

Skyline College
Official Course Outline

1. **COURSE ID:** BUS. 123 **TITLE:** Statistics
Units: 3.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; and 96.0-108.0 Homework hours
Method of Grading: Letter Grade Only
Prerequisite: MATH 120, or MATH 190 or equivalent.
Recommended Preparation:
 Eligibility for ENGL 100 or ENGL 105, or equivalent.
 BUS. 120 or equivalent.

2. **COURSE DESIGNATION:**
Degree Credit
Transfer credit: CSU; UC
AA/AS Degree Requirements:
 Skyline - GENERAL EDUCATION REQUIREMENTS: 9A3. English Language Communication and Critical Thinking - Critical Thinking
CSU GE:
 CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING:
 B4 - Mathematics/Quantitative Reasoning
IGETC:
 IGETC Area 2: MATHEMATICAL CONCEPTS AND QUANTITATIVE REASONING: A: Math

3. **COURSE DESCRIPTIONS:**
Catalog Description:
 Introduction to basic statistical methods, descriptive statistics, classification of data, probability, probability distributions, hypothesis testing, estimates and sample sizes, correlation and regression, chi-square tests, and analysis of variance. Use of technology to analyze data from business, life sciences, social sciences, psychology, health science, education, and physical science.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
 Upon successful completion of this course, a student will meet the following outcomes:
 - A. Organize and interpret sample data using tables and graphs.
 - B. Summarize data using measures of central tendency and dispersion.
 - C. Estimate the value of unknown parameters using confidence intervals.
 - D. Use the appropriate hypothesis test for making inferences about one or more population parameters, interpret the results, and identify the practical implications.
 - E. Analyze the relationship between two variables using simple regression and correlation analysis, interpret the results and determine their usefulness in making predictions.

5. SPECIFIC INSTRUCTIONAL OBJECTIVES:

Upon successful completion of this course, a student will be able to:

- A. Describe the difference between descriptive and inferential statistics
- B. Identify the standard methods of data collection, their advantages and disadvantages
- C. Describe the difference between qualitative and quantitative data
- D. Differentiate between the different levels of measurement and their implications
- E. Analyze data using frequency tables, histograms, stem-and-leaf plots, and other types of graphs.
- F. Calculate and interpret the mean, median, midrange, mode, range, z-scores, standard deviation, variance, percentiles, and quartiles.
- G. Draw boxplots and determine if a set of data has outliers using the interquartile range
- H. Describe the shape of a distribution as symmetric or skewed.
- I. Use the Empirical Rule to analyze data that are bell shaped.
- J. Compute probabilities and apply the addition rule and multiplication rule.
- K. Distinguish between discrete and continuous random variables.
- L. Construct a discrete probability distribution and find the mean, variance, and standard deviation
- M. Determine if a probability experiment is a binomial experiment and calculate probabilities and statistics from the binomial distribution.
- N. Distinguish between population and sample distributions and explain the significance of the Central Limit Theorem.
- O. Calculate probabilities using normal and t-Distributions.
- P. Construct confidence intervals for means and proportions (critical values of t- and z-distributions).
- Q. Explain statistical significance, including Type I/II errors and p-values.
- R. Perform a hypothesis test for a claim about one mean or one proportion using both the p-value and the classical approaches (t- and z-tests).
- S. Perform a hypothesis test for a claim about two independent means using both the p-value and the classical approaches (t-test).
- T. Perform a hypothesis test for a claim about two dependent means using both the p-value and the classical approaches (t-test).
- U. Perform a hypothesis test for a claim about two proportions using the p-value and classical (z-test) approaches.
- V. Conduct a chi-square test for goodness of fit.
- W. Conduct a chi-square test for independence.
- X. Investigate whether there is a linear relationship between two variables and use regression analysis to determine the equation of the least-square line.
- Y. Calculate and interpret the correlation coefficient and coefficient of determination.
- Z. Conduct a hypothesis test using one-way ANOVA techniques to see if there is a statistically significant difference between three or more sample means.

- AA. Use appropriate statistical techniques to analyze data and interpret results from applications based on data from a variety of disciplines including business, life and social sciences, psychology, health science, education, and physical science.
- BB. Use statistical software or graphing calculators to compile and analyze data.

6. **COURSE CONTENT:**

Lecture Content:

1. Use technology throughout the course, which may include graphing calculators, Excel spreadsheets, StatCrunch, or statistical software like SPSS or Minitab
2. Applications using data from disciplines including business, social sciences, health sciences, life sciences, psychology, and education.
3. Data collection
 - A. Introduction to the practice of statistics
 - B. Sample versus population
 - C. Sampling techniques, their advantages and disadvantages
 - D. Qualitative and quantitative data
 - E. Levels of measurement
 - F. Observational studies and Experiments
4. Descriptive Statistics
 - 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
 - I. Boxplots
5. Introduction to Basic Probability Ideas
 - 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
6. Discrete Probability Distributions
 - A. Discrete and continuous random variables
 - B. The mean, expected value, and standard deviation
 - C. Binomial distribution and experiments
7. Normal Probability Distributions

- 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
8. The Central Limit Theorem
 - A. The Sampling Distribution of the sample means
 - B. Applications of the Central Limit Theorem
 9. Confidence Intervals
 - A. Confidence interval for a population mean using the Student's t-distribution
 - B. Confidence intervals for a population proportion
 10. Hypothesis Testing for One Sample Mean or Proportion
 - 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
 11. Hypothesis Testing for Two Sample Means or Proportions
 - 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
 12. Chi-Square Analysis
 - A. The Chi-Square Distribution
 - B. Goodness of fit test
 - C. Test for independence
 13. Correlation and Regression Analysis
 - 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
 14. Hypothesis Testing for Three or More Population Means - ANOVA
 - A. One-Way ANOVA techniques
 - B. The f-distribution
7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
 Typical methods of instruction may include:

- A. Lecture
- B. Discussion
- C. Experiments
- D. Other (Specify): a. Lecture/demonstrations emphasizing the basic concepts and methodologies of statistical analysis, which encourage an interactive dialogue with the teacher and with other students. b. Student use of PowerPoint presentations and videos to reinforce concepts learned in class and in the textbook. c. Students will be required to read a college level textbook on statistics. d. Students will receive regular homework assignments that will require them to apply material learned in class and in the textbook to the solution of problems from various disciplines. e. Students will be required to complete online experiments that make use of interactive resources available on the Internet. f. Students will be required to complete a series of group exercises that require a high degree of collaboration and problem-solving skills.

8. REPRESENTATIVE ASSIGNMENTS

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

- A. Once students become familiar with the course methodology they are asked to complete a detailed list of study tasks and organizational skills necessary to be successful in the course. The assignment includes peer review and varies in length between a few short paragraphs to two pages, depending on the student (one to two hours).
- B. Online discussion posts, including peer evaluation, of key statistical concepts and statistical statements in current media (three to six per semester, requiring one hour each).

Reading Assignments:

- A. One chapter of college level statistics textbook per week (approximately 20-40 pages).
- B. Weekly chapter study guide including key concepts, videos, and additional support documents (approximately one hour per week).

Other Outside Assignments:

- A. Online textbook homework exercises to reinforce course concepts (one to two hours per week).
- B. Weekly chapter practice problems (approximately one hour).
- C. Group class problems for classroom sections (four to six per semester).

9. REPRESENTATIVE METHODS OF EVALUATION

Representative methods of evaluation may include:

- A. Class Participation
- B. Class Work
- C. Exams/Tests

- D. Homework
- E. Quizzes
- F. Research Projects
- G. a) Individual homework assignments b) Group exercises c) Online problems sets
d) Online Interactive experiments e) Unit tests g) Comprehensive midterm exams
h) Class and online participation

10. **REPRESENTATIVE TEXT(S):**

Possible textbooks include:

- A. Triola, M.. *Essentials of Statistics*, 6th ed. Pearson, 2017
- B. Sullivan III, M.. *Fundamentals of Statistics: Informed Decisions Using Data*, 5th ed. Pearson, 2018

Other:

- A. McLaughlin & Wakefield, *Graphing Calculator Manual for the TI-84/84 Plus and TI-89*, organized to follow topics in *Fundamentals of Statistics: Informed Decisions Using Data*, 5th ed. Pearson, 2018

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