

MATH 341 - Principles of Probability and Statistics

Course Description: Summary and display of data; basic probability concepts; discrete distributions; continuous distributions; computer-aided probabilistic and statistical modeling of real problems; estimation; tests of statistical hypotheses.

Prerequisite: C or better in MATH 232.

Schedule: Fall, Spring. 3 credit hours.

Textbook: Hogg, R.V. and Tanis, E.A., *Probability and Statistics Inference*, 7th edition. Prentice Hall.

Topic covered: In this course, we will cover chapters 1, 2, 3, 5, 6 and 8.

After this course, you should know:

- .Summary and display of data;
- .Basic probability concepts;
- .Knowledge of discrete distributions; continuous distributions;
- .Knowledge of the normal distribution;
- .Estimation and testing of statistical hypotheses.

Chapter 1: Probability

Basic Concepts
Properties of Probability
Methods of Enumeration
Conditional Probability
Independent Events
Bayes' Theorem

Chapter 2: Discrete Distributions

Random Variables of the Discrete Type
Mathematical Expectation
The Mean, Variance, and Standard deviation
Bernoulli Trials and the Binomial Distribution
The Moment-Generating Function
The Poisson Distribution (if time permits)

Chapter 3: Continuous Distributions

Continuous-Type Data and EDA
Random Variables of the Continuous Type
The Uniform and Exponential Distributions
The Gamma and Chi-Square Distributions
Distributions of Functions of a Random Variable
Additional Models (if time permits)

Chapter 5: The Normal Distribution

A Brief History of Probability

The Normal Distribution

Random Functions Associated with Normal Distributions

The Central Limit Theorem

Approximations for Discrete Distributions

The Bivariate Normal Distribution

Limiting Moment-Generating Functions

Importance of Understanding Variability (The textbook does not have this section)

Chapter 6: Estimation

Sample Characteristics

Point Estimation

Sufficient Statistics

Confidence Intervals for Means

Confidence Intervals for Difference of Two Means

Confidence Intervals for Variances

Confidence Intervals for Proportions

Sample Size

Order Statistics

Distribution-Free Confidence Intervals for Percentiles

A Simple Regression Problem

More Regression

Resampling Methods (if time permits)

Asymptotic Distributions of Maximum Likelihood Estimators

Chapter 8: Tests of Statistical Hypotheses

Tests About Proportions

Tests About One Mean and One Variance

Tests of the Equality of Two Normal Distributions

The Wilcoxon Tests

Chi-Square Goodness of Fit Tests

Contingency Tables

One-Factor Analysis of Variance

Two-Factor Analysis of Variance

Tests Concerning Regression and Correlation

Kolmogorov-Smirnov Goodness of Fit Test

Run Test and Test for Randomness (if time permits)