

# MATH 234 – Statistics for the Health Sciences – SYLLABUS

Department of Mathematics  
Millersville University

## Description

For nursing program and other health science students. Descriptive statistics, odds ratios, counting, basic probability, concept of random sampling, random variables, probability distributions, and statistical inference including confidence interval estimation and hypothesis testing for one and two sample problems involving means and proportions, chi-squared tests, one way ANOVA, simple linear regression, and correlation will be covered at an appropriate level. (4 credits)

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

**Prerequisites:** Math Placement or a 100 level MATH course. MATH 130 and MATH 235 are equivalent courses, credit will not be given for MATH 130, 234 and/or 235.

## Course Objectives

Students will become proficient in applying the techniques of probability and statistics. By the conclusion of this course the successful student will be able to:

- solve problems in elementary probability and apply the concepts to appropriate applications;
- use basic methods of statistical analysis to describe data, including shape, position and a variety of measures of center and spread;
- demonstrate an understanding of the properties of the discrete and continuous probability distributions;
- recognize appropriate applications of the discrete and continuous probability distributions and solve problems using these distributions, including binomial and normal distributions;
- construct interval estimates of means, proportions, differences of means, and differences of proportions;
- interpret confidence intervals, confidence levels, p-values, and results of hypothesis tests;
- perform hypothesis tests to make inferences for means, and proportions involving one and two or more populations and in the context of regression analysis;
- interpret statistical results in research articles, effectively communicate with statisticians, and interpret computer output involving means, standard errors, p-values, confidence limits, linear regression, one way ANOVA output and other fundamental measures;

## Assessment

Assessment of student achievement of the course objectives will vary from one instructor to another. Typical assessment will be made through homework, application assignments and examinations.

## Use of Technology

Students should have access to a basic scientific calculator.

## Topics

- Descriptive Statistics:
  - Populations and samples
  - Frequency Distributions
  - Numerical Descriptive Statistics
  - Graphical Displays
- Discrete Probability:
  - General properties
  - Probability of the union
  - Conditional probability
  - Mutually exclusive, exhaustive, complementary and independent events
  - Counting Rules
- Discrete Probability Distributions:
  - Discrete random variables
  - Mathematical expectation
  - Variance
  - Binomial distribution
- Continuous Probability:
  - General case
  - Uniform Distribution
  - Normal Distribution
  - Sampling Distributions
  - Central Limit Theorem
- Estimating Parameters and Determining Sample Sizes– One sample
  - Mean
  - Proportion
- 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
- Correlation and Regression
  - Correlation analysis
  - Simple Linear Regression Models
  - Inference in Regression
- Contingency Tables
  - $X^2$  tests
- Analysis of Variance
  - One-way ANOVA
  - Inference in ANOVA

## **Recently Used Textbooks**

*Biostatistics for the Biological and Health Sciences*, Triola, Triola & Roy, 2<sup>nd</sup> Edition, Pearson, 2018