Cerro Coso College

Course Outline of Record Report

02/23/2022

MATHC121 : Elementary Probability and Statistics

General Information

Author:	• Steven Rogers • Bernsten, Dean • Chen, Yihfen
Course Code (CB01) :	MATHC121
Course Title (CB02) :	Elementary Probability and Statistics
Department:	Mathematics
Proposal Start:	Fall 2019
TOP Code (CB03) :	(1701.00) Mathematics, General
SAM Code (CB09) :	Non-occupational
Distance Education Approved:	Yes
Course Control Number (CB00) :	CCC000334672
Curriculum Committee Approval Date:	10/26/2018
Board of Trustees Approval Date:	12/13/2018
External Review Approval Date:	12/13/2018
Course Description:	This course covers data analysis using descriptive and inferential statistics. Graphs and computations include measures of central tendency and dispersion, correlation and regression, and presentation of data on a histogram, scatter plot, box plot, and the normal curve. Probability concepts include those for discrete and continuous random variables. Sampling and hypothesis testing are covered for means and variances. Topics from algebra are combined with applications in statistics in the lab portion of the class. This course applies to the degree requirements for students not majoring in Science, Technology, Engineering, and Math (STEM) fields.
Submission Type:	Mandatory Revision The course is being changed from a weekly 4 hours of lecture format to 3 hours of lecture and 3 hours of lab to increase the weekly student contact hours. The concurrent support provided to all students in the lab portion of the course is designed to provide all students with the math skills needed to be successful in the course.
Author:	No value

Faculty Minimum Qualifications

Master Discipline Preferred:	• Mathematics
Alternate Master Discipline Preferred:	• Engineering • Mathematics
Bachelors or Associates Discipline Preferred:	• Mathematics
Additional Bachelors or Associates Discipline Preferred:	No value

Course Development Options

Basic Skills Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Grade Options

- Pass/No Pass
- Letter Grade Methods

☐ Allow Students to Gain Credit by Exam/Challenge

Allowed Number of Retakes

0

Course Prior To College Level (CB21)

Not applicable.

Rationale For Credit By Exam/Challenge

No value

Retake Policy Description

Type:|Non-Repeatable Credit

☑ Allow Students To Audit Course

Course Support Course Status (CB26)

No value

Associated Programs

☑ Course is part of a program (CB24)

Associated Program	Award Type	Active
No value	No value	

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

No value

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

Cerro Coso General Education Requirements	Categories	Status	Approval Date	Comparable Course
Area 4.2	Language & Rationality Analytical Thinking	Approved	No value	No Comparable Course defined.

CSU General Education Certification	Categories	Status	Approval Date	Comparable Course
Area B.4	Scientific Inquiry & Quantitative Reasoning Mathematics / Quantitative Reasoning	Approved	No value	No Comparable Course defined.

Intersegmental General Education Transfer Curriculum	Categories	Status	Approval Date	Comparable Course
Area 2	Mathematical Concepts & Quantitative Reasoning	Approved	No value	No Comparable Course defined.

Units and Hours

Summary

Minimum Credit Units (CB07)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	108
Total Student Learning Hours	216
Faculty Load	0

Credit / Non-Credit Options

Course Credit Status (CB04)

Credit - Degree Applicable

Course Non Credit Category (CB22)

Credit Course.

Non-Credit Characteristic

No Value

Course Classification Status (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

☐ Variable Credit Course

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	3	0
Activity Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	54
Activity	0
Total	108
Course Out-of-Class Hours	
Lecture	108
Laboratory	0

Activity	0
Total	108

Time Commitment Notes for Students

Six hours per week of student study time outside of class

Faculty Load

Extra Duties: 0

Faculty Load: 0

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

MATHC055 - Intermediate Algebra

In Math C121 students are expected to consistently perform signed number operations correctly; demonstrate proficiency with operations of algebraic fractions; use the rules of exponents and radicals to simplify expressions and solve equations; recognize the difference between functions and non-functions; graph a line and write the equation of a line; recognize and graph at least one quadratic – parabola, circle, ellipse, or hyperbola; solve a linear system of equations by at least two of the following methods: graphing, substitution, addition elimination, Cramer's rule; solve quadratic equations by at least two of the following methods: factoring, completing the square, quadratic formula, graphing calculator; graph exponential and logarithmic functions; use the properties of exponential and logarithmic functions to solve equations; set up and solve word problems related to the skills above. Students successfully demonstrating these MATH C055 skills will be prepared for MATH C121.

OR

Prerequisite

MATHC053 - Preparation for Statistics

This is an accelerated statistics preparation course for non-STEM majors. Topics include linear, quadratic, rational, exponential, and logarithmic functions and equations; systems of linear equations and inequalities; and data collection, data summaries, and descriptive statistics. The emphasis is on statistical applications of the algebraic material. Students successfully demonstrating these MATH C053 skills will be prepared for MATH C121.

Entrance Skills

Entrance Skills	Description

No value	No value

Limitations on Enrollment

Limitations on Enrollment	Description
No value	No value

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Rationale	Lectures are based on the course objectives. Textbook readings and homework either written or using an online course management system will be assigned.
Methods of Instruction	Group Work
Rationale	In the lab portion of the class students may work in small groups to complete assignments and statistics applications which are designed to provide them with the math and Algebra skills needed to succeed in the transfer-level class.
Methods of Instruction	Problem Solving
Rationale	Applications in the lab allow students to apply the theory they learn in the lecture and at the same time practice needed math and Algebra skills

Assignments

A. Daily homework assignments Students work mathematics problems. For example, given summary statistics and a significance level, students perform a hypothesis test to test the claim that more than 75% of adults know what Twitter is. B. Online Course Management System Example: Students determine a Probability Value for a right-tailed hypothesis test about a claim of a population mean using StatCrunch and the MyStatLab website.

Methods of Evaluation	Rationale
Participation	A. Daily in-class assignments Example: Students work mathematics problems assigned from the text and from hand- outs to reinforce concepts and skills discussed in lecture.
Tests	B. Weekly Quizzes Weekly quizzes over the previous week's lecture material, homework, and in-class assignments assess the student's understanding. For example, given that the brand name McDonalds has a 95% recognition rate, using the binomial probability formula, find the probability that exactly 13 of 15 randomley selected consumers recognize the McDonalds brand name.,

	C. Chapter Exams Exams cover lecture material, homework, and in-class assignments and assess the student's understanding.
Distance Education Description: how outcomes are evaluated	Online assignments and exams. An example of an online assignment is students use a two-way contingency table involving state and chip preference and the intuitive approach to discern yes or no as to whether state and chip preference are independent or dependent. Students justify their answer with a brief one or two sentence explanation.

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Triola, M	Elementary Statistics	Pearson Education	2018	

Other Instructional Materials

Description	Manuals Periodicals Software Other
Author	No value
Citation	No value

Materials Fee

No

Learning Outcomes and Objectives

Course Objectives

Interpret data displayed in tables and in graphs.

Apply concepts of sample space and probability.

Calculate measures of central tendency and variation for a given data set.

Identify the standard methods of obtaining data and identify advantages and disadvantages of each.

Calculate the mean and variance of a discrete distribution.
Calculate probabilities using normal and student t-distribution.
Distinguish the difference between sample and population distributions and analyze the role played by the Central Limit Theorem.
Construct and interpret confidence intervals.
Determine and interpret levels of statistical significance including p-values.
Interpret the output of a technology-based statistical analysis.
Identify the basic concept of hypothesis testing including Type I and II errors.
Formulate hypothesis tests involving samples from one and two populations.
Select the appropriate technique for testing a hypothesis and interpret the result.
Use linear regression and ANOVA analysis for estimation and inference, and interpret the associated statistics.
Use appropriate statistical techniques to analyze and interpret applications based on data from disciplines including business, social sciences, psychology, life science, health science, and education.

CSLOs

1. Apply appropriate inferential analyses to real situations in order to draw conclusions about a population or several populations.

Expected SLO Performance: 70.0

ISLOs Core ISLOs	Students who are completing a program will be prepared to engage in responsible citizenship at various levels.
	Students who are completing a program will be able to think critically and creatively and apply reasoning.
Social Science Liberal Arts: Social & Behavioral Sciences AA Degree	Identify and apply the Scientific Method used by social scientists to study human behavior.
Social Science IGETC PLOs	Use a complex symbol system to solve problems.
Social Science PLOs for CSU GE COA	Use a complex symbol system to solve problems.

Social Science Psychology AA Degree for Transfer	3. The student will be able to evaluate psychological data and apply the scientific method to psychological theory. Assessment:The student will complete a research project scored by a rubric.
Business Information Technolog Law, Public Policy, and Society for Transfer	Apply laws, public policy, and/or societal or ethical theories to develop a solution to a legal issue, a public policy issue, and/or a societal concern.

2. Compute probabilities using the basic probability laws based on the binomial or normal distribution. Expected SLO Performance: 70.0

3. Construct and interpret hypothesis tests and confidence intervals. Expected SLO Performance: 70.0

Social Science Psychology AA Degree for Transfer	3. The student will be able to evaluate psychological data and apply the scientific method to psychological theory. Assessment:The student will complete a research project scored by a rubric.
ISLOs Core ISLOs	Students who are completing a program will be able to access, evaluate, and effectively use information.
Social Science Anthropology AA Degree for Transfer	Use the scientific method to analyze aspects of the human condition.
	Use the scientific method to analyze aspects of the human condition.
Social Science Sociology AA-T	Use the scientific method to analyze social and cultural patterns among human groups.

4. Analyze quantitative data verbally, graphically, symbolically, and numerically. Expected SLO Performance: 70.0

Business Information Technolog Business Administration A.A. Degree for Transfer	2. Apply critical thinking skills (analysis, synthesis, and evaluation) to technical and economic issues in a business environment.
Social Science Psychology AA Degree for Transfer	3. The student will be able to evaluate psychological data and apply the scientific method to psychological theory. Assessment:The student will complete a research project scored by a rubric.
ISLOs Core ISLOs	Students who are completing a program will be able to access, evaluate, and effectively use information.
Social Science Anthropology AA Degree for Transfer	Use the scientific method to analyze aspects of the human condition.
	Use the scientific method to analyze aspects of the human condition.
Science Liberal Arts: Mathematics & Science AA Degree	Apply algebraic, graphical, numerical, and other methods to solve applied problems in the areas of mathematics, natural sciences, computer graphics, and computer animation.
Social Science Sociology AA-T	Use the scientific method to analyze social and cultural patterns among human groups.

Outline

Course Outline

The Mathematics Department has adopted the following best practices for teaching this course: offering or awarding extra-credit is forbidden, the allowance of multiple attempts at exams is forbidden, and an approved

on-site proctor for online course exams is required.

A. Summarizing Data Graphically and Numerically:
- i. Levels of measurement
- ii. Characteristics of data and types of graphs
- iii Measures of relative position and boxplots

B. Descriptive Statistics: Measurement, Measures of Central Tendency, and Variation
- i. Mean and standard deviation
- ii. Population vs. sample statistics

C. Probability:
- i. Sample spaces and probability
- ii. Relative frequency
- iii. Conditional probability and independence
- iv. Graphical and computational approaches

D. Random Variables and Expected Value:
- i. Mean and standard deviation for critical thinking

E. Sampling and Sampling Distributions:
- i. Biased and unbiased estimators

F. Discrete Distributions:
- i. Binomial Distribution
- ii. Poisson Distribution

G. Continuous Distributions:
- i. Uniform Distribution
- ii. Normal Distribution

H. The Central Limit Theorem:
- i. Assessing normality
- ii. Normal as an approximation to binomial

I. Estimation and Confidence Intervals:
- i. Proportions
- ii Means
- iii Standard deviation or variance

J. Hypothesis Testing and Inference, Including t-tests for One and Two Populations, and Chi-Square test:
- i. Example: Test the claim that the mean pulse rate of adult females in a data set is less than 75 bpm.
- ii. Z-test
- iii. T-test
- iv. Chi-Square Distribution
- v. Power of a hypothesis test
- vi. Two populations
  - a. means to include both independent samples and matched pairs

b. two population proportions
c. two population variances

K. Correlation and Regression Lines:
i. Example: From a set of Consumer Price Index/ subway data, determine if there is a linear correlation.
ii. Coefficient of determination

L. Analysis of Variance (ANOVA):
i. Introduction of Fisher's F-Distribution
ii. One-way ANOVA
iii.Two-way ANOVA

M. Applications Using Data from at Least Four of the Following Disciplines: Business, Economics, Social Science, Psychology, Political Science, Administration of Justice, Life Science, Physical Science, Health Science, Information Technology, and Education

N. Technology-Based Statistical Analysis:
i. Complete a statistical analysis using StatCrunch, Minitab, Excel or a graphing calculator.

Lab Outline

1) Topics from Pre-Algebra and Beginning Algebra

a. Order of operations
b. Performing arithmetic operations on signed numbers
c. Graphing fractions, decimals, and signed numbers on a number line
d. Comparing fractions with the same and with different denominators
e. Comparing fractions, decimals, and percentages
f. Identify fractions and percentages that describe part of a whole
g. Relative difference versus absolute difference
h. Graphing in the Cartesian coordinate system
i. A graph as the set of solutions to an equation
j. Proportions and linearity
k. Scientific notation and other scientific calculator functions

2) Topics from Intermediate Algebra

a. Evaluating expressions
b. Scatterplots
c. Solving linear equations
d. Linear functions, constant rate of change, graphing, interpreting slope and y-intercept in context
e. Compound Inequalities
f. Absolute value equations
g. Radicals and radical functions
h. Solving quadratic equations with the quadratic formula
i. Exponential functions
j. Factorials
k. Summation notation

Delivery Methods and Distance Education

Delivery Method: Please list all that apply -Face to face -Online (purely online no face-to-face contact) -Online with some required face-to-face meetings ("Hybrid") -Online course with on ground testing -iTV – Interactive video = Face to face course with significant required activities in a distance modality -Other

Face 2 Face
Online with proctoring
Hybrid
Interactive

Rigor Statement: Assignments and evaluations should be of the same rigor as those used in the on-ground course. If they are not the same as those noted in the COR on the Methods of Evaluation and out-of-class assignments pages, indicate what the differences are and why they are being used. For instance, if labs, field trips, or site visits are required in the face to face section of this course, how will these requirements be met with the same rigor in the Distance Education section?

Rigor:
The assignments and evaluations will be the same no matter what delivery method is used. The outcomes for this course, both for on-ground and online classes, will be evaluated and assessed by exam.

Approved on-site proctors are required for online course exams.

Effective Student-Instructor Contact: Good practice requires both asynchronous and synchronous contact for effective contact. List the methods expected of all instructors teaching the course. -Learning Management System -Discussion Forums -Moodle Message -Other Contact -Chat/Instant Messaging -E-mail -Face-to-face meeting(s) -Newsgroup/Discussion Board -Proctored Exam -Telephone -iTV -Interactive Video -Other (specify)

Student-Instructor contact will include the following: discussion forums, learning management system messages, announcements, and feedback for each student's work.
Student-Instructor contact MAY include the following: chat/Zoom, newsgroup/discussion board, phone, and iTV.
Student-Student contact will include the following: discussion forums.
Student-Student contact MAY include the following: chat/Zoom, learning management system messages, group work, and peer reviewed projects.

Software and Equipment: What additional software or hardware, if any, is required for this course purely because of its delivery mode? How is technical support to be provided?

For online courses a Pearson access code may be required. There is a toll free student technical support line included with the access code.

Accessibility: Section 508 of the Rehabilitation Act requires access to the Federal government's electronic and information technology. The law covers all types of electronic and information technology in the Federal sector and is not limited to assistive technologies used by people with disabilities. It applies to all Federal agencies when they develop, procure, maintain, or use such technology. Federal agencies must ensure that this technology is accessible to employees and the public to the extent it does not pose an "undue burden". I am using -iTV—Interactive Video only -Learning management system -Publisher course with learning management system interface.

Faculty will use the Canvas accessibility checker, along with other resources provided by our Distance Education Director, to ensure all learning materials are accessible, including but not limited to documents, pdfs, OERs, external websites, and videos.

Class Size: Good practice is that section size should be no greater in distance ed modes than in regular face-to-face versions of the course. Will the recommended section size be lower than in on-ground sections? If so, explain why.

class_size Hybrid 45