PSYC A160: STATISTICS FOR THE BEHAVIORAL SCIENCES

Item	Value
Curriculum Committee Approval Date	03/20/2024
Top Code	170100 - Mathematics, General
Units	4 Total Units
Hours	72 Total Hours (Lecture Hours 72)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Associate Arts Local General Education (GE)	• OC Comm/Analytical Thinking - AA (OA2)
Associate Science Local General Education (GE)	• OCC Comm/AnalyticalThinking-AS (OAS2) • OCC Mathematics (OMTH)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 2A Math Concepts (2A)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 2A Math Concepts (2A)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B4 Math/Quant.Reasoning (B4)

Course Description

This course emphasizes the calculation, interpretation, and application of descriptive and inferential statistics in the behavioral sciences. Topics include research methods, mathematical concepts, distributions, estimation, correlation, regression, sampling and probability, hypothesis testing, z and t Tests, ANOVA, and nonparametric tests. Students completing STAT C1000 may petition for alternative credit for PSYC A160. Enrollment Limitation: STAT C1000; students who complete PSYC A160 may not enroll in or receive credit for STAT C1000. PREREQUISITE: Successful completion of a course at the level of intermediate algebra or Appropriate OCC math placement. Transfer Credit: CSU; UC: Credit Limitation: MATH A160, STAT C1000, and PSYC A160 combined: maximum credit, 1 course. C-ID: MATH 110.**C-ID:** MATH 110.

Course Level Student Learning Outcome(s)

1. Students will be able to critically evaluate statistical concepts, research designs, and applications in the behavioral sciences.

Course Objectives

- 1. Define important statistical terms, use mathematical notation, and describe relationships among concepts.
- 2. Differentiate descriptive from inferential statistics.
- 3. Distinguish among different scales of measurement and identify the attributes and implications of each.
- 4. Interpret data displayed in tables and graphs.
- 5. Calculate measures of central tendency and variation for a given data set.
- 6. Calculate the mean and variance of a discrete distribution.
- 7. Describe central tendency, use measures to explain research data, and appropriately graph results.
- 8. Apply concepts of sample space and probability.
- 9. Identify the standard methods of obtaining data and identify advantages and disadvantages of each.
- 10. Find and interpret relative position of values in a distribution.
- 11. Distinguish between sample and population distributions and analyze the role played by the Central Limit Theorem.
- 12. Explain sampling, compute probability, apply methods to solve problems, and interpret the position of values in the normal curve distribution.
- 13. Calculate probabilities using normal and Students t-distributions.
- 14. Explain hypothesis testing, including: stating null and alternative hypotheses, determining decision rules using alpha levels, assessing the likelihood of Type I and II errors, computing test statistics, and evaluating the test statistic in comparison to the critical values.
- 15. Formulate hypothesis tests involving samples from one and two populations.
- 16. Determine and interpret levels of statistical significance including p-values.
- 17. Select the appropriate technique for testing a hypothesis and interpret the result.
- 18. Describe, differentiate, compute, and interpret various statistical tests, including: z Tests, t Tests, F Tests, and nonparametric tests.
- 19. Compute and interpret effect size using Cohens d, r-squared, and eta-squared.
- 20. Construct and interpret confidence intervals.
- 21. Perform parameter estimation - both point estimates and confidence intervals - for values such as μ, μ1-μ2, and μD.
- 22. Discuss correlational research, identify strengths and weaknesses, explain relationships, perform associated computations, and interpret results.
- 23. Use linear regression and ANOVA analysis for estimation and inference, and interpret the associated statistics.
- 24. Acquire skills for organizing data, performing statistical analyses, interpreting results, and making conclusions.
- 25. Perform statistical analysis using technology such as SPSS, Excel, or graphing calculators.
- 26. Interpret the output of a technology-based statistical analysis.
- 27. use appropriate statistical techniques to analyze and interpret applications based on data from disciplines including psychology, social sciences, business, life science, health science, and education.

Lecture Content

Statistics and the Scientific Method Methods of knowing Research methodology Descriptive and inferential statistics Basic Measurement Concepts Mathematical notation Measurement Continuous and discrete variables, real limits, and rounding Scales of measurement Frequency Distributions and Graphing Organizing data Types of frequency distributions: relative frequency, cumulative frequency, and cumulative percentage Computing percentiles Graphing data

Relative position in distributions Measures of Central Tendency and Variability Characteristics of central tendency Measures of central tendency: mean, median, and mode Measures of variability: range, variance, and standard deviation Relative position in distributions Sample Spaces and Probability Basic probabilities Probability of events in a defined set of outcomes Discrete Random Variables Construction of probability distribution Identification of expected value Continuous Distributions - Normal Curve Areas under the normal curve Standardized (z) scores Calculation of proportions associated with values in the distribution Percentile ranks Random Sampling and Probability Random sampling techniques Sampling with and without replacement Computing probability Addition and multiplication rules Sampling and Sampling Distributions The distribution of sample means (aka sampling distribution) Sampling error Expected value/ mean of the sampling distribution Standard error of the mean (standard de viation of the sampling distribution) Central Limit Theorem Law of Large Numbers Hypothesis Testing Binomial distribution Data distributions and probability Alternative hypothesis Null hypothesis Decision rules and alpha levels Type I and Type II errors One and two-tailed probability evaluations Effect sizes Power Hypothesis testing with the z statistic Assumptions of the z Test Normal deviate (z) test Parameter estimation Point estimate Confidence interval estimate Students t Test Comparison of the z and t Tests Sampling distributions of t and degrees of freedom Assumptions of the t Test for single samples Calculating and interpreting the t Test for single samples Parameter estimation Point estimate Confidence interval estimate Students t Test for Related Measures Comparison between t Tests for single samples and correlated groups Assumptions of the t Test for correlated groups Calculating and interpreting the t Test for correlated groups Parameter estimation Point estimate Confidence interval estimate Students t Test for Independent Groups Comparison between t Tests for correlated and independent groups Assumptions of the t Test for independent groups Calculating and interpreting the t Test for independent groups Parameter estimation Point estimate Confidence interval estimate One-Way Analysis of Variance Purpose of the Analysis of Variance (ANOVA) Assumptions of ANOVA Within-groups variance, between groups v ariance, and the F Ratio Calculating and interpreting the F Test Relationships between t Test and F Test Multiple comparisons Two-Way Analysis of Variance Comparison between one-way and two-way ANOVA Assumptions of the two-way ANOVA Main effects and interactions Calculating and interpreting two-way ANOVA Multiple comparisons Correlation Types of relationships Strength of the relationship Correlation coefficient: Pearson r Other correlation coefficients Range of score effects Linear Regression Considerations for using linear regression Prediction and errors Computing and interpreting the linear regression equation and least-squares line Multiple regression Nonparametric Tests Parametric and nonparametric tests Chi-square: computing and interpreting single and two-variable experiments Wilcoxon Test Mann-Whitney U Test Kruskal-Wallis Test Statistical Analysis using Technology Tools (e.g., Excel, SPSS, or graphing calculator) Generating graphs to visualize data Generating tables to organize data Descriptive statistics Hypothesis testing Effect size calculation and interpretation Parameter estimation Application of statistical concepts and procedures with date from diverse fields Psychology Social sciences Business Life sciences Health sciences Education

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

Instructors will use zoom (or other online video conferencing services) for lectures and labs. Instructors will also communicate with students using announcements, chat rooms, and email. Online office hours will be held weekly and the syllabus and schedule will be posted daily throughout the entire semester. Engagement with students: Discussions will be uploaded on Discussion boards where students can interact with other classmates and the instructor. Instructors will provide feedback to students on assignments and papers using the comment tool on Canvas. Exams will take place online and instructors will provide feedback after exams are graded.

Reading Assignments

2.5 hours per week reading from the assigned textbook and supplementary materials Reading assignments may include: Textbook chapters and supplements Contemporary academic articles using/ addressing course-specific concepts

Writing Assignments

2.5 hours per week writing paper describing and interpreting statistical concepts Written assignments may include: Short-answer questions (e.g., describe statistical concepts). Essay questions (e.g., interpret statistical test results).

Out-of-class Assignments

3 hours per week completing out-of-class homework assignments Out of class assignments may include: Practice problem sets requiring application of course material A data set assignment requiring the organization, analysis, and interpretation of raw data Preparation assignments that reuqire students to answer specific questions that will be discussed in an upcoming class meeting

Demonstration of Critical Thinking

In-class quizzes completed individually or in group formats. Written assignments. Data set projects Exams Homework problem sets

Required Writing, Problem Solving, Skills Demonstration

Minimum of three exams including conceptual and computational question formats Homework problem sets Data set projects

Eligible Disciplines

Psychology: Masters degree in psychology OR bachelors degree in psychology AND masters degree in counseling, sociology, statistics, neuroscience, or social work OR the equivalent. Masters degree required.

Textbooks Resources

1. Required McCall, Robert B. . Fundamental Statistics for Behavioral Sciences, 8th ed. Belmont, CA: Thomson Wadsworth, 2001 Rationale: latest 2. Required Moore, D.S. . The Basic Practice of Statistics, 9th ed. New York, NY: MacMillan, 2021 Rationale: latest 3. Required Pagano, Robert R.. Understanding Statistics in the Behavioral Sciences, 10th ed. Belmont, CA: Thomson Wadsworth, 2012 Rationale: . 4. Required Gravetter, F.J. Wallnau, L.B.. Essentials of Statistics for the Behavioral Sciences, 10th ed. Belmont, CA: Cengage, 2021

Other Resources

1. Instructor prepared handouts