ME EN 2550 Probability and Statistics for Engineers

Syllabus Fall 2019

Class Time: MWF 11:50 am – 12:40 pm, WEB L101
Instructor: Dr. Jake Abbott
Office: MEK 2016
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Office Hours: MWF 2:00-3:00pm; Other times by appointment

Text Book: *OpenIntro Statistics, 4th Edition, Diez, Barr, & Rundel, ISBN-13: 978-1943450077*
Software: MATLAB with Statistics and Machine Learning Toolbox

TA: Amir Yazdani (mjb.yazdani@gmail.com)
Office: 2233 MEB
Office Hours: TH 2:00-3:00pm

Course Summary

The purpose of this course is to introduce mathematical concepts and statistical methods used in modern engineering analysis. The goal is to introduce students to analytical and numerical tools that can be used to solve real-world engineering problems. Lectures will be supplemented by several programming exercises using MATLAB, and a large number of practical examples on relevant engineering topics. This course covers the role of statistics in engineering, probability theory and distributions, continuous random variables, random sampling, data description, statistical analyses for a single sample, common hypothesis testing, and design of experiments.

Course Objectives

At the end of this course, students should be able to:

1. Use statistical methodology and tools in the engineering problem-solving process.
2. Compute and interpret descriptive statistics using numerical and graphical techniques.
3. Understand concepts of probability, random variables, probability distribution, and joint probability distribution.
4. Compute point estimation of parameters, explain sampling distributions, & understand the central limit theorem.
5. Develop problem-solving approaches to learning and acquiring information through sampling.
6. Design and conduct analysis of single-factor experiments using Analysis of Variance
7. Perform tests of hypotheses for single and multiple variables.
8. Communicate results by summarizing and interpreting data, working as a team, and producing a written report.

Homework

The homework (HW) assignments will emphasize material covered in lecture. HW must be handed in by the specified deadline. Sometimes only selected problems may be graded. You may work with others on the HW, but the work you hand in must reflect your own understanding of the problem. **LATE HW CANNOT BE ACCEPTED FOR CREDIT**. Please do not use email to get HW assistance or to submit HW. The lowest two HW scores will be dropped, so missing one should not adversely affect your homework grade (although it may affect your understanding of the material, which will likely affect your exam grades, so try to do them all).

Note: You may (are even encouraged to) work with others on your homework. Brainstorming with others can be a very effective learning tool. However, the problems you hand in should reflect your own independent efforts. No copies (scanned, photo images, etc.) of HW are acceptable. Copying work or reports from any source may result in a failure in the course.

Projects

Projects will represent a group effort of 2-3 students. Projects from individuals will not be accepted without prior permission from the instructor. The purpose of the projects is to conduct an in-depth investigation and analysis of data related to an engineering, or otherwise interesting, topic. The typed, written report is designed to help students develop technical writing and organizational skills. Each student is encouraged to think about projects that require data collection and analysis.

Grading

The course grade in ME EN 2550 will be based on:

Homework	20% (two lowest scores dropped)
Projects	20%
Two mid-term exams, each	15% (30% total)
Final exam	30%

Grades will approximately follow the standard scale: 93-100% A, 90-92% A-, 87-89% B+, 83-86% B, 80-82% B-, 77-79% C+, 73-76% C, 70-72% C-, <70% E – D+.

Academic Honesty

All students are responsible for their own work. Violations include, but are not limited to:

Cheating – Cheating on an examination, such as copying from another's paper, using unauthorized notes, calculators, etc., or giving or receiving unauthorized aid, such as trading examinations, whispering answers, passing notes, or using electronic devices to transmit or receive information.
Plagiarism – This is using someone else's work (including computer code) without giving credit. *The risk of plagiarism can be avoided in written work by clearly indicating, either in footnotes or in the paper itself, the source of any major or unique idea or wording that you did not arrive at on your own. Sources must be given regardless of whether the material is quoted directly or paraphrased.*
Multiple Submission – This means using the same work to fulfill the academic requirements in more than one course. Prior permission of the instructors must be obtained to use the same work for more than one course.

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the center for disability services, 162 Olpin Union Building, 801-581-5020 (v/tdd) to make arrangements for accommodations. With prior notification, the written information in this course can be made available in an alternative format.

Copies of the "COLLEGE OF ENGINEERING GUIDELINES": (1) appeal procedures, (2) withdrawal procedures, (3) repeating courses policy (i.e. only the 2nd attempt counts), and (4) adding classes are posted throughout MEK, MEB, and WEB.

Wk	Date	Topic	Reading	HW Due
1	19-Aug	Introduction		
	21-Aug	Case study and Data basics	1.1-1.2	
	23-Aug	Sampling principles and strategies	1.3	0
2	26-Aug	Experiments	1.4	
	28-Aug	Examining numerical data	2.1	1
	30-Aug	Considering categorical data	2.2	
3	2-Sep	**No class, Labor Day**		
	4-Sep	Case study: malaria vaccine	2.3	2
	6-Sep	Defining probability	3.1	
4	9-Sep	Conditional probability	3.2	
	11-Sep	Sampling from a small population and Random variables	3.3-3.4	3
	13-Sep	Continuous distributions	3.5	
5	16-Sep	Normal distribution	4.1	
	18-Sep	Geometric distribution	4.2	4
	20-Sep	Binomial and Negative-binomial distributions	4.3-4.4	
6	23-Sep	Poisson distribution	4.5	
	25-Sep	Point estimates and sampling variability	5.1	5
	27-Sep	Confidence intervals for a sample proportion	5.2	
7	30-Sep	Hypothesis testing for a proportion	5.3	
	2-Oct	**Midterm Exam 1 (Chapters 1-4, Homeworks 1-5)**		
	4-Oct	Inference for a single proportion	6.1	
8	7-Oct	**No class, Fall Break**		
	9-Oct	**No class, Fall Break**		
	11-Oct	**No class, Fall Break**		
9	14-Oct	Difference of two proportions	6.2	
	16-Oct	Discuss Midterm Exam 1		6
	18-Oct	Testing for goodness of fit using chi-square	6.3	
10	21-Oct	Testing for independence in two-way table	6.4	
	23-Oct	One-sample means with the *t* -distribution	7.1	7
	25-Oct	Paired data	7.2	Proj. 1
11	28-Oct	Difference of two means	7.3	
	30-Oct	Power calculations for a difference of means	7.4	8
	1-Nov	Comparing many means with ANOVA	7.5	
12	4-Nov	Fitting a line, residuals, and correlation	8.1	
	6-Nov	Least squares regression	8.2	9
	8-Nov	Types of outliers in linear regression	8.3	
13	11-Nov	Inference for linear regression	8.4	
	13-Nov	**Midterm Exam 2 (Chapters 5-7, Homeworks 6-9)**		
	15-Nov	Introduction to multiple regression	9.1	
14	18-Nov	Model selection	9.2	
	20-Nov	Discuss Midterm Exam 2		10
	22-Nov	Checking model conditions using graphs	9.3	
15	25-Nov	Multiple regression case study: Mario Kart	9.4	
	27-Nov	Introduction to logistic regression	9.5	11
	29-Nov	**No class, Thanksgiving Break**		
16	2-Dec	Review for Final Exam		
	4-Dec	Review for Final Exam		12
17	13-Dec	**Comprehensive Final Exam: 10:30-12:30 (usual classroom)**		Proj. 2