

Syllabus

STAT 02.361 - Mathematical Statistics

CATALOG DESCRIPTION:

STAT 02.361 Mathematical Statistics 3 s.h.

(Prerequisite: STAT 02.360 Probability and Random Variables with a grade of C- or better)

A continuation of Introduction to Probability & Statistics I, the course emphasizes the theory of inferential statistics and its applications. The Central Limit Theorem is more fully developed as are the concepts of estimation and hypothesis testing. The properties of estimators are covered and tests using normal, t, chi-square, and F distributions are studied. Nonparametric methods, regression, and correlation are also covered. Statistical software and/or graphing calculators will be used.

OBJECTIVES:

Students will understand the Central Limit Theorem from both an experimental and theoretical point of view and will know the value of this theorem in inferential statistics. They will know the desirable qualities for an estimator and learn a number of techniques for finding minimum-variance, unbiased estimators. They will know the elements of an hypothesis test and be able to carry out a number of different hypothesis tests. They will also learn about linear models and estimation by least squares.

CONTENT:

1. Functions of random variables and sampling distributions

- 1.1 Method of Distribution Functions
- 1.2 Method of Moment Generating Functions
- 1.3 Chi-Squared Distribution
- 1.4 Student's t-Distribution
- 1.5 F Distribution
- 1.6 The Central Limit Theorem
- 1.7 Normal Approximation for Binomial Distribution

2. Estimation

- 2.1 Properties of point estimators
- 2.2 Evaluating the goodness of point estimators
- 2.3 Method of Maximum Likelihood
- 2.4 Confidence intervals for large samples

2.5 Confidence intervals for small samples

2.6 Confidence intervals for two samples

3. Hypothesis Testing

3.1 Elements of Statistical Test

3.2 Common large sample tests

3.3 Attained significance levels or p-Values

3.4 Tests using the t distribution

3.5 Tests using the F distribution

3.6 Power of tests

4. Linear Models

4.1 Linear Statistical Models

4.2 Method of Least Squares

4.3 Properties of least Squares Estimators for simple and multiple linear regression

4.4 Inferences concerning model parameters

4.5 Predicting a particular value for Y

4.6 Test of hypothesis

4.7 Correlation

5. Nonparametric Statistics

5.1 Chi-square tests

5.2 Sign test

5.3 Wilcoxon Signed Rank Test

5.4 Mann-Whitney Test

5.5 Runs Test

5.6 Rank Correlationm Coefficient

TEXTS:

Hastings, Probability and Statistics. Pearson, Boston, 1997.

Hogg and Tannis, PROBABILITY AND STATISTICAL INFERENCE, 8th edition. Pearson, Boston, 2010.

Larsen and Marx, An Introduction to Mathematical Statistics and Its Applications, 5th edition. Pearson, Boston, 2012.

Mendenhall, Wackerly, and Schaeffer, MATHEMATICAL STATISTICS with APPLICATIONS, 7th edition, Brooks/Cole, Belmont, CA, 2008.