

## ISYE 3030 BASIC STATISTICAL METHODS

### Required

**Credit:** 3-0-3

**Prepared** Profs, Huo, Lu, Paynabar, Serban, Tuo, Xie, Summer 2018

**Prerequisite(s):** ISYE 2027 PROBABILITY WITH APPLICATIONS and, CS 1301 INTRO TO COMPUTING with concurrency or CS 1371 COMPUTER FOR ENGINEERS, with concurrency.

### Catalog Description:

Point and interval estimation of systems parameters, statistical decision making about differences in system parameters, analysis and modeling of relationships between variables.

### Text:

Douglas C. Montgomery, George C. Runger, *Applied Statistics and Probability for Engineers*, 7<sup>th</sup> Edition, Wiley, 2018.

### Objective

The objective of this course is to introduce students to data collection and analysis from which sound conclusions can be drawn. This includes techniques of estimation, hypothesis testing, and regression.

### Topical Outline

	Weeks
Data Description: Random Sampling; Data Displays; Sampling Distributions include $t$ -Distribution and $F$ -Distribution.	2
Point and Interval Estimation: Estimating the Mean; Estimating the Differences between Means; Proportions, and Variances; Methods of Moments; Maximum Likelihood Estimation; Properties of Estimators.	4
Tests of Hypothesis: One-and Two-Sided Tests; Single Sample Tests; Two Sample Tests; Use of $p$ -Values; Goodness-of-Fit Test; Test for Independence; Test for Homogeneity.	4
Linear Regression and Correlation: Least Squares and the Fitted Model; Properties of the Least Squares Estimators; Inferences Concerning the Regression Coefficients; Analysis of Variance.	4

### Grading

This depends on the instructor. I am providing 2 instructors who teach this course routinely. There are tests and a project in this course.

Professor Kamran Paynabar

Homework (15%) and assignments (5%)	20%
Quizzes and class participation	15%
Exam 1 (02/20)	20%
Exam 2 (04/17)	25%
Group project (presentation on 04/24, and 4/30, report due on 4/30)	20%

Professor J.C. Lu

Exam #1 (25%)
Exam #2 (25%)
Exam #3 (25%)
Computer Project (15%)
Attendance (5%)

### **Academic Honor Code and Student Faculty Expectations**

You can find Georgia Tech student body developed Honor Code:

<http://osi.gatech.edu/content/honor-code>.

You can also find Georgia Tech student and faculty developed Student-Faculty Expectations at: <http://www.catalog.gatech.edu/rules/22/>

### **Attendance**

We will follow the institute attendance policy <http://www.catalog.gatech.edu/rules/4/>.

The accepted absences include

1. Email notification from Dean's office. The accommodation depends on the suggestions in the email.
2. Institute Approved Absences <https://registrar.gatech.edu/info/institute-approved-absence-form-for-students>.

### **Special Needs**

If you have special needs, please contact the Office of Disability Services:

<http://www.catalog.gatech.edu/policies/disabled-assistance>

### **Software**

A software package will be used in this class for assignments, projects or in some professor's classes in the tests. Currently, ISyE adopted the open source software R. It is free, very powerful, and employers appreciate the skill of competence in R.

### **Outcomes and their relationships to ISyE Program Outcomes**

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

1. Estimate parameters of distributions
2. Perform statistical analysis and decision making using statistical inference
3. Use statistical software to conduct analyses and interpret output
4. Draw sound statistical conclusions from experiments and observational studies

<b>Course outcome  \ Program Outcomes</b>	<b>1. identify, formulate solve engg prob by engg, sci &amp; Math</b>	<b>2. produce solutions consider public health, safety, welfare, global, cultural, social, environ &amp; economic</b>	<b>3 communicate with a range of audience</b>	<b>4 recognize ethical &amp; professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.</b>	<b>5. effective on a team provide leadership, collaborative and inclusive environ, plan tasks &amp; meet objectives</b>	<b>6. develop and conduct experiment, analyze and interpret data &amp; use engineering judgement to draw conclusions.</b>	<b>7. acquire and apply new knowledge using appropriate learning strategies</b>
1. Estimate parameters of distributions	H						
2. Perform statistical analysis and decision making using statistical influence	H					M	
3. Use statistical software to conduct analysis and interpret output						M	
4. Draw sound statistical conclusions from experiments and observational studies						H	

#### **Evaluation of the important outcomes**

- H will be assessed in selective final exam questions

**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>