

MATH-1500: BUSINESS PROBABILITY AND STATISTICS II

Cuyahoga Community College

Viewing: MATH-1500 : Business Probability and Statistics II

Board of Trustees:

June 2020

Academic Term:

Fall 2021

Subject Code

MATH - Mathematics

Course Number:

1500

Title:

Business Probability and Statistics II

Catalog Description:

Second of two-semester introductory sequence in probability and statistics, intended for students majoring in business. Includes study of inferences on means and proportions, analysis of variance, correlation, simple and multiple linear regression models, business applications and decision making, and the use of statistical software.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

MATH-1490 Business Probability and Statistics I, or departmental approval: equivalent coursework.

Outcomes

Course Outcome(s):

Perform hypothesis tests to make data driven decisions and evaluate claims about population means and proportions for one and two samples.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Determine the appropriate hypothesis test based upon a data set and verify test assumptions.
2. Formulate an appropriate null and alternative hypothesis.
3. Calculate Type II error probabilities.
4. Perform hypothesis tests using small and large samples.
5. Perform hypothesis tests with known and unknown population standard deviations.
6. Identify independent and dependent samples for hypothesis tests.
7. Use the result of a hypothesis test to draw an appropriate business conclusion.

Course Outcome(s):

Use statistical control charts to monitor a business process.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Understand the concept of statistical control.
 2. Construct and interpret a control chart for process location (x-bar chart).
 3. Construct and interpret a control chart for process variation (R chart and/or s chart).
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Course Outcome(s):

Apply a single factor Analysis of Variance (ANOVA) to make inferences about the means of several populations.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Understand and verify the ANOVA model assumptions.
 2. Perform the calculations to complete the ANOVA table.
 3. Perform a multiple comparison procedure to determine the significant differences between the means.
 4. Use statistical software to find the ANOVA table and interpret the results.
 5. Identify an ANOVA model - Completely Randomized Design vs. Randomized Block Design.
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Course Outcome(s):

Build a simple linear regression model to solve problems involving prediction in business and other applications.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Construct scatter plots to graphically represent the relationship between two variables.
 2. Find the simple correlation coefficient to assess the appropriateness of performing a simple linear regression.
 3. Calculate by hand and use statistical software to find the least squares estimates of the model parameters (slope and intercept).
 4. Use the least squares line to compute a point prediction.
 5. Identify and verify model assumptions.
 6. Assess the strength of the model and find and interpret the simple coefficient of determination.
 7. Perform and interpret test of significance of the regression parameters.
 8. Use statistical software to find and interpret confidence intervals and prediction intervals.
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Course Outcome(s):

Build a multiple linear regression model to solve problems involving prediction in business and other applications.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Understand the concept of a multiple linear regression model.
 2. Interpret the model parameters and estimate them using statistical software.
 3. Use statistical software to perform inferences about an individual model parameter.
 4. Use statistical software to find the multiple coefficient of determination, R^2 , and adjusted R^2 .
 5. Interpret R^2 and the adjusted R^2 and use them to assess model fit.
 6. Use statistical software to find confidence intervals and prediction intervals and interpret these intervals.
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Course Outcome(s):

Apply Chi-square tests and F test to solve different types of decision-making problems.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Use the Chi-square tests for population variance, goodness-of-fit, and independence.
2. Use the F test for testing two population variances.

Course Outcome(s):

Use the ANOVA Two-Way Factorial Design model to make inferences about the means of the treatments.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Perform the calculations to complete the ANOVA table.
2. Perform a multiple comparison procedure to determine the significant differences between the means.
3. Use statistical software to find the ANOVA table and interpret the results.

Methods of Evaluation:

1. Periodic exams.
2. Quizzes.
3. Homework.
4. In class collaborative work.
5. Comprehensive final exam.

Course Content Outline:

1. Hypothesis Test on the mean of a population
 - a. Large and small samples
 - b. P-value to report test results
 - c. Type II error probabilities
2. Hypothesis Test to compare two means
 - a. Independent samples - large and small
 - b. Equal variances
 - c. Paired t-test
3. Inferences on proportions
 - a. Estimating a proportion
 - b. Testing hypothesis on a proportion
 - c. Comparing two proportions
4. Correlation and simple linear regression analysis
 - a. Scatter plots and correlation coefficient
 - b. The simple linear regression model
 - c. Inferences on correlation and regression coefficients
5. Multiple linear regression model
 - a. Notation, assumptions, development and assessment of the model
 - b. Inferences on regression coefficients
 - c. Estimation and prediction
6. Analysis of variance
 - a. The assumptions, model and notation
 - b. Treatment effects
 - c. Statistical inferences
7. Use of technology
 - a. Graphing calculators and software packages
 - b. Interpretation of results
 - c. Supplemental websites
8. Chi-square distribution and inferences on variances

- a. Chi-square table
 - b. Interval estimation of population variance
 - c. Hypothesis testing on population variance
 - d. Multinomial distribution
 - e. Goodness-of-fit test
 - f. Test of Independence
9. The F distribution
- a. F table
 - b. Comparing two variances
10. ANOVA two-way factorial design model
- a. Assumptions and notation
 - b. ANOVA table
 - c. Multiple comparison procedures
11. Statistical control charts
- a. X-bar chart
 - b. R chart and s chart
 - c. Business applications

Resources

David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm and James J. Cochran. *Statistics for Business and Economics*. 13th. Cengage, 2018.

James T. McClave, George P. Benson and Terry Sincich. *Statistics for Business & Economics*. 13th. Pearson, 2018.

David P. Doane and Lori E. Seward. *Applied Statistics in Business and Economics*. 6th. McGraw Hill, 2019.

David Groebner, Patrick Shannon and Phillip Fry. *Business Statistics: A Decision Making Approach*. 10th Edition. Pearson, 2018.

Clarence Johnson. *Business Statistics: Clearly Explained*. 1st Edition. Kendall Hunt, 2019.

Resources Other

- 1. Various statistical software packages.
- 2. Publisher websites.

Instructional Services

OAN Number:

Ohio Transfer 36 TMMSL

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Key: 2847