



El Camino College
COURSE OUTLINE OF RECORD – Approved

I. GENERAL COURSE INFORMATION

Subject and Number: Mathematics 115
Descriptive Title: Probability and Statistics for Prospective Elementary School Teachers
Course Disciplines: Mathematics
Division: Mathematical Sciences

Catalog Description:

This course is designed to provide a comprehensive and in-depth exploration of the concepts in probability and statistics. Topics include creating and interpreting graphs, random variables and sampling, measures of central tendency and dispersion, analysis of experiments including hypothesis testing, design of experiments, and data gathering. In addition, basic laws of probability, logic and set theory including dependent, independent, and mutually exclusive events, odds, and expected values will be examined.

Note: The maximum UC credit allowed for students completing Mathematics 110, 111, 115, and 116 is one course.

Conditions of Enrollment:

Prerequisite: Mathematics 67 or Mathematics 73 or Mathematics 80 with a minimum grade of C in prerequisite or qualification appropriate assessment.

Recommended Preparation: eligibility for English 1A

Course Length:	X Full Term	Other (Specify number of weeks):
Hours Lecture:	2.00 hours per week	TBA
Hours Laboratory:	3.00 hours per week	TBA
Course Units:	3.00	

Grading Method: Letter
Credit Status: Associate Degree Credit

Transfer CSU: X Effective Date: January 22, 2002
Transfer UC: X Effective Date: Fall 2002

General Education:

El Camino College:

4B – Language and Rationality – Communication and Analytical Thinking

Term: Other:

6 – Mathematics Competency

Term: Other:

CSU GE:

B4 - Mathematics/Quantitative Thinking

Term: Fall 2003 Other:

IGETC:

2A - Mathematical Concepts and Quantitative Reasoning

Term: Fall 2003 Other:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

SLO #1 Research Study

Students will be able to design a research study, develop an appropriate assessment instrument, collect and analyze data using appropriate methods, and draw statistical inferences from the data in written form.

SLO #2 Analyze Statistical Procedure

Given a particular set of data, students will be able to determine the appropriate statistical procedures to analyze and display the data, complete the statistical methods, and explain the mathematical concepts in written and oral forms.

SLO #3 Explain Statistics and Probability Concepts

Given a particular set of data, students will be able to explain statistics and probability concepts and use appropriate methodologies for elementary or middle school teachers.

SLO #4 Solve and Interpret Experimental and Mathematical Probability

Students will be able to solve, explain, and interpret informal, experimental, and mathematical probability concepts and application problems both in written and oral forms.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Explain and distinguish the differences among various types of data, random variables, and sampling techniques.
 - Homework Problems
2. Design and analyze experiments involving data gathering in order to draw meaningful conclusions from studies.
 - Other (specify)
 - Research Project
3. Create and interpret line graphs, pie charts, histograms, bar graphs, stem and leaf plots, scatter plots, and box plots.
 - Performance exams
4. Calculate, interpret, and explain measures of central tendency, measures of dispersion, and measures of position.
 - Performance exams
5. Explain the differences between population and sample.
 - Other (specify)
 - Class explanations in small and large group formats
6. Implement simple random samplings.
 - Performance exams
7. Calculate and solve application problems involving the normal distribution of data.
 - Homework Problems
8. Determine the appropriate statistical procedure, such as hypothesis testing, to analyze and draw inferences regarding populations.
 - Performance exams
9. Calculate and explain the probability and odds of given events.
 - Homework Problems

10. Calculate and explain the meaning of expected values for real world applications.
 - Performance exams
11. Solve problems involving probability and statistics using both computer software and graphing calculators, and explain the results.
 - Homework Problems
12. Perform basic operations on sets using set notation.
 - Homework Problems
13. Apply basic principles of logic to justify valid arguments.
 - Homework Problems
14. Solve problems involving dependent, independent, and mutually exclusive events.
 - Performance exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	18	I	Descriptive Statistics <ol style="list-style-type: none"> A. Different classifications of data, variables, and distributions B. Visual displays of distributions; bar graphs, line graphs, pie charts, stem and leaf plots, histograms, box and whisker plots, scatter plots C. Design and analysis of experiments; data gathering, random variables, population vs sample, bias in sampling methods D. Measures of central tendency; mean, median, mode, midrange E. Measures of dispersion: range, variance, standard deviation F. Measures of position; quartiles and percentiles G. Comparing and contrasting different distributions H. Normal distribution: properties and graph, z-scores and t-scores <ol style="list-style-type: none"> 1. Uses and misuses of statistics
Lab	22	II	Descriptive Statistics Activities based on: <ol style="list-style-type: none"> A. Different classifications of data, variables, and distributions B. Visual displays of distributions; bar graphs, line graphs, pie charts, stem and leaf plots, histograms, box and whisker plots, scatter plots C. Design and analysis of experiments; data gathering, random variables, population vs sample, bias in sampling methods D. Measures of central tendency; mean, median, mode, midrange E. Measures of dispersion: range, variance, standard deviation F. Measures of position; quartiles and percentiles G. Comparing and contrasting different distributions

			H. Normal distribution: properties and graph, z-scores and t-scores 1. Uses and misuses of statistics
Lecture	4	III	Hypothesis Testing A. Appropriate choice of null and alternative hypotheses B. Level of significance C. Analysis of experiments, interpretation and conclusion
Lab	8	IV	Hypothesis Testing Activities based on A. Appropriate choice of null and alternative hypotheses B. Level of significance C. Analysis of experiments, interpretation and conclusion
Lecture	10	V	Probability A. Experiments to determine the number of possible outcomes B. Counting methods; basic counting law, combinations and permutations C. Basic laws of probability, dependent and independent events, mutually exclusive events D. Odds and expected values
Lab	18	VI	Probability Activities based on A. Experiments to determine the number of possible outcomes B. Counting methods; basic counting law, combinations and permutations C. Basic laws of probability, dependent and independent events, mutually exclusive events D. Odds and expected values
Lecture	4	VII	Basic Logic and Set Theory A. Valid arguments and common fallacies B. Set notation and operations
Lab	6	VIII	Basic Logic and Set Theory Activities based on A. Valid arguments and common fallacies B. Set notation and operations
Total Lecture Hours		36	
Total Laboratory Hours		54	
Total Hours		90	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

A 27-year old woman decides to pay \$156 for a one-year life-insurance policy with coverage of \$100,000. The probability of her living through the year is 0.9995. Determine the expected monetary value for this life insurance policy. Write a brief explanation of what this value means from the woman's perspective and from the life insurance company's perspective.

C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

1. The Chemco Company manufactures car tires that last distances that are normally distributed with a mean of 35,600 mi and a standard deviation of 4,275 mi. If the manufacturer wants to guarantee the tires so that only 3% will be replaced because of failure before the guaranteed number of miles, determine the number of miles for which the tires should be guaranteed. Show all work and explain the results.
2. The average SAT score in mathematics is 483 with a standard deviation of 100. A special preparation course states that it can increase scores. A sample of 32 students completed the course, and the average score was 494. At a significance level of 0.05, determine whether the course does what it claims. Show all work and explain the results.

D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Quizzes

Homework Problems

Term or other papers

Other (specify):

Research Study

Presentation

V. INSTRUCTIONAL METHODS

Group Activities

Lecture

Other (please specify)

Individual assistance, activities involving computer software or graphing calculators, student presentations

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study

Answer questions

Required reading

Problem solving activities

Written work

Estimated Independent Study Hours per Week: 4

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Aliaga and Gunderson. Interactive Statistics. 3rd ed. Pearson, 2006.
 Qualifier Text: Discipline Standard,
 Rossman and Chance. Workshop Statistics, Discovery with Data. 4th ed. Wiley, 2011.
 Qualifier Text: Discipline Standard,

B. ALTERNATIVE TEXTBOOKS

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Mathematics-67 or	Sequential
Course Prerequisite Mathematics-73 or	Sequential
Course Prerequisite Mathematics-80 or	Sequential
Non-Course Prerequisite	Qualification by appropriate assessment.

B. Requisite Skills

Requisite Skills
<p>Graph linear functions. MATH 67: Describe the behavior of linear and exponential functions using symbolic expressions, verbal descriptions, tables and graphs. MATH 73: Graph a variety of functions and relations and draw connections between these graphs and solutions to problems. MATH 80: Graph a variety of functions and relations and draw connections between these graphs and solutions to problems.</p> <p>Solve linear and literal equations. MATH 67: Construct and use equations and inequalities to represent relationships involving one or more unknown or variable quantities to solve problems. MATH 73: Solve problems involving a variety of function types, including linear, quadratic, polynomial, rational, radical, exponential, and logarithmic functions. MATH: 80 Solve problems involving a variety of function types, including linear, quadratic, polynomial, rational and radical functions, as well as the absolute value function.</p> <p>Solve application problems. MATH 67: Construct and use equations and inequalities to represent relationships involving one or more unknown or variable quantities to solve problems. MATH 67: Translate problems from a variety of contexts into a mathematical representation</p>

(symbolic, tabular, and graphic) and vice versa.
 MATH 80: Using numerical, symbolic and graphical methods, model application problems, solve them and interpret the results in the context of the problem.
 MATH 73: Using numerical, symbolic and graphical methods, model application problems, solve them and interpret the results in the context of the problem.

Perform numerical calculations involving powers and roots.
 MATH 67: Describe the behavior of linear and exponential functions using symbolic expressions, verbal descriptions, tables and graphs.
 MATH 73: Carry out numerical operations and manipulate algebraic expressions, including expressions with rational and negative exponents.
 MATH 80: Carry out numerical operations and manipulate algebraic expressions, including expressions with rational and negative exponents, complex numbers, and logarithms.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Non-Course Recommended Preparation eligibility for English 1A	Students must be able to articulate in writing the conceptual underpinnings of the mathematical ideas which are skills developed during the English A and English 84 courses.

D. Recommended Skills

Recommended Skills
<p>Students must be able to articulate in writing the conceptual underpinnings of the mathematical ideas.</p> <p>ENGL A - Read and apply critical thinking skills to college-level expository prose for the purposes of writing and discussion.</p> <p>ENGL A - Apply appropriate strategies in the writing process including prewriting, composing, revising, and editing techniques.</p> <p>ENGL 84 - Identify an implied main idea (thesis), and support with major and minor details, from a longer text or novel.</p>

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Cynthia Bredek on 11/01/2001.

BOARD APPROVAL DATE: 01/22/2002

LAST BOARD APPROVAL DATE: 06/15/2020

Last Reviewed and/or Revised by: Alice Martinez, Judy Kasabian, Trudy Meyer **Date:** 04/2020

19908