

SOC 7: STATISTICS FOR THE BEHAVIORAL SCIENCES

Foothill College Course Outline of Record

| Heading | Value |
|------------------------------------|--|
| Effective Term: | Summer 2022 |
| Units: | 5 |
| Hours: | 5 lecture per week (60 total per quarter) |
| Prerequisite: | One of the following: PSYC 1, 1H, SOC 1, 1H; Intermediate Algebra or equivalent. |
| Advisory: | UC will grant transfer credit for a maximum of one course from the following: PSYC 7, SOC 7, MATH 10 or 17—students are strongly encouraged to meet with a counselor for appropriate course selection; not open to students with credit in PSYC 7. |
| Degree & Credit Status: | Degree-Applicable Credit Course |
| Foothill GE: | Area V: Communication & Analytical Thinking |
| Transferable: | CSU/UC |
| Grade Type: | Letter Grade (Request for Pass/No Pass) |
| Repeatability: | Not Repeatable |
| Cross-Listed: | PSYC |

Student Learning Outcomes

- 1. Using appropriate descriptive and inferential statistics, students will be able to analyze and perform computations on data sets.
- 2. Students will be able to accurately match and perform the appropriate statistical tests for a wide range of descriptive, correlational, qualitative, and experimental research designs.

Description

For students majoring in psychology, sociology, and other behavioral sciences. Introduction to the basic statistical techniques and design methodologies used in behavioral sciences. Topics include descriptive statistics; probability and sampling distributions; statistical inference and power; linear correlation and regression; chi-square; t-tests, and ANOVA. Computations will be completed by hand and with the use of statistical software. Emphasis on the interpretation and relevance of statistical findings and the application of statistical concepts to real-world problems in the behavioral and social sciences.

Course Objectives

The student will be able to:

- A. Distinguish among different scales of measurement and their implications
- B. Identify the standard methods of obtaining data and identify advantages and disadvantages of different sampling techniques and techniques for obtaining data

- C. Interpret data displayed in tables and graphs
- D. Determine measures of central tendency and variability for a given data set
- E. Calculate measures of central tendency and variability for discrete distributions
- F. Apply concepts of sample space and probability
- G. Calculate probabilities using normal and t-distributions
- H. Explain the difference between sample and population distributions and the role played by central limit theorem
- I. Calculate z-scores
- J. Construct standardized distributions from z-scores
- K. Construct and interpret confidence intervals
- L. Explain the basic concept of hypothesis testing, including Type I and II errors
- M. Interpret levels of statistical significance, including p-values
- N. Compute by hand and interpret data from many types of statistical tests, including the z-test, the single-sample t-test, the independent samples t-test, the repeated measures t-test, one-way ANOVA, Pearson's correlation, Spearman's correlation, linear regression, and chi-square
- O. Compute using software, such as SPSS, Excel, or R, and interpret data from many types of statistical tests, including the z-test, the single-sample t-test, the independent samples t-test, the repeated measures t-test, one-way ANOVA, Pearson's correlation, Spearman's correlation, linear regression, and chi-square
- P. Interpret the output of a computer-based statistical analysis from programs, such as SPSS, Excel, or R
- Q. Formulate a hypothesis test (e.g., choose the forms of null and alternative hypotheses) involving samples from two populations
- R. Use appropriate statistical techniques to analyze and interpret applications based on data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education
- S. Apply simple regression analysis for estimation, inference, and interpret the associated statistics
- T. Calculate and interpret measures of effect size for many different types of statistical tests, including but not limited to single-sample t-test, independent samples t-test, repeated measures t-test, one-way ANOVA, Pearson's r, and chi-square

Course Content

- A. Introduction to Statistics
 1. Explain the definitions of statistics, science, and observation
 2. Populations and samples
 3. Sampling methods
 4. Advantages and disadvantages of sampling methods, including but not limited to random sampling, cluster sampling, stratified sampling, and convenience sampling
 5. The scientific method and the design of research studies
 6. Variables and measurement
 7. Scales of measurement as they relate to variables associated with behavioral and social sciences, such as psychology, sociology, economics
 8. Statistical notation
 9. Overview of how statistical operations are applied to research within business, social sciences, psychology, life science, health science, and education
- B. Frequency Distributions
 1. Frequency distribution tables
 2. Frequency distribution graphs
 3. The shape of frequency distributions

4. Sample spaces

C. Central Tendency

1. The mean
2. The median
3. The mode
4. Selecting a measure of central tendency
5. Measures of relative position
6. Binomial distributions
7. Random variables
8. Discrete distributions
9. Explanation for how to interpret means and "mean differences" that are reported in behavioral science literature
10. Central tendency and the shape of the distribution
11. Interpretations of behavioral aspects of data sets with different shapes and skews

12. How to report measures of central tendency in the literature using APA format

13. Applications of measures of central tendency using data sets from business, social sciences, psychology, life science, health science, and education

D. Variability

1. The range and the interquartile range
2. Standard deviation and variance for a population
3. Standard deviations and variance for samples
4. How to determine if a sample is biased or unbiased using variance
5. How to interpret the behavioral aspects of data sets with relatively small, medium, and large standard deviations
6. How to interpret the behavioral aspects of sample data sets by analyzing the relationship between the mean and standard deviation
7. How to report the standard deviation in the literature using APA format
8. Applications of measures of variability using data sets from business, social sciences, psychology, life science, health science, and education

E. Correlation and Regression

1. The pearson correlation
2. Using and interpreting the pearson correlation
3. Uses and applications of the pearson correlation to research in the behavioral sciences, including study design, inter-rater reliability, and concurrent validity, and construct validity
4. Hypothesis tests and the pearson correlation
5. Reporting correlations in the literature using APA format
6. The point-biserial correlation and measuring effect size with r-squared
7. The spearman correlation
8. Applications of pearson's r correlation and the spearman correlation using data sets from business, social sciences, psychology, life science, health science, and education
9. Introduction to regression
10. Analysis and interpretation of data using statistical software, such as SPSS, Excel, or R
11. Applications of regression using data sets from business, social sciences, psychology, life science, health science, and education

F. Z-scores: Location of Scores and Standardized Distributions

1. Definition and introduction to z-scores
2. Z-scores and location in a distribution
3. Using z-scores to standardize a distribution
4. Other standardized distributions based on z-scores
5. The connection between z-scores and inferential statistics
6. Explanation of how inferential statistics are used in the behavioral sciences, such as business, psychology, life sciences, sociology, economics, and education

G. Probability

1. Explanation of the concept of probability using data sets that are exemplar to behavioral sciences

2. Probability and the normal distribution

3. Probabilities and proportions for scores in a normal distribution

4. The connection between probability and inferential statistics

5. Binomial and discrete distributions

6. Random variables and expected value

H. Probability and Samples: The Distribution of Sample Means

1. Samples and sampling error

2. The distribution of sample means

3. Probability and the distribution of sample means

4. The standard error of the mean

5. How to report the standard error in the literature using APA format

6. The connection between the distribution of sample means and inferential statistics

7. Binomial distributions

I. Introduction to Hypothesis Testing

1. The logic of hypothesis testing within the behavioral sciences

2. Uncertainty and errors in hypothesis testing

3. Null and alternative hypothesis

4. P-value and criteria for a decision of significance

5. Z-test as an introduction to hypothesis testing

6. Type I and Type II errors

7. Single-sample z-test

8. Comparison of how one-tailed and two-tailed tests are used within social and behavioral science research, including in disciplines such as business, psychology, sociology, economics, and education

9. Measuring effect size with Cohen's d

10. Interpretations of Cohen's d

11. Importance of effect size and reporting effect size in the literature using APA format

12. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education

J. Single Sample T-Test

1. Hypothesis tests with a single-sample t-statistic (a t-test with one population)

2. Applications of the single-samples t-statistics to research design in the behavioral sciences

3. Measuring effect size for the single-sample t-statistic (Cohen's d and r-squared)

4. Reporting the results of a t-test in the literature using APA format

5. Analysis and interpretation of data using hand calculations and statistical software, such as SPSS, Excel, or R

6. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education

7. Technology based statistical analysis, such as SPSS, Excel or R

K. The Independent Samples T-Test (Between Subjects T-Test)

1. Research design within the behavioral sciences for an independent-samples t-test (a t-test with two populations)

2. Hypothesis tests and effect size with the independent-measures t-statistic

3. Reporting the results of an independent-measures t-test in the literature using APA format

4. Analysis and interpretation of data using hand calculations and statistical software, such as SPSS, Excel, or R

5. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education

6. Technology based statistical analysis, such as SPSS, Excel or R

- L. The Repeated Measures T-Test (Within Subjects T-Test)
1. Research design within the behavioral sciences for a repeated measures t-test (within subjects t-test), which is a t-test with two populations
 2. Hypothesis tests and effect size for the repeated-measures t-test
 3. Reporting the results of a repeated-measures t-test in the literature using APA format
 4. Analysis and interpretation of data using hand calculations and statistical software, such as SPSS, Excel, or R
 5. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education
 6. Technology based statistical analysis, such as SPSS, Excel or R
- M. Estimation and Confidence Intervals
1. Overview of estimation
 2. How to calculate and utilize confidence intervals
 3. Interpretation of confidence intervals using data sets that are exemplar to behavioral sciences
 4. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education
 5. Technology based statistical analysis, such as SPSS, Excel or R
- N. Introduction to ANOVA
1. The logic of analysis of variance
 2. ANOVA notation and formulas
 3. Applications of one-way ANOVA to behavioral science research
 4. The distribution of F-ratios
 5. Examples of hypothesis testing and effect size with ANOVA
 6. Post-hoc tests
 7. Reporting the results of analysis of variance in the literature
 8. Analysis and interpretation of data using hand calculations and statistical software using APA format
 9. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education
 10. Technology based statistical analysis, such as SPSS, Excel or R
- O. Two-Factor Analysis of Variance
1. Introduction to two-factor analysis of variance and how it is used within the behavioral sciences
 2. Introduction to main effects and interactions
 3. Interpretations of main effects and interactions
 4. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life science, physical science, health science, information technology, and education
 5. Technology based statistical analysis, such as SPSS, Excel or R
- P. Chi-Square Test
1. Introduction to the non-parametric statistics
 2. Calculating the chi-square test by hand and also using statistical software such as SPSS, Excel, or R
 3. Calculating a chi-square test with no preference
 4. Calculating a chi-square test from a known population
 5. Single factor and multiple factor (e.g., 2x2) chi-square tests
 6. Interpreting the results of chi-square tests
 7. Effect size measures of chi-square
 8. Assumptions and limitations of chi-square
 9. Reporting of chi-square tests using APA-style format
 10. Applications using data from at least two of the following disciplines: business, economics, political science, administration of justice, life

science, physical science, health science, information technology, and education

11. Technology based statistical analysis, such as SPSS, Excel or R

Lab Content

Not applicable.

Special Facilities and/or Equipment

When taught as an online distance learning section, students and faculty need ongoing and continuous internet and email access.

Method(s) of Evaluation

Methods of evaluation may include, but are not limited to:

- A. Multiple choice quizzes
- B. Hand computations
- C. Weekly homework assignments
- D. Data entry and analysis and interpretation of results using SPSS
- E. Research papers
- F. Summaries and analysis of primary source research articles
- G. Problem-solving exercises
- H. Midterm exams
- I. Final exams

Method(s) of Instruction

- A. Lectures
- B. In-class group and individual activities
- C. Class discussion
- D. Active learning exercises

Representative Text(s) and Other Materials

Gravetter, Frederick Jr., and Larry B. Wallnau. [Essentials of Statistics for the Behavioral Sciences](#). 8th ed. Wadsworth Cengage Learning, 2014.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

- A. Reading assignments:
 1. Reading and studying of textbook
 2. Reading and critically analyzing primary source research articles
- B. Writing assignments:
 1. Weekly homework assignments
 2. Interpretations to data analysis
 3. Computing statistical operations on data

Discipline(s)

Sociology, Psychology