ISYE 3030 BASIC STATISTICAL METHODS

Required for BSIE

Credit: 3-0-3

Coordinators: Profs. Ethan Lee and Jing Li, Fall 2025

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*, 7th 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, regression, and design of experiments (DOE).

Topical Outline

Topics	Weeks
Review and Descriptive Statistics (Ch6): Normal Random Variables; Histograms; Boxplots; Probability Plots.	1
Point Estimation (Ch7): Random Sampling; Sampling Distributions; Estimating the Means, Differences in Means, Proportions, and Variances; Properties of Estimators; Methods of Moments; Maximum Likelihood Estimation.	2.5
Interval Estimation (Ch8): Estimating the Confidence Intervals for Means, Variances, and Proportions.	1.5
Tests of Hypothesis (Ch9 and Ch10): One-and Two-Sided Tests; Single Sample Tests; Two Sample Tests; Use of p-Values; Goodness-of-Fit Test.	4.5
Linear Regression (Ch11 and Ch12): Least Squares and the Fitted Model; Properties of the Least Squares Estimators; Inferences Concerning the Regression Coefficients; Analysis of Variance.	3
Design of Experiments (Ch13): Completely Randomized Single-Factor Experiments; Random-Effect Models; Randomized Complete Block Design.	1.5
Total	15

Software
A software package will be used in this class for assignments and projects. *R* and *Python* are the preferred programming languages.

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 the output
4. Draw sound statistical conclusions from experiments and observational studies

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

Evaluation of the important outcomes
- H will be assessed in complex verbal problems in an engineering context in final exam questions or a major assignment.

Honor Code
Make sure that you are aware of the GT Honor Code by visiting
https://www.policylibrary.gatech.edu/student-affairs/academic-honor-code
Any violation of the Honor Code (e.g., cheating in assignments or tests, not being
truthful, plagiarism, etc.) may result in an F in this class.
Also, the student government and faculty representatives have developed a new Student-
Faculty Expectations document. Please see the page: https://catalog.gatech.edu/rules/22

Special Needs
Georgia Tech provides upon request appropriate academic accommodations for students
with disabilities. https://disabilityservices.gatech.edu