MATH 236 – Elements of Statistics 2 – SYLLABUS

Department of Mathematics
Millersville University

Description

An extension of MATH 130 or MATH 235. Includes estimation, hypothesis testing, design of experiments with analysis of variance, regression analysis, covariance analysis and nonparametric approaches. Includes experiences using a variety of computing devices. A substantial methods course for any major who needs to use statistical techniques. No credit toward math major. (3 credits)

This course may be taken for general education credit (G2)

Prerequisites

MATH 130 or MATH 235

Course Objectives

Students will learn the theory and techniques of calculus and its applications. By the conclusion of this course the successful student will be able to:

- perform one and two sample T-tests and demonstrate understanding of the basic concepts of statistical inference,
- demonstrate understanding of nonparametric statistical methods and when they are appropriate,
- demonstrate understanding of inference procedures for qualitative data, including one and two proportion tests based on the normal distribution and chi-square tests for contingency tables,
- demonstrate understanding of when it is appropriate to use ANOVA models, how to interpret resulting computer output and how to evaluate the validity of the model,
- demonstrate understanding of when it is appropriate to use linear regression models how to interpret resulting computer output, and how to evaluate the validity of the model,
- will be solve original problems using the appropriate statistical procedures and to explain their solutions.

Assessment

Assessment of student achievement of the course objectives will vary from one instructor to another. Typical assessment will be made through work in class, homework, computer

projects, and examinations.

Use of Technology

Students will be required to use one or more statistical computing packages (e.g. R, Minitab, StatCrunch) to solve problems. A scientific calculator will also be helpful.

Topics

- Review of statistical inference
  - Estimating Parameters and Determining Sample Sizes–
    - Mean (one sample and two sample problems)
    - Proportions (one sample and two sample problems)
  - Hypothesis Testing – One sample and two sample
    - Statistical hypotheses
    - Type I and Type II errors
    - Logic of statistical hypothesis testing
    - Tests pertaining to means
    - Tests pertaining to proportions
    - *p*-values
- Categorical Data Analysis
  - Contingency tables
  - Chi-square tests
- Analysis of Variance models
  - Designed Experiments
  - Randomized block designs
  - Two-factor factorial experiments
  - Methods for multiple comparisons
- Simple and multiple regression analysis
  - Model fitting and assumptions
  - Residual analysis
  - Inference for regression models
  - Higher order models
  - Indicator variable regression
  - Stepwise regression
- Nonparametric Statistics
  - Mathematics of distribution free tests
  - One sample inference procedures
  - Two sample inference procedures
  - Comparing three or more populations inference procedures

Designed Experiments
Randomized block designs