4	10	10
14 (11/24 - 11/28)	Holiday on Thur!	Linear Regression & HOLIDAY!	7.1-7.4	11	NONE!
15 (12/1 - 12/5)		Multiple Regression	8.1-8.3	12	11
16 (12/8 - 12/12)	RRR				
<b>TUESDAY DEC 16</b>	<b>Final Exam 3-6 PM</b>				