



Western Technical College

## 10804189 Introductory Statistics

### Course Outcome Summary

#### Course Information

<b>Description</b>	Students taking Introductory Statistics display data with graphs, describe distributions with numbers perform correlation and regression analyses, and design experiments. They use probability and distributions to make predictions, estimate parameters, and test hypotheses. They draw inferences about relationships including ANOVA.
<b>Instructional Level</b>	Associate Degree Courses
<b>Total Credits</b>	3
<b>Total Hours</b>	72

#### Textbooks

*Statistics by Learning Objective – with Access*. 1st Edition. Copyright 2019. Cengage Learning. Publisher: Cengage Learning. **ISBN-13:** 978-1-337-68759-1. Required.

#### Learner Supplies

Scientific calculator - \$10-20. **Vendor:** Campus Shop. Required.

#### Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Live Responsibly: Develop Resilience
3. Live Responsibly: Foster Accountability
4. Refine Professionalism: Improve Critical Thinking

#### Course Competencies

##### 1. Organize data.

###### Assessment Strategies

- 1.1. by submitting tables, charts or graphs using software
- 1.2. by submitting tables, charts or graphs manually
- 1.3. by completing assignments/written tests/projects

## Criteria

*You will know you are successful when*

- 1.1. you construct frequency distributions.
- 1.2. you construct histograms.
- 1.3. you construct stem and leaf diagrams.
- 1.4. you construct pie charts.
- 1.5. you construct box plots.
- 1.6. you construct line graphs.
- 1.7. you construct bar graphs.
- 1.8. you apply standards of spelling, English grammar, and punctuation.
- 1.9. you provide a statistical description that is appropriate to the nature of the data.
- 1.10. you model your graphs with the professional attributes of the class examples.
- 1.11. you accurately represent the data with a graph.
- 1.12. you provide accurate numerical answers.

## Learning Objectives

- 1.a. Identify the types of information used to construct different graphs.
- 1.b. Identify the required characteristics of different graphs.
- 1.c. Construct the correct type of graph, based on type of information given.
- 1.d. Interpret the information communicated by different graphs.
- 1.e. Construct graphs with required characteristics: title, labels, accuracy.

## 2. Summarize data numerically.

### Assessment Strategies

- 2.1. by completing assignments/written tests/projects

## Criteria

*You will know you are successful when*

- 2.1. you determine measures of central tendency.
- 2.2. you interpret measures of central tendency.
- 2.3. you determine measures of spread.
- 2.4. you interpret measures of spread.
- 2.5. you determine measures of relative position (quartiles, percentiles).
- 2.6. you interpret measures of relative position.
- 2.7. you choose a statistical description appropriate to the nature of the data.
- 2.8. you provide accurate numerical answers.

## Learning Objectives

- 2.a. Identify the characteristics of different measures of center.
- 2.b. Identify the characteristics of measures of spread.
- 2.c. Identify the characteristics of measures of position.
- 2.d. Determine measures of center from a data set.
- 2.e. Determine measures of spread from a data set.
- 2.f. Determine measures of position from a data set.
- 2.g. Interpret characteristics of data, based on measures of center.
- 2.h. Interpret characteristics of data, based on measures of spread.
- 2.i. Interpret characteristics of data, based on measures of position.

## 3. Use probability distributions.

### Assessment Strategies

- 3.1. by completing assignments/written tests/projects

## Criteria

*You will know you are successful when*

- 3.1. you distinguish between theoretical and empirical probabilities.
- 3.2. you create a probability distribution from observational data.
- 3.3. you calculate theoretical probabilities of events.
- 3.4. you evaluate the parameters of a probability distribution.

- 3.5. you apply the Normal distribution to solve problems.
- 3.6. you apply Central Limit Theorem.
- 3.7. you choose a statistical description appropriate to the nature of the data.
- 3.8. you provide accurate numerical answers.
- 3.9. you apply standards of spelling, English grammar, and punctuation in stating conclusions.

**Learning Objectives**

- 3.a. Determine appropriate probabilities, based on data provided.
- 3.b. Evaluate the parameters of a probability distribution.
- 3.c. Apply the normal distribution to solve problems.

**4. Investigate study design.**

**Criteria**

*You will know you are successful when*

- 4.1. you distinguish between experimental and observational studies.
- 4.2. you locate sources of data.
- 4.3. you identify sampling techniques.
- 4.4. you critique the validity of the analysis.
- 4.5. you identify sources of bias.
- 4.6. you provide accurate numerical answers.
- 4.7. you apply standards of spelling, English grammar, and punctuation in stating conclusions.

**Learning Objectives**

- 4.a. Identify the difference between experimental and observational studies.
- 4.b. Identify sampling techniques.
- 4.c. Evaluate the application of sampling techniques.
- 4.d. Identify sources of bias.

**5. Draw inference about population parameters from sample data from one population.**

**Assessment Strategies**

- 5.1. by completing assignments/written tests/projects

**Criteria**

*You will know you are successful when*

- 5.1. you chose appropriate procedure to construct a confidence interval for the population mean.
- 5.2. you chose appropriate procedure to construct a confidence interval for the population standard deviation.
- 5.3. you chose appropriate procedure to construct a confidence interval for the population proportion.
- 5.4. you interpret confidence intervals.
- 5.5. you analyze the role of sample size.
- 5.6. you distinguish between random and non-random samples.
- 5.7. you perform hypothesis test on a single population parameter.
- 5.8. you choose a procedure appropriate to the nature of the data (z distribution, t distribution).
- 5.9. you provide accurate numerical answers.
- 5.10. you apply standards of spelling, English grammar, and punctuation in stating conclusions.

**Learning Objectives**

- 5.a. Construct confidence intervals for statistical measures of single samples.
- 5.b. Interpret confidence intervals.
- 5.c. Examine the effects of sample size on confidence intervals.
- 5.d. Perform hypothesis testing on single samples.
- 5.e. Identify the criteria for choosing correct procedures for hypothesis testing.
- 5.f. Choose correct procedure for hypothesis testing, based on data provided.

**6. Draw inference about population parameters from sample data from two or more populations.**

**Assessment Strategies**

- 6.1. by completing assignments/written tests/projects

**Criteria**

*You will know you are successful when*

- 6.1. you chose appropriate procedure to construct a confidence interval for the difference of population means.
- 6.2. you chose appropriate procedure to construct a confidence interval for the difference of population proportions.
- 6.3. you distinguish between independent random samples and matched pairs.
- 6.4. you interpret confidence intervals.
- 6.5. you analyze the role of sample size.
- 6.6. you perform a hypothesis test on a parameter from two populations.
- 6.7. you perform a hypothesis test on a parameter from more than two populations (F distribution, ANOVA).
- 6.8. you perform a chi-square test on a contingency table for categorical variables.
- 6.9. you perform a chi-square test for "goodness of fit".
- 6.10. you choose a procedure appropriate to the nature of the data.
- 6.11. you provide accurate numerical answers.
- 6.12. you apply standards of spelling, English grammar, and punctuation in stating conclusions.

### **Learning Objectives**

- 6.a. Construct confidence intervals for statistical measures of two samples.
- 6.b. Interpret confidence intervals for two samples.
- 6.c. Perform hypothesis testing on two samples and multiple samples.
- 6.d. Identify the criteria for choosing correct procedures for hypothesis testing for two samples and multiple samples.
- 6.e. Choose correct procedure for hypothesis testing of two samples and multiple samples, based on data provided.

## **7. Evaluate correlation and linear regression in bi-variate data.**

### **Assessment Strategies**

- 7.1. by completing assignments/written tests/projects

### **Criteria**

*You will know you are successful when*

- 7.1. you create a scatter plot of bi-variate data.
- 7.2. you calculate the correlation coefficient.
- 7.3. you interpret the correlation coefficient.
- 7.4. you construct the best fit regression line.
- 7.5. you use the best fit line to make predictions.
- 7.6. you use the best fit line to solve applied problems
- 7.7. you interpret relationships between variables.
- 7.8. you provide accurate numerical answers.
- 7.9. you apply standards of spelling, English grammar, and punctuation in stating conclusions.

### **Learning Objectives**

- 7.a. Identify the characteristics of bi-variate data.
- 7.b. Create a scatter plot for bi-variate data
- 7.c. Identify the connections of the correlation coefficient to different characteristics of data sets.
- 7.d. Explore the characteristics of the formula for the regression line.
- 7.e. Use the regression line to make predictions.