

# MAT 151 STATISTICS I

## **COURSE DESCRIPTION:**

Prerequisites: MAT 080 or MAT 090 or MAT 140 or satisfactory score on placement test

Corequisites: None

This course provides a project-based approach to the study of basic probability, descriptive and inferential statistics, and decision-making. Emphasis is on measures of central tendency and dispersion, correlation, regression, discrete and continuous probability distributions, quality control, population parameter estimation, and hypothesis testing. Upon completion, students should be able to describe important characteristics of a set of data and draw inferences about a population from sample data. Students are able to compare two population means of both large and small groups as well as compare population proportions. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics.* Students may not receive credit for both MAT 151 and MAT 155. Course Hours Per Week: Class, 3. Semester Hours Credit, 3.

## **LEARNING OUTCOMES:**

1. Students will be able to identify methodological problems with statistical studies and use descriptive statistics to summarize data. Students will display proficiency by demonstrating the following competencies:
  - a. Define statistics, population, and sample.
  - b. Define and distinguish between qualitative and quantitative data and between discrete and continuous data.
  - c. Define random sampling and identify variations on random sampling including systematic, stratified, cluster and convenience sampling.
  - d. Read and construct statistical graphs, including histograms, relative frequency histograms, frequency polygons, stem-and-leaf displays, and box-and-whiskers displays.
  - e. Define and calculate measures of central tendency: mean, median, mode and midrange.
  - f. Define and calculate measures of variation: range, variance and standard deviation.
  - g. Define and calculate measures of position: quartiles, deciles, percentiles and z-scores.
  - h. Define correlation between two data sets and draw scatter plots of correlated data.
  - i. Use a calculator to compute the line that best fits a set of correlated data.
  - j. Use the calculator to compute the linear correlation coefficient.
2. Students will be able to identify situations in which normal and binomial distributions are applicable and compute probabilities of various outcomes using these distributions. Students will display proficiency by demonstrating the following competencies:
  - a. Define discrete random variables and continuous random variables.
  - b. Compute the mean, variance and standard deviation for a discrete random variable.
  - c. Define a binomial probability distribution.
  - d. Compute the mean, variance and standard deviation for a binomial probability distribution.
  - e. Define the standard normal distribution for a continuous random variable.

- f. Compute the probability for a given range of values for a continuous random variable with a standard normal distribution.
  - g. Define and interpret the Central Limit Theorem in terms of sampling distributions and their characteristics.
3. Students will be able to create confidence intervals and perform one- and two-sample hypothesis tests. Students will display proficiency by demonstrating the following competencies:
- a. Construct a confidence interval for the population mean when  $\sigma$  is known.
  - b. Construct a confidence interval for the population mean when  $\sigma$  is unknown.
  - c. Construct a confidence interval for a population proportion based on a sample proportion.
  - d. Determine a sample size necessary to estimate a population mean or proportion, given a specific margin of error.
  - e. Use hypothesis testing to test a claim about a population mean when  $\sigma$  is known.
  - f. Use hypothesis testing to test a claim about a population mean when  $\sigma$  is unknown.
  - g. Use hypothesis testing to test a claim about a population proportion using sample proportions.
  - h. Use hypothesis testing to test the difference between two population means when  $\sigma_1$  and  $\sigma_2$  are known.
  - i. Use hypothesis testing to test the difference between two population means using two samples composed of matched pairs.
  - j. Use hypothesis testing to test the difference between two population means when  $\sigma_1$  and  $\sigma_2$  are unknown.
  - k. Use hypothesis testing to test the difference between two population proportions using two independent sample proportions.

## OUTLINE OF INSTRUCTION

- I. Introduction to Statistics
  - A. Definitions of Statistics
  - B. Types of Data
  - C. Uses and Abuses of Statistics
  - D. Types of Sampling
- II. Summarizing and Graphing Data
  - A. Frequency Distributions
  - B. Histograms
  - C. Statistical Graphs
- III. Describing, Exploring and Comparing Data
  - A. Measures of Center
  - B. Measures of Variation
  - C. Measures of Relative Standing and boxplots
- IV. Probability Distributions
  - A. Random Variables
  - B. Binomial Probability Distributions
  - C. Mean, Variance, and Standard Deviation for the Binomial Distribution

- V. Normal Probability Distributions
  - A. The Standard Normal Distribution
  - B. Applications of Normal Distributions
  - C. The Central Limit Theorem
  
- VI. Estimates and Sample Sizes
  - A. Estimating a Population Proportion
  - B. Estimating a Population Mean:  $\sigma$  Known
  - C. Estimating a Population Mean:  $\sigma$  Not Known
  - D. Determining a Sample Size
  
- VII. Hypothesis Testing
  - A. Basics of Hypothesis Testing
  - B. Testing a Claim about a Proportion
  - C. Testing a Claim about a Mean:  $\sigma$  Known
  - D. Testing a Claim about a Mean:  $\sigma$  Not Known
  
- VIII. Inferences from Two Samples
  - A. Inferences about Two Proportions
  - B. Inferences about Two Means: Independent and Large Samples
  - C. Inferences from Dependent Samples
  
- IX. Correlation and Regression
  - A. Correlation
  - B. Regression

**REQUIRED TEXTBOOK AND MATERIALS:**

Triola, Mario F. Elementary Statistics. 11<sup>th</sup> Ed. Addison Wesley, 2010.

**CALCULATOR:**

TI-83/84 Graphing Calculator.

**STATEMENT OF DISABILITIES ACCOMMODATION:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 536-7207 x 1413 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.