

ROWAN UNIVERSITY
Department of Mathematics

Syllabus

Math 01.505 - Probability and Mathematical Statistics

CATALOG DESCRIPTION:

Math 01.505 Probability and Mathematical Statistics, 3 s.h.

This course is an introduction to the theory and application of mathematical statistics. After an introductory discussion of descriptive and inferential statistics, the attention turns to probability theory and its mathematical connection to statistics. Topics include sample spaces, random variables, Chebyshev's Theorem, discrete and continuous probability distributions, mathematical expectation, hypothesis testing, and multivariate distributions.

OBJECTIVES:

Students will learn the distinction between descriptive and inferential statistics, and see the important role that the theory of probability plays in the mathematical development of inferential statistics. They will study discrete and continuous random variables in enough depth to understand the Central Limit Theorem. They will understand the value of moment generating functions and be able to recognize various discrete and continuous probability distributions. Finally, students will gain skills in combinatorics and using probability distributions in evaluating series and definite integrals. In view of the recommendation that an introduction to probability and statistics be included in the high school curriculum, it is essential that math teachers acquire sufficient knowledge of the mathematical bases of both descriptive and inferential statistics. In terms of background from undergraduate studies, this course assumes the materials in an introductory applied statistics course and materials in calculus as well.

CONTENT:

1. Descriptive Statistics

- Measures of Central Tendency
- Measures of Dispersion
- Least Squares Method for Fitting a Line

2. Elementary Probability

- Axiomatic Approach
- Combinatorics
- Probability Theorems
- Bayes's Theorem

3. Discrete Probability Distributions

- Discrete Random Variables
- Expected Values
- Binomial Distribution
- Hypothesis Tests for Small Sample Binomial Populations
- Geometric Distribution
- Hypergeometric Distribution
- Poisson Distribution
- Moment Generating Functions

4. Continuous Probability Distributions

- Continuous Random Variables
- Expected Values
- Uniform Distribution
- Gamma Distribution
- Normal Distribution
- Beta Distribution
- Heuristic Approach to Central Limit Theorem
- Confidence Interval Estimation
- Moment Generating Functions.

5. Multivariate Probability Distributions

- Multivariate Distributions
- Marginal and Conditional distributions
- Independent Random Variables
- Expected values for a function of random variables
- Covariance and Correlation
- Conditional Expectations

TEXTS:

Mendenhall, Wackerly, and Schaeffer, MATHEMATICAL STATISTICS with APPLICATIONS, PWS-KENT Publishing Co., Boston, 1990

Hogg and Tannis, PROBABILITY AND STATISTICAL INFERENCE, Macmillan Publishing Co., New York, 1988

Freund and Walpole, MATHEMATICAL STATISTICS, Prentice Hall, Englewood Cliffs, NJ, 1987

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