

IE 3521: Statistics, Quality and Reliability

Syllabus - Spring 2024

Lectures Tue/Thu, 1:25-3:20pm, Lind Hall 302

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Course Description

We live in a world with an abundance of data, where the tools of data science and analytics are used to derive insights and make decisions in a variety of industries, from e-commerce and logistics enterprises like Amazon and UPS, to platform markets like Uber and AirBnb. In recent years, the pandemic has highlighted the importance of learning from limited data to make better decisions.

Now more than ever, there is great value attached to the ability to work with data, to describe, summarize and visualize it, and to draw valid inferences from it. This has made the mastery of basic probability and statistical concepts indispensable. The goal of this course is to build a foundation in probability and statistics, build familiarity with standard statistical methodologies, and highlight applications in quality and reliability.

Catalog description: Random variables/probability distributions, statistical sampling/measurement, statistical inferencing, confidence intervals, hypothesis testing, single/multivariate regression, design of experiments, statistical quality control, quality management, reliability, maintainability.

Course Goals and Learning Objectives

Upon successful completion of the course, students would be able to achieve the following objectives:

- Use probability theory to identify and analyze distributions of various summary statistics.
- Use standard statistical tools to build models, test hypotheses, and make inferences.
- Use computational tools like R to perform exploratory data analysis, summarize the data and provide error bounds for summary statistics.
- Apply these tools to make judgments about quality and reliability in basic engineering contexts.

Prerequisites

The official prerequisite is MATH 1372 or equivalent. Familiarity with basic combinatorial probability theory will be useful, but prior knowledge of probability and statistics will not be assumed.

Textbook

We will follow closely the book “**Probability and Statistics for Engineers and Scientists**” by Anthony J. Hayter (Cengage Learning, 4th Edition). Specifically, we will cover parts of Chapters 1-10,12,16,17.

Grade Components

The contributions toward the overall course grade are as follows.

Homework	30%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	30%