

## 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, 5<sup>th</sup> Edition, 2010, John Wiley and Sons.

Sometimes used: W. W. Hines, D. C. Montgomery, D. Goldsman, and C. Borror, Probability and Statistics in Engineering, 4<sup>th</sup> 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

### Student Outcome Assessment Plan

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Ability to collect, organize, summarize and present data graphically						L	
2. Demonstrate ability to use formal mathematical argument with basic probability concepts, including conditional probability distributions	L						
3. Understand how to characterize and assess probability in its role in experiments	L						

4. Use statistical tests and confidence intervals to assess mathematical uncertainty in statistical decisions	L						
5. Select proper statistical techniques for statistical decision making based on the type of data available						L	
6. Use statistical software to conduct data analyses and interpret output						L	
7. Draw sound statistical conclusions from experiments and observational studies						L	

**Evaluation of the important course outcomes**

The course outcomes. This is a service course, not relevant to BSIE. If the other units want to assess the outcomes, those Ls can be assessed.

**The approximate relationship from prior ABET a – k to new ABET 1 – 7.**

<p>OLD Criterion 3. Student Outcomes The program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.</p>	<p>NEW Criterion 3: Student Outcomes The program must have documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.</p>
<p>(a) an ability to apply knowledge of mathematics, science, &amp; engineering (e) an ability to identify, formulate, and solve engineering problems</p>	<p>(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</p>
<p>(b) an ability to design and conduct experiments, as well as to analyze and interpret data</p>	<p>(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.</p>
<p>(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 &amp; safety, manufacturable, &amp; sustainable</p>	<p>(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</p>
<p>(d) an ability to function on multidisciplinary teams</p>	<p>(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative &amp; inclusive environment, establish goals, plan tasks, and meet objectives.</p>
<p>(f) an understanding of professional and ethical responsibility (h) the broad education necessary to understand the impact of engg solutions in a global, economic, environmental, &amp; societal context (j) a knowledge of contemporary issues</p>	<p>(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.</p>
<p>(g) An ability to communicate effectively.</p>	<p>(3) An ability to communicate effectively with a range of audiences.</p>
<p>(i) a recognition of the need for, and an ability to engage in life-long learning</p>	<p>(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.</p>
<p>(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p>	<p>Implied in 1, 2 and 6</p>