

ROWAN UNIVERSITY
Department of Mathematics

Master Syllabus

STAT 02.286 – Probability and Statistics for Electrical & Computer Engineering (3sh)

CATALOG DESCRIPTION:

This is a junior level course covering concepts in probability and statistics useful to those studying electrical and computer engineering. Assuming knowledge of descriptive statistics and basic probability from earlier courses, topics will include more advanced probability, continuous and discrete random variables, sampling distributions, interval estimation, and hypothesis testing for one and two parameters. Also explored will be topics in linear regression, analysis of variance, and an introduction to distribution free tests. Emphasis will be placed on problems with applications to engineering. While this course is directed at students pursuing a major in Electrical and Computer Engineering, it is open to other Engineering majors.

OBJECTIVES:

Course Objective: Students will learn techniques in probability, random variables & probability distributions, mathematical expectations, some discrete & continuous probability distributions; fundamental sampling distributions, one- and two- sample estimation problems, one- and two- sample test of hypotheses, ANOVA models, and nonparametric statistics.

This course is designed to meet the needs of ECEs and ABET requirements. The examples and applications presented in this probability and statistics course will be tailored to use cases pertinent to Electrical and Computer Engineering (ECE).

Learning Objective: *Upon course completion* students will gain a solid understanding of key principles in probability and statistics, including sampling distributions, bootstrap distributions, confidence intervals, randomization distributions, ANOVA, and more, all tailored specifically for applications in electrical engineering. Additionally, these concepts will not only be explored theoretically but also demonstrated practically through code. This approach ensures that students not only grasp the theoretical underpinnings but also acquire hands-on experience in applying these techniques using programming languages and software tools relevant to their field.

PREREQUISITES:

MATH 01.235 Mathematics for Engineering Analysis OR (MATH 01.210 Linear Algebra AND MATH 01.230 Calculus III) with a grade of C- or better

CONTENT:

1. Probability

- a. Events, Counting Sample Points, Probability of an Event.
 - b. Conditional Probability, Independence, and the Produce Rule
 - c. Bayes' Rule
2. Random Variables and Probability Distributions
 - a. Concept of a Random Variable
 - b. Discrete & Continuous Probability Distributions
3. Mathematical Expectation
 - a. Mean of a Random Variable
 - b. Variance of Random Variables
 - c. Means and Variances of Linear Combinations of Random Variables
4. Data Descriptions
 - a. Random Sampling
 - b. Some Important Statistics
 - c. Sampling Distributions
 - d. Sampling Distribution of Means and the Central Limit Theorem
5. One- and Two-Sample Estimation Problems
 - a. Statistical Inference
 - b. Classical Methods of Estimation
 - c. Confidence Intervals
6. One- and Two-Sample Tests of Hypotheses
 - a. Statistical Hypotheses: General Concepts
 - b. Testing a Statistical Hypothesis
 - c. Single Sample: Tests Concerning a single
 - d. Two Samples: Tests on Two Means
 - e. Two Samples: Paired Observations
 - f. Relationship between Hypothesis Testing and Confidence Intervals
 - g. The bootstrap (time-permitting)
7. One-Factor Experiments: General
 - a. Analysis-of-Variance Technique
 - b. One-Way Analysis of Variance: Completely Randomized Design
8. Nonparametric Statistics
 - a. Nonparametric Tests
 - b. Signed-Rank Test

SUGGESTED TEXTS:

- Probability and Statistics for Engineers and Scientists, 9th ed., Walpole, Myers, Myers & Ye, Prentice Hall, 2012.
- Applied Statistics and Probability for Engineers, 4th ed., Montgomery & Runger, John Wiley & Sons, Inc.

Edited: 10/2024