Statistics | Lecture

Academic Year 2020-2021

Course Information

Course Numbers	Total Units	Time Requirement
MATH213	**3 (lecture only)**	**45 hrs**

Course Details

Recommended Prerequisites

College Algebra

Course Description

This course introduces fundamental tools of quantitative methods in research such as data collection, organization, presentation, analysis and interpretation. Attention is given to tabulation, graphic presentation of data, measure of central tendency, variability, the normal curve, probability and statistical inference, linear correlation and research methods. Students will conduct statistical analyses using a dataset provided in the course.

Lecture Communication

A website will be set up on Canvas by your instructor.
Log in with your Username and password: **https://scuhs.instructure.com**

Faculty Information

Refer to the Canvas course webpage for this information.

Class Meeting Times

Refer to Canvas course webpage for this information.

Instructional Materials

- Elementary Statistics by Navidi and Monk (3rd edition), McGraw Hill Education. ISBN-13: 978-1259969454. An electronic textbook will be accessible through Canvas.

- Access to Microsoft Excel (provided through SCU). Students may also use Google Sheets.

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Course Purpose

Student Learning Outcomes

Upon completion of this course, students will:

1. Calculate and interpret basic statistics, both descriptive (e.g., measure of central tendency, standard deviation) and inferential statistics (e.g, ANOVA, Pearson R).
2. Describe and explain hypothesis testing, including rejecting and failing to reject the null hypothesis.
3. Evaluate the strengths and limitations of research data and apply it to life experiences.

Course Schedule

(subject to slight modifications by the instructor)

Week	Lecture	Assessment
1	Basic Ideas	Learning Objectives
	Graphical Summaries of Data	Quiz 1, 2, 3
	Numerical Summaries of Data	Exam 1
2	Summarizing Bivariate Data	Learning Objectives
	Probability	Quiz 4, 5, 6
	Discrete Probability Distributions	Exam 2
3	The Normal Distribution	Learning Objectives
	Confidence Intervals	Quiz 7, 8, 9
	Hypothesis Testing	Exam 3
4	Two-Sample Confidence Intervals	Learning Objectives
	Two-Sample Hypothesis Testing	Quiz 10, 11, 12
	Tests with Qualitative Data	Exam 4
5	Analysis of Variance (ANOVA)	Learning Objectives
	Inference in Linear Models	Quiz 14, 13
		Final Project (or) Exam 5

Tentative Grading Procedures

Assessment	Weight
Learning Objectives Check	30%
Quiz	30%
Weekly Exam	30%
Final Project or Exam 5	10%
Total	100%

Grading scale:

Please note letter grades will be assigned only at the end of the trimester.

A = 90% to 100%

B = 80% - less than 90%

C = 70% - less than 80%

D = 60% - less than 70%

F = less than 60%

W = Withdrawal

Academic Integrity

Visit SCU's **Academic Integrity** page to review policies for professionalism and academic integrity.

Teaching Methods and Activities

The course will follow a linear format, meaning you will complete all of the modules in sequence. The material in each module will include a combination of interactive assignments, formative quizzes and weekly exams. You can read about each of the course components below. Each module takes about 8-10 hours to finish. The course requires a significant time commitment from students.

Learning Objectives Check:

Each "Learning Objective Check" is an adaptive assignment on McGraw Hill's ALEKS platform; ALEKS is an artificially intelligent learning and assessment system. After determining each student's prior knowledge of a subject, ALEKS presents each student with the appropriate learning objectives that the student is ready to learn. Students will complete scaffolded calculation-based questions that introduce them to components of the learning objective. Each question is accompanied by learning resources such as media, video recordings and highlighted sections of the e-textbook. Students move through the topics by achieving at least 50-70% of each Learning Objective Check. Instructors monitor student performance on these assignments to provide targeted intervention based on each student's ability and pace.

Quizzes:

At the end of each Learning Objective Check, students will complete a quiz that provides on-the-spot feedback on how well they have understood and retained each chapter's content. Performance on the quiz will give students and instructors information about which concepts each student may be missing.

Weekly Exams:

Weekly exams assess cumulative understanding and retention of 2-3 chapters each week.

Final Project:

In the final project, students will put their statistical skills to use to craft a research or grant proposal.

Online Learning at SCU

MySCU is SCU's online campus portal. It includes SCU's learning management system (Canvas). It acts as a single point of access for a variety of campus information. It houses resources such as university policies, campus safety procedures, financial aid forms, class schedules, campus news, library databases, and other electronic resources for faculty, staff, and students. Incoming students receive login credentials and learn to navigate MySCU during orientation.

Your Keys to Success

This course requires no face-to-face meetings but students are required to maintain communication with the instructor by responding within 24-48 hrs to instructor messages. To be successful in this course, you will need to log in regularly and plan ahead to manage your workload.

Self-Directed Learning

Online courses require motivation, time management, and self-discipline on the part of the learner. Creating a self-directed learning plan will help you improve your independent study skills. Creating a routine weekly study schedule and a quiet working space will help you stay on pace with the class.

Online Etiquette

Follow the professional and online etiquette guidelines below when interacting with your peers and facilitator in the online environment, including discussion boards:

- Disagree with others with respect in the form of constructive feedback.
- Support your position with academic citations from the text or academic literature.
- Write clearly and concisely and stay on topic.
- Do not simply repeat what others have said but provide new information or analysis.
- If you quote another student's post, be sure to place it in quotation marks.
- Be mindful that the written word may be misinterpreted by others without hearing your tone and in the absence of face-to-face cues.
- Avoid the use of strong or offensive language.
- Check your spelling and grammar before sending emails or posting to the discussion boards.

University Policies

Accommodations

As a learning-centered community, Southern California University of Health Sciences recognizes that all students should be afforded the opportunity to achieve their academic and individual potential. The University recognizes and supports the standards set forth in Section 504 of the Rehabilitation Act and

the American with Disabilities Act (ADA). In accordance with its mission and federal and applicable state laws, the University is committed to making reasonable accommodations for qualified applicants for admission and enrolled students with disabilities. A student who needs accommodation(s) due to a disability should contact the Academic Support Office located in the Learning Resource Center.

Faculty and Dr./Patient Relationships

SCU faculty are highly skilled. However, per University Policy, health care is offered to students through the University Health System only. Neither preclinical nor clinical faculty can provide advice, assessment, treatment, or other elements that would be considered part of a Doctor-Patient relationship outside of a clinical setting established for that purpose.

Learning Activities

Students are expected to spend at least two hours for each lecture hour of course time per week in activities and assessments outside the classroom. Examples of activities include, but are not limited to: writing papers; reading articles or text; small group work; presentations; completing assignments; preparation for assessments; online activities and other activities that do not include direct instructor interaction and involvement.

All university policies apply to this course and all others. For full policy information please consult the university SCU Policy Manual. For a quick reference guide to the following policies: make-up examination, F-challenge examination, grade posting, results of failing grades, student support information, syllabus amendments, special needs, student conduct, and attendance, please consult the academic policies document housed on the **Online Student Services .**

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Course Learning Objectives

1. Define and differentiate the following basic concepts in research: population, parameter, sample, statistic, predictor variable, response variable (dependent), predictor (independent) variable, extraneous variable, natural organismic or subject) variable, and operational definition, inductive reasoning, and deductive reasoning.
2. Detail the goals of statistical data analysis by explaining how models explain and predict ("account for") data and how regularities uncovered by models can lead to the discovery of underlying mechanisms of behavioral phenomena.
3. Construct and/or interpret the following numerical descriptions of data: grouped and ungrouped frequency distributions, stemplots, boxplots, bar graphs, histograms, and polygons.
4. Define, calculate, and interpret different measures of central tendency (mean, median, and mode) for different data sets, including arrays, ungrouped frequency distributions, and grouped frequency distributions.
5. Assess the mathematical characteristics of the mean in order to explain why it is the preferred measure of central tendency in many statistical applications.
6. Define, calculate, and interpret measures of variation: (range, interquartile range, sum of squares, variance, and standard deviation) for different data sets, including arrays, ungrouped frequency distributions, and grouped frequency distributions.
7. Categorize distributions in terms of skew and outliers by applying measures of central tendency and variation to calculate statistics.
8. Calculate z-scores and use them to make probability statements about ranges of scores in a normal distribution.
9. Assess error and precision by calculating and interpreting residuals, sum of squares of residuals, and mean squares of residuals.
10. Apply probability theory by (a) defining and differentiating relevant concepts such as sample space, event, outcome, mutual exclusiveness, independence, and exhaustiveness; (b) using the Addition and Multiplication Rules to calculate probabilities; and (c) calculating joint and conditional probabilities from frequency tables and explain how they can be used to infer relations between variables.
11. Apply the Central Limit Theorem to determine various aspects of a sampling distribution of a statistic, including shape, mean, variance, and standard error.
12. Define and differentiate one- and two-tailed probabilities and explain how they are related to directional and nondirectional hypotheses.
13. Identify Null and Alternative Hypotheses for various research questions and express them mathematically in the form of linear models.
14. Determine statistical significance by defining and differentiating alpha levels, p-values, Type I and Type II errors and applying these concepts to decisions regarding statistical hypotheses.
15. Calculate and interpret the following: (a) single sample cases when population parameters are known (z-tests) and unknown (t-tests); (b) two-sample cases when the samples are independent and dependent (independent and correlated t-tests); (c) multi-sample (3 or more) independent cases with a single predictor variable (oneway ANOVA) and 2+ predictor variables (two-way ANOVA).

16. Conduct statistical tests by calculating and interpreting estimates of effect size, statistical power, degree of association, homogeneity of variance, and (for ANOVA) a posteriori comparisons (e.g., Tukey's HSD, Fischer's LSD).
17. Analyze and explain the advantages of multigroup and factorial research designs in comparison to single factor two-group designs.
18. Measure and apply correlation and regression by (a) defining and differentiating these two concepts; (b) explaining their application in prediction and estimation; (c) differentiating between correlation and causation; (d) calculating either a Pearson Product Moment Correlation Coefficient or a Spearman r, (depending on the level of measurement of the bivariate data); and (e) calculating a regression line and its associated statistics (i.e., residual variance, standard error of the estimate, proportion of explained and unexplained variation, coefficient of determination).