
CREDITS: 3

COURSE DESCRIPTION: Exploratory data analysis; basic probability, probability distributions, mathematical expectation, sampling distributions; basic statistical inference (estimation and hypothesis testing); topics in reliability. Prerequisite: MATH-154 Calculus II or MATH-157 Calculus & Analytic Geometry II.

TEXTBOOK: Probability & Statistics for Engineering and the Sciences, 8th Ed., by Devore (adopted Fall 2012)
Previous:
Principles of Statistics for Engineers & Scientists, 1st Ed., by Navidi (adopted F09)
Applied Statistics for Engineers & Scientists, 2nd Ed., by Devore (adopted F05; 1st Ed. adopted F03)
Engineering Statistics: an Industrial Experience, 1st Ed., by Ostle (adopted F96)
Probability and Statistics for Engineers, 3rd Ed., by Devore

COURSE OBJECTIVES:
The student who successfully completes this course will have:
1. an understanding of the basic principles of exploratory data analysis.
2. an understanding of the basic principles in probability, mathematical expectation, and various probability distributions.
3. an understanding of the basic principles of statistical inference (i.e., estimation and hypothesis testing).
4. skill in applying the basic principles of statistical inference to practical problems.
5. an understanding of some of the basic ideas of reliability theory.
6. experience in the use of a statistical computing package.

COURSE OUTLINE:
1. Exploratory Data Analysis
   A. Graphical Methods in Data Analysis: Bar Graphs, Histograms, Stem-and-Leaf Displays, Box Plots
   B. Numerical Summary Methods: Measures of Location and Measures of Variability
2. Probability
   A. Sample Spaces and Events
   B. Counting Techniques
   C. Axioms and Properties of Probability; Conditional Probability; Independence
3. Random Variables and Probability Distributions
   A. Definition of Discrete and Continuous Random Variables
   B. Probability Distributions for Discrete Random Variables, Including the Binomial and Poisson Distributions
C. Probability Distribution for Continuous Random Variables, Including the Exponential and Normal Distributions
D. Expected Values and Variances for Discrete and Continuous Random Variables

4. Topics in Reliability: Failure Time Distributions, Reliability Functions, Hazard Rates

5. Linear Combinations of Random Variables
A. Expected Values of Linear Combinations of Several Random Variables
B. Variance of Linear Combinations of Several Independent Random Variables
C. Probability Distributions of Means of Random Variables; Central Limit Theorem


7. Interval Estimation Based on a Single Sample
A. Large Sample Confidence Intervals for the Mean and Proportion
B. Small Sample Confidence Intervals for the Mean of a Normal Distribution

8. Tests of Hypotheses Based on a Single Sample
A. Basic Concepts of Hypothesis Testing
B. Hypothesis Tests of the Mean for Large and Small Samples
C. Hypothesis Tests of a Proportion
D. P-Values

9. Inference Based on Two Samples
A. Confidence Intervals and Hypothesis Tests for the Difference of Two Means
B. Confidence Intervals and Hypothesis Tests for the Difference of Two Proportions
C. Analysis of Paired Data

10. Other topics as time permits
A. Linear Regression Analysis
B. Categorical Data Analysis