Virginia Western Community College
MTH 245
Statistics

Prerequisites
Successful completion of MTH 154*, MTH 161*, or MTH 167* with a grade of "C" or better.

Course Description
Presents an overview of statistics, including descriptive statistics, elementary probability, probability distributions, estimation, hypothesis testing, correlation, and linear regression. Credit will not be awarded for both MTH 155* Statistical Reasoning and MTH 245: Statistics I or equivalent. This is a Passport and UCGS transfer course.

Semester Credits: 3 **Lecture Hours: 3** **Lab/Clinical/Internship Hours:** 0

Required Materials

Textbook:
Discovering Business Statistics. Nottingham. 2nd edition. Hawkes. ISBN: 9781642775204

Other Required Materials:
Minitab or another Statistics Package

Course Outcomes

- Graphical and Numerical Data Analysis
  - Identify the difference between qualitative, discrete quantitative, and continuous quantitative data.
  - Construct and interpret graphical displays of data, including (but not limited to) frequency tables, box plots, line charts, histograms, and bar charts.
  - Compute measures of center (mean, weighted mean, median, mode), measures of variation, (range, interquartile range, standard deviation, variance), and measures of position (percentiles, quartiles, standard scores).
  - Apply the Empirical Rule
- Sampling/Experimental Design
  - Recognize a representative sample and describe its importance.
  - Identify methods of sampling.
  - Explain the differences between observational studies and experiments.
  - Recognize and explain the key concepts in experiments.
- Probability Concepts

  - Describe the difference between relative frequency and theoretical probabilities and use each method to calculate probabilities of events.
  - Determine whether two events are mutually exclusive or independent.
  - Determine probabilities of composite events using the complement rule, the addition rule, and the multiplication rule.
  - Apply the Law of Large Numbers.
  - Distinguish between discrete and continuous random variables.
  - Use the binomial, normal, and t distributions to calculate probabilities.
  - Recognize or restate the Central Limit Theorem and use it as appropriate.
  - Identify when the use of the normal distribution is appropriate.
  - Identify when the t distribution is preferable to the normal distribution in statistical inference.
  - Distinguish between the distribution of a random variable and the sampling distributions of its associated sample statistics.
  - Identify the sampling distributions of the sample mean and the sample proportion and use them to make statistical inferences.
- Univariate Statistical Inference
  - Explain the difference between point and interval estimates.
  - Describe the concepts of best estimate and margin of error.
  - Construct confidence intervals for population means and proportions.
  - Interpret the confidence level associated with an interval estimate.
  - Distinguish between a two-tailed, left-tailed, and right-tailed hypothesis tests.
  - Conduct hypothesis tests for population means and proportions.
  - Interpret the meaning of both rejecting and failing to reject the null hypothesis.
  - Describe Type I and Type II errors in the context of specific hypothesis tests.
  - Use a p-value to reach a conclusion in a hypothesis test.
  - Identify the interrelationship between hypothesis tests and confidence intervals.
- Two-Sample Statistical Inference
  - Construct and interpret a confidence interval for the difference between two population means where the samples are independent and the population variances are assumed unequal.
  - Construct and interpret a confidence interval for the difference between two population means where the data consists of matched pairs.
  - Conduct a hypothesis test for the equality of two population means where the samples are independent and the population variances are assumed unequal.
  - Conduct a hypothesis test for the equality of two population means where the data consists of matched pairs.
- Correlation and Regression
  - Analyze scatterplots for patterns, linearity, and influential points.
  - Determine the equation of a least-squares regression line and interpret its slope and intercept.
  - Calculate and interpret the correlation coefficient and the coefficient of determination.
  - Conduct a hypothesis test for the presence of correlation.
- Technology Application
  - Construct statistical tables, charts, and graphs using appropriate technology.

- Calculate descriptive and inferential statistics using an appropriate statistical software package.
- Complete statistical project. Students are required to complete some form of semester project in their course that is worth a significant portion of the student's grade. This could be either an individual or group effort, and could be completed in stages through the semester or as a single, stand-alone exercise. As a minimum, the project should require students to manipulate and draw statistical inferences from a large, realistic data set using a statistical software package.

Major Topics to be Included

- Graphical and Numerical Data
- Sampling and Experimental Design
- Probability
- Univariate Statistical Inference
- Two-Sample Statistical Inference
- Correlation and Regression

Topical Description

1. Descriptive Statistics
2. Displaying Data
3. Discrete distributions
4. Binomial Distributions
5. Normal Distributions
6. Random Variables
7. Random Sampling
8. Sampling Distributions
9. Statistical Inference
10. One and Two Sample Hypothesis Testing
11. ANOVA
12. Linear Regression

Notes to Instructors

- The use of computers will be stressed throughout the course.

ADA Statement (PDF)
Title IX Statement (PDF)