El Camino College
COURSE OUTLINE OF RECORD – Official

Subject:	MATH
Course Number:	150H
Descriptive Title:	Honors Elementary Statistics with Probability
Division:	Mathematical Sciences
Department:	Mathematics
Course Disciplines:	Mathematics
Catalog Description:	This honors course, intended for students in the Honors Transfer Program, will include practice of statistics, including descriptive statistics, inferential statistics, and the role probability plays in statistical analysis. Students will calculate and interpret various descriptive statistics using graphing calculators with statistical testing capabilities or statistical software, as well as by hand. Major topics include methods of data collection and simulation; measures of central tendency, variability, and relative position; graphical summaries of data; linear regression and correlation; distributions, including normal and binomial distributions; probability theory; and inferential statistical methods. Students will choose, justify, use, and interpret the results of inferential techniques, such as confidence intervals, hypothesis tests, goodness of fit, analysis of variance, and nonparametric tests. This course emphasizes extensive, rigorous demonstrations of understanding the concepts of statistics. Students will also complete at least one project demonstrating an application or synthesis of topics covered in the course. *Note: Students may take either Mathematics 150 or Mathematics 150H. Duplicate credit will not be awarded for Mathematics 150 and Mathematics 150H. *Note: The maximum UC credit allowed for students completing Mathematics 150 and Psychology 9A or Mathematics 150 and Sociology 109 is one course.
Prerequisite:	Intermediate algebra or equivalent or placement by appropriate assessment
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	4
Hours Laboratory (per week):	0
Outside Study Hours:	8
Total Hours:	72
Course Units:	4
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable

Transfer CSU:	Yes
Effective Date:	2/21/2017
Transfer UC:	Yes
Effective Date:	Fall 2018
General Education: ECC	Area 6 - Mathematics Competency
Term:	
Other:	
CSU GE:	Area B4 - Physical Universe and its Life Forms: Mathematics/Quantitative Reasoning
Term:	
Other:	
IGETC:	Area 2A - Mathematical Concepts and Quantitative Reasoning
Term:	
Other:	
Student Learning Outcomes:	**SLO #1 Computing and Interpreting Various Measures** From data or bivariate data, compute statistics and develop displays of the data that illustrate the measures of central tendency, variation, relative position, and correlation. Interpret the displays in context. **SLO #2 Probability** Compute probability of an event by applying the basic assumption in classical probability and using addition rule and multiplication rule for contingency tables. **SLO #3 Central Limit Theorem** Use the Central Limit Theorem to compute probabilities concerning the distribution of the sample means and comparing these to the probabilities of the related random variable. **SLO #4 Confidence Intervals and Hypothesis Testing** Compute the confidence intervals and conduct hypothesis testing for a variety of parameters, and perform non-parametric hypothesis testing.
Course Objectives:	1. Identify, compare and contrast various types of data and sampling techniques. 2. Summarize data both graphically (including histograms, frequency distributions, stem and leaf plots, box plots, bar graphs and pie charts) and numerically. 3. Calculate appropriate measures of central tendency, variation, relative position and scale/levels of measurement. Use the measures to interpret and answer questions in the context of data. Describe methods of calculating outliers. Define and determine outliers for given sets of data. 4. Calculate the probability of a given event using elementary probability techniques and the definition of sample space. Use the probability to answer questions in the context of data. 5. Define, construct, and interpret random variables and apply these concepts to expected values.

	6. Understand the difference between discrete and continuous probability distributions. Construct and use discrete probability distributions (including the binomial distribution) and continuous probability distributions (including the normal distribution). 7. Define the Central Limit Theorem and use it to understand the relationship between population and sampling distributions. 8. Understand and describe sampling methods and construct sampling distributions. 9. Calculate and interpret confidence interval estimates of various parameters including singles means and proportions as well two population means and proportions. Justify the choice of confidence interval by demonstrating that the necessary criteria are met. Understand the effects of changing the confidence level of a confidence interval. 10. Perform parametric and non-parametric hypothesis tests including t-tests for single and two population means, proportions, Chi-square tests, and ANOVA. Interpret these results in context and justify the choice of test by demonstrating that the necessary criteria are met. Understand the effects of changing the significance level of a hypothesis test. 11. Create appropriate scatterplots for a given set of bivariate data. Calculate the regression line and correlation coefficient, interpret the results and use the regression line to calculate predicted values. 12. Use the above on data from disciplines including business, social sciences, psychology, life science, health science, and education. 13. Perform tasks corresponding to objectives 1 through 12 using statistical technology such as SPSS, EXCEL, Minitab, R, or graphing calculators.
Major Topics	**I. Overview of Statistics (2 hours, lecture)** A. Descriptive B. Inferential **II. Collection of Data and Sampling Techniques (2 hours, lecture)** A. Random Sampling B. Survey Methods C. Experimental Design **III. Data Description (8 hours, lecture)** A. Frequency Distributions and Graphs B. Measures of Center, Spread, Relative Position and Levels of Scale/Measurement **IV. Probability (8 hours, lecture)** A. Sample Spaces B. Empirical (Experimental) Probability C. Classical (Theoretical) Probability D. Addition and Multiplication Rule **V. Probability Distributions (8 hours, lecture)** A. General Probability Distributions

	B. Binomial Distributions C. Mean and Variance of Discrete Distributions and Random Variables D. Expected Value **VI. Normal Distributions (8 hours, lecture)** A. The Standard Normal Distribution B. Applications of Normal Distributions C. Binomial Distributions Approximated by Normal Distributions **VII. Central Limit Theorem (6 hours, lecture)** A. Define Central Limit Theorem B. Difference between Population and Sampling Distributions C. Sampling Distribution of the Sample Mean and Proportion **VIII. Confidence Intervals for Parameters (6 hours, lecture)** A. Estimating Population Proportion B. Estimating Population Mean C. Estimating Difference of Parameters (including 2 populations) **IX. Hypothesis Testing for Parameters (8 hours, lecture)** A. Testing a Claim About a Proportion B. Testing a Claim About a Mean C. Testing a Claim About the Difference of Parameters (Including 2 populations) D. Type I and Type II Errors **X. Correlation and Regression (8 hours, lecture)** A. Scatterplots B. Correlation Coefficient C. Regression Lines D. Predicted Values and Residuals **XI. Other Statistical Tests (8 hours, lecture)** A. Chi - Square Tests including Tests of Independence and Goodness of Fit B. Analysis of Variance (ANOVA) C. Nonparametric Tests
Total Lecture Hours:	72
Total Laboratory Hours:	0
Total Hours:	72
Primary Method of Evaluation	2) Problem solving demonstrations (computational or non-computational)

Typical Assignment Using Primary Method of Evaluation:	A college statistics class conducted a survey of how students spend their money. They asked 25 students to estimate how much money they typically spend each week on fast food. They determined that the mean amount spent on fast food is $31.52 with a standard deviation of $21.60. Later they realized that a value entered as $3 should have been $30. They recalculate the mean and standard deviation. The mean is now $32.60. Write a one-page description of how the standard deviation is affected by the entry error. The description should include: (1) the purpose of calculating the standard deviation; (2) calculations which illustrate the effect of the entry error on the standard deviation; (3) calculations which illustrate how the error should be corrected, and (4) graphs to illustrate the correct standard deviation vs. the standard deviation resulting from the entry error.
Critical Thinking Assignment 1:	The drug Prevnar is a vaccine meant to prevent certain types of bacterial meningitis. It is typically administered to infants starting around 2 months of age. In randomized double-blind clinical trials of Prevnar, infants were randomly divided into two groups. Subjects in group 1 received Prevnar, while subjects in group 2 received a control vaccine. After the second dose, 137 of 452 subjects in the experimental group (group 1) experienced drowsiness as a side effect. After the second dose, 31 of 99 subjects in the control group (group 2) experienced drowsiness as a side effect. Does the evidence suggest that a lower proportion of subjects in group 1 experienced drowsiness as a side effect than subjects in group 2? Write a well-organized paper (1-2 pages) detailing the steps taken to solve this problem. Include calculations and an explanation of the findings from this study.
Critical Thinking Assignment 2:	Complete a project by collecting, analyzing, interpreting, and graphing statistical data using a graphing calculator or a software package such as Excel, Minitab, SPSS, SAS, etc. The project can be a semester-long project consisting of 5 - 7 pages typed or consisting of up to three smaller projects, each of which requires two typed pages (totaling 5 - 7 pages).
Other Evaluation Methods:	Homework Problems, Multiple Choice, Objective Exam, Presentation, Quizzes, True/False, Written Homework
Instructional Methods:	Discussion, Group Activities, Lecture, Role play/simulation
If other:	
Work Outside of Class:	Answer questions, 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 Textbooks:	Michael Sullivan III. Statistics - Informed Decisions Using Data. 6th ed. Pearson, 2021.
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite:	
Category:	

Requisite course(s): List both prerequisites and corequisites in this box.	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite:	Intermediate algebra or equivalent or placement by appropriate assessment
Requisite and Matching Skill(s): Bold the requisite skill(s). If applicable	**Solve algebraic equations.** Carry out numerical operations and manipulate algebraic expressions, including expressions with rational and negative exponents. **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:	Ambkia Silva
Date:	09/01/2016
Original Board Approval Date:	02/21/2017

Last Reviewed and/or Revised by:	Benjamin Mitchell
Date:	02/02/2022
Last Board Approval Date:	06/20/2022