MATH 235 – Survey of Statistics – SYLLABUS

Department of Mathematics
Millersville University

Description

A survey of elementary probability theory, estimation, hypothesis testing and simple regression and correlation. Interpretation of statistical inference in the analysis of data. Emphasis on applications in both behavioral and physical sciences (3.0 credits)

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

MATH 130 and MATH 234 are equivalent courses, credit will not be given for MATH 130, 234 and/or 235.

Prerequisites

MATH 101 or MATH 151 or higher, or math placement of MATH 151 or higher.

Course Objectives

The objectives of this course are to provide the student with a basic understanding of statistical inference in the areas of estimation, and hypothesis testing. Thus, the student should acquire:

- An insight into the need and role of statistical inference in the analysis of data.
- An ability to read and understand technological literature, now rather commonly interwoven with statistical terminology.
- An understanding of elementary probability theory and be able to apply the concepts in appropriate situations.
- To introduce students to a statistical computing package (e.g. R, Minitab, StatCrunch) to solve problems in probability and statistics.

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, and examinations administered in a traditional face-to-face classroom environment, in an online environment, or in a hybrid of face-to-face and online assessments.

Use of Technology

Students will be well served by a scientific calculator and a statistical computing package.

Topics

1. Introduction
   a) Descriptive and inferential statistics
   b) Populations and samples
   c) Problems for the statistician
   d) Role of Statistics in Research
2. Statistical Measures of Data
   a) Parameters and statistics
   b) Measures of central tendency; mean, median, mode
   c) Measures of variability; Chebyshev's theorem, Empirical Rule
   d) Graphical presentations of data
3. Probability
   a) Sample space; events
   b) Operations with events
   c) Counting sample points. (Multiplication rule, permutations, combinations)
   d) Probability of an event; additive rules
   e) Conditional probability; multiplicative rules
4. Distributions of Random Variables
   a) Concept of a random variable
   b) Discrete probability distributions
   c) Mean of a random variable; mathematical expectation
   d) Variance of a random variable.
5. Some Discrete Probability Distributions
   a) Binomial distribution
6. Some Continuous Probability Distributions
   a) Normal curve; areas under the curve
   b) Applications
7. Sampling Distributions
   a) Sampling distributions of the mean
   b) Central Limit Theorem
   c) t-distribution
   d) Sampling distributions of the differences of means
8. Estimation of Parameters
   a) Statistical inference; classical methods of estimation; estimating the mean
   b) Estimating the difference between two means (large sample, small sample, pair observations)
   c) Estimating a proportion and the difference between two proportions
9. Hypothesis Testing
   a) Statistical hypotheses; testing a hypothesis; Type I and Type II errors
   b) One-tailed and two-tailed tests
   c) P-values

d) Tests concerning means (large sample, small sample, and paired difference)
e) Tests concerning proportions and the difference between two proportions
10. Correlation and Regression Analysis
a) Simple Linear Regression
b) Correlation Analysis

Recently Used Textbooks

- *Statistics*, 12th edition, James McClave and Terry Sincich, Pearson (2011).
- *Statistics*, 13th edition, James McClave and Terry Sincich, Pearson (2021)
- *Statistics: The Art and Science of Learning from Data*, 5th edition, Alan Agresti, Christine Franklin, and Bernhard Klingenberg, Pearson (2021).