ISYE/CEE 3770 - Statistics and Applications

Required for some majors, no credit for BSIE students

Credit: 3-0-3

Prepared Prof. Paul Kvam, 2013

Catalog Description: Introduction to probability, probability distributions, point estimation, confidence intervals, hypothesis testing, linear regression, and analysis of variance. Cross-listed with CEE 3770.

Hours 3-0-3 (Lecture-Lab-Total Credit Hours)

Prerequisite(s): MATH 2401 or MATH 2411 or MATH 24X1 or MATH 2605

Texts
Main Text: Applied Statistics and Probability for Engineers by Douglas C. Montgomery, George C. Runger, 5th Edition, 2010, John Wiley and Sons.

Sometimes used: W. W. Hines, D. C. Montgomery, D. Goldsman, and C. Borror, Probability and Statistics in Engineering, 4th Edition, 2003, John Wiley and Sons.

Reference
Probability and Statistics for Engineers and Scientists (with CD-ROM) by Anthony J. Hayter, Duxbury Press; 3 edition,

Objective: Provide an introduction to probability and statistics, emphasizing applications in science and engineering.

Topical Outline:

Topics	Weeks
Probability Introduction	1
Random Variables	1
Discrete Distributions	1
Continuous Distributions (including Normal)	2
Descriptive Statistics	1
Sampling Distributions	1
Point Estimation	1
Confidence Intervals	1
Hypothesis Testing	1
Categorical Data Analysis	1
Analysis of Variance, Experimental Design	2
Simple Linear Regression	1.5
Multiple Linear Regression	0.5

Outcomes and their relationships to ISyE Program Outcomes

- Ability to collect, organize, summarize and present data graphically
- Demonstrate ability to use formal mathematical argument with basic probability concepts, including conditional probability distributions
- Understand how to characterize and assess probability in its role in experiments
- Use statistical tests and confidence intervals to assess mathematical uncertainty in statistical decisions
- Select proper statistical techniques for statistical decision making based on the type of data available
- Use statistical software to conduct data analyses and interpret output
- Draw sound statistical conclusions from experiments and observational studies

Course outcome \ Program Outcomes	a. apply math	b. Design, conduct experiment, analyze interpret data	c. Design system	d. team	e. problem solving	f. prof/ and ethical responsibilities	g. communication	h. global, eco, envi and soc context	i. Life-long learning	j. Contemporary issues	k. use tools for eng. practice
Ability to collect, organize …		High									Med
Demonstrate ability to use formal…	High				High						
Understand how to characterize …	High				High						
Use statistical tests…		High			High	Med	Med				High
Select proper statistical…			Med		High	High			High		High
Use statistical software		High									High
Draw sound statistical conclusions …					High	High			High		

- Team project are sometimes conducted

Evaluation of the important outcomes:

Three or more important outcomes will be evaluated from direct questions in the Final exam:

1. Demonstrate ability to use formal mathematical argument with basic probability concepts their role in interpreting experimental outcomes.
2. Students should be able to analyze, summarize and display sample data.
3. Students should be able to interpret experimental outcomes and draw conclusions about the larger population based on correctly designed experiments and the experimental data that accompanies them.
4. Students should be able to choose and apply proper statistical methods and to draw sound statistical conclusions for a large variety of experimental data

ISyE ABET Student Outcomes a - k

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.