Subject:	BUS
Course Number:	116
Descriptive Title:	Statistics for Business Decision Making
Division:	Business
Department:	Business Management
Course Disciplines:	Business Management
Catalog Description:	This course takes a business focused approach to statistical analysis. Students will collect, clean, process, present, and interpret numerical data for the purpose of making effective business decisions. Key topics include: hypothesis testing, measures of central value and spread, confidence intervals, development of projections, probability distributions, sampling methods, hypothesis testing, Analysis of Variance (ANOVA), regression and correlation. Students will apply these methodologies and use inferential thinking to make decisions in areas such as operations, marketing, sales, economics, and human resources.
Prerequisite:	Intermediate algebra, has met the standards of the Common Core State Standards for Mathematics (CCSSM) from high school, or equivalent
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	3
Hours Laboratory (per week):	0
Outside Study Hours:	6
Total Course Hours:	54
Course Units:	3
Grading Method:	Letter Grade and Pass/No Pass
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	Fall 2025
Transfer UC:	Yes
Effective Date:	Pending
General Education ECC:	Area 6 - Mathematics Competency
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	Area 2A - Mathematical Concepts and Quantitative Reasoning

Term:	Pending
Other:	

	Upon completion of this course, students will be able to:
Student Learning Outcomes:	1. Organize and interpret raw business data using tables and graphs. 2. Summarize data using measures of central tendency to help drive business decisions. 3. Use the appropriate hypothesis test for making inferences about one or more population parameters and interpret the results to arrive at a data-driven business decision. 4. Analyze the relationship between two variables using simple regression and correlation analysis, interpret the results and determine their usefulness in making business decisions.
Course Objectives:	1. Explain the meaning of statistics and its role in making business and economic decisions. 2. Identify, collect, clean, process, present, interpret numerical data using proper sampling methods and tools. 3. Calculate the mean, median, mode, variance and standard deviation given a data set. 4. Distinguish the difference between sample and population distributions and analyze the role of the Central Limit Theorem. 5. Calculate and interpret confidence intervals for population means or proportions. 6. Explain the concept of hypothesis testing including Type I and Type II errors. 7. Use linear regression and ANOVA analysis for estimation and inference and interpret the associated statistic. 8. Differentiate between descriptive and inferential uses of statistics. Select the appropriate technique for testing a hypothesis and interpreting the result. 9. Calculate measure of central tendency, variation, and location for quantitative variables. 10. Calculate measures of frequency, contingency, dependence, or independence for categorical variables. 11. Calculate probabilities using various models of probability distributions: Poisson, Binomial, Normal, T, Chi-square, F, Uniform, Custom, and others. 12. Formulate hypothesis tests involving samples from one population.

Major Topics:	I. **Data collection (2 hours, lecture)**
	    A. Use spreadsheet or statistical software like SPSS or minitab
	    B. Introduction to the practice of statistics
	    C. Sample versus population
	    D. Sampling techniques, their advantages and disadvantages
	    E. Qualitative and quantitative data
	    F. Levels of measurement
	    G. Observational studies and experiments
	    H. Explore how artificial intelligence applications can support making decisions with business statistics
	II. **Descriptive Statistics (3 hours, lecture)**
	    A. Frequency and relative frequency tables
	    B. Bar graphs and histograms
	    C. Stem-and-leaf plots
	    D. Polygons
	    E. The mode, mean, and median

F.   Range, variance, and standard deviation
G.   Measures of position and outliers
H.   Quartiles and five-number summary

A.   Boxplots

III.   **Introduction to Basic Probability Ideas (3 hours, lecture)**
    A.   The sample space
    B.   Classical, empirical, and subjective probabilities
    C.   The two basic properties of probability
    D.   Complement of an event
    E.   Mutually exclusive events
    F.   The Addition Rule
    G.   Independent events

IV.   **Discrete Probability Distributions (3 hours, lecture)**
    A.   Discrete and continuous random variables
    B.   The mean, expected value, and standard deviation
    C.   Binomial distribution and experiments

V.   **Normal Probability Distributions (4 hours, lecture)**
    A.   Areas under the uniform probability distribution
    B.   Areas under a normal curve
    C.   The probabilities for random variables with normal distributions
    D.   Standard z-scores
    E.   Areas under the standard normal curve
    F.   Probabilities for normally distributed variables

VI.   **The Central Limit Theorem (3 hours, lecture)**
    A.   The Sampling Distribution of the sample means
    B.   Applications of the Central Limit Theorem

VII.   **Confidence Intervals (3 hours, lecture)**
    A.   Confidence interval for a population mean using the student's t-distribution
    B.   Confidence intervals for a population proportion

VIII.   **Hypothesis Testing for One Sample Mean or Proportion (5 hours, lecture)**
    A.   Null and alternative hypotheses
    B.   One-tailed and two-tailed tests
    C.   Type I and Type II errors
    D.   Interpreting the test statistic (t- and z-tests)
    E.   The p-value approach and significance levels
    F.   The classical approach using critical values
    G.   Reject/Fail to Reject, writing conclusion

IX.   **Hypothesis Testing for Two Sample Means or Proportions (5 hours, lecture)**
    A.   Inference about two means (t-test): Dependent Samples (matched-pairs)
    B.   Inference about two means (t-test): Independent Samples
    C.   Inference about two population proportions (z-test): Independent Samples

X.   **Chi-Square Analysis (3 hours, lecture)**
    A.   The Chi-Square Distribution
    B.   Goodness of fit test
    C.   Test for independence

XI.   **Correlation and Regression Analysis (5 hours, lecture)**
    A.   Scatter-plots and correlation
    B.   Interpreting the correlation coefficient
    C.   The Least-Squares Regression Line
    D.   Interpreting the slope and y-intercept
    E.   The difference between correlation and causation

	F. The coefficient of determination
	G. Prediction
	XII. **Hypothesis Testing for Three or More Population Means - ANOVA (4 hours, lecture)**
	    A. One-Way ANOVA techniques
	    B. The f-distribution
	    C. Out two means (t-test): Independent Samples
	    D. Inference about two population proportions (z-test): Independent Samples
	XIII. **Chi-Square Analysis (3 hours, lecture)**
	    A. The Chi-Square Distribution
	    B. Goodness of fit test
	    C. Test for independence
	XIV. **Correlation and Regression Analysis (5 hours, lecture)**
	    A. Scatter-plots and correlation
	    B. Interpreting the correlation coefficient
	    C. The Least-Squares Regression Line
	    D. Interpreting the Slope and y-Intercept
	    E. The difference between correlation and causation
	    F. The coefficient of determination
	    G. Prediction
	XV. **Hypothesis Testing for Three or More Population Means – ANOVA (3 hours, lecture)**
	    A. One-way ANOVA techniques
	    B. The f-distribution

Total Lecture Hours:	54
Total Laboratory Hours:	0
Total Hours:	54
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	ABC Company operates a call center where customer service representatives handle incoming calls. The company has identified three key performance indicators (KPIs) to measure the efficiency of its call center operations: 1. Average call handling time (AHT) 2. Average speed of answer (ASA) 3. Service level (SL) For each KPI, ABC Company wants to understand the distribution of values and the potential variability to make informed decisions about resource allocation and process improvement. AHT: The time taken by a customer service representative to handle a call, including the time spent speaking with the customer and any necessary follow-up tasks. The AHT follows a normal distribution with a mean of 6 minutes and a standard deviation of 1.5 minutes. ASA: The time a caller spends waiting in the queue before connecting with a representative. ASA follows a normal distribution with a mean of 30 seconds and a standard deviation of 10 seconds.

SL: The percentage of calls answered within a specified time threshold. ABC Company aims for a service level of 80%, meaning 80% of calls should be answered within 20 seconds.

Questions:

1. Calculate the mean, expected value, and standard deviation of the AHT, ASA, and SL.
2. Discuss how variability in AHT and ASA can impact the overall service level of the call center. Propose strategies that ABC Company could implement to improve its service level while managing variability.
3. If ABC Company receives 1000 calls in a day, estimate the total time spent by customer service representatives on call handling. Discuss the implications of this estimate for workforce management and resource planning.

Critical Thinking Assignment 1:

A marketing researcher is investigating the relationship between advertising expenditure and sales revenue for a certain product. The researcher collected data on advertising expenditure (in dollars) and corresponding sales revenue (in thousands of dollars) for 12 months. The dataset is provided below:

Advertising Expenditure (x)	Sales Revenue (y)
200	15
300	20
400	25
500	30
600	35
700	40
800	45
900	50
1000	55
1100	60
1200	65
1300	70

Questions:

1. Plot a scatter plot of advertising expenditure (x) versus sales revenue (y). Based on the scatter plot, does it appear that there is a linear relationship between the two variables?
2. Calculate the correlation coefficient (r) between advertising expenditure and sales revenue. Interpret the value of the correlation coefficient in the context of this marketing research.
3. Conduct a simple linear regression analysis to determine the equation of the regression line that best fits the relationship between advertising expenditure and sales revenue. Interpret the coefficients of the regression equation.
4. Use the regression equation to predict the sales revenue when the advertising expenditure is $1500. Interpret the meaning of this prediction in the context of the marketing research.

	5. Evaluate the goodness-of-fit of the regression model. Discuss any limitations or assumptions of the regression analysis in the context of this marketing research.
Critical Thinking Assignment 2:	A human resources manager is conducting a study to analyze the effect of different training methods on employee performance. The manager randomly selected three training methods (A, B, and C) and assigned employees to each training method. After completing the training, employees were evaluated based on their performance scores. The data for each training method is provided below: Training Method A: Performance Scores: 82, 85, 79, 80, 83 Training Method B: Performance Scores: 78, 76, 82, 79, 81 Training Method C: Performance Scores: 75, 77, 74, 79, 76 Questions: 1. State the null hypothesis and alternative hypothesis for the ANOVA test in this scenario. 2. Calculate the mean performance score for each training method. 3. Perform an ANOVA test to determine whether there is a statistically significant difference in the mean performance scores among the three training methods. Use a significance level of 0.05. 4. If the ANOVA test indicates a significant difference, conduct post-hoc tests to identify which specific training methods differ significantly from each other in terms of their effect on employee performance. 5. Interpret the results of the ANOVA test and post-hoc tests in the context of the human resources study. What implications do these findings have for the selection and implementation of training methods in the organization?
Other Evaluation Methods:	Class Performance, Essay Exams, Homework Problems, Journal kept throughout course, Matching Items, Multiple Choice, Objective Exam, Performance Exams, Presentation, Quizzes, Reading Reports, Term or Other Papers, True/False, Written Homework
If Other:	
Instructional Methods:	Demonstration, Discussion, Group Activities, Guest Speakers, Lecture, Multimedia presentations, Role play/simulation
If other:	
Work Outside of Class:	Answer questions, Journal (done on a continuing basis throughout the semester), Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting), Problem solving activity, Required reading, Skill practice, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Texts:	James McClave, P. Benson, Terry Sincich. Statistics for Business & Economics, 14th Edition, 2021. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, James J. Cochran. Essentials of Modern Business Statistics with Microsoft Excel (MindTap Course List), 8th Edition, 2021.
Alternative Texts:	

Required Supplementary Readings:	
Other Required Materials:	
Requisite	
Category	
Requisite course:	
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	Intermediate algebra, has met the standards of the Common Core State Standards for Mathematics (CCSSM) from high school, or equivalent
Requisite Skill and Matching skill(s): Bold the requisite skill(s). if applicable	**Solve algebraic equations.** Solve a variety of equations and inequalities, as well as systems of equations and inequalities, using algebraic and graphical methods. Types of equations include linear, quadratic, polynomial, rational and radical equations, as well as absolute value equations. **Graph linear functions.** Graph a variety of functions and relations and draw connections between these graphs and solutions to problems. **Perform numerical calculations involving powers and roots.** Solve problems involving a variety of function types, including linear, quadratic, polynomial, rational and radical functions, as well as the absolute value function.
Requisite course:	
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
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Enrollment Limitations and Category:	

Enrollment Limitations Impact:	
Course Created by:	M. SOMDECERFF
Date:	05/10/2024
Original Board Approval Date:	06/17/2024
Effective Term:	FALL 2025