MATH 014: STATISTICAL METHODS

Originator
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Justification / Rationale
AB 705 statement update

Effective Term
Fall 2019

Credit Status
Credit - Degree Applicable

Subject
MATH - Mathematics

Course Number
014

Full Course Title
Statistical Methods

Short Title
STATISTICAL METHODS

Discipline

Disciplines List
Mathematics

Modality
Face-to-Face

Catalog Description
This course is an introduction to descriptive and inferential statistics; how to use measures of central tendency and dispersion among population samples to draw inferences about a population and to compare two or more populations. Discrete and continuous probability density distributions are analyzed including the binomial, normal, Student-t, chi-squared, and F-distributions. Confidence intervals for population means, proportions and variance are set. Additional topics include regression and correlation analysis and techniques of hypothesis testing, including ANOVA, and use of calculator and software applications. (C-ID MATH 110)
Note: All students now can enroll in this transfer-level course without completing posted requisites. Please refer to AB 705 (under How do I enroll in courses at COD?) or see a Counselor.

Schedule Description
An introduction to descriptive and inferential statistics using measures of central tendency and dispersion of samples, probability, confidence intervals, and hypothesis testing to draw inferences about one or more populations. Prerequisite: MATH 040 or MATH 045 Advisory: ENG 061 & RDG 061 IGETC: 2A*

Lecture Units
3
Lecture Semester Hours
54

Lab Units
1
Lab Semester Hours
54

In-class Hours
108

Out-of-class Hours
108

Total Course Units
4

Total Semester Hours
216

Prerequisite Course(s)
MATH 040 or MATH 045
Advisory: ENG 061 & RDG 061

Required Text and Other Instructional Materials

Resource Type
Book

Author
Triola, Mario

Title
Elementary Statistics

Edition
13th

City
Boston, MA

Publisher
Pearson/Addison Wesley

Year
2018

College Level
Yes

Flesch-Kincaid Level
12

ISBN #
978-0134462455

Class Size Maximum
35

Entrance Skills
Understand that the key characteristic of a linear model is its constant rate of change.

Prerequisite Course Objectives
MATH 040-Comprehend that the key characteristic of a linear model is its constant rate of change.
MATH 045-Comprehend that the key characteristic of a linear model is its constant rate of change and interpret slope as a rate of change and relate slope to topics from social sciences.

Entrance Skills
Interpret slope as a rate of change.

Prerequisite Course Objectives

MATH 040-Interpret slope as a rate of change.
MATH 045-Comprehend that the key characteristic of a linear model is its constant rate of change and interpret slope as a rate of change and relate slope to topics from social sciences.

Entrance Skills

Recognize when a table, graph, or equation is linear.

Prerequisite Course Objectives

MATH 040-Recognize when a table, graph, or equation is linear.
MATH 045-Recognize when a table, graph, or equation is linear and recognize when a scatterplot appears to show linear correlation and be able to describe this relationship and discuss how it does not necessarily reflect causation in written form.

Entrance Skills

Create a linear model in the form of a table, graph, or equation.

Prerequisite Course Objectives

MATH 040-Create a linear model in the form of a table, graph, or equation.
MATH 045-Create a linear model in the form of a table, graph, or equation, including a line of best fit for a set of given points.

Entrance Skills

Find the equation of a line and apply it to solve problems with a constant of change.

Prerequisite Course Objectives

MATH 040-Find the equation of a line and apply it to solve problems with a constant of change.
MATH 045-Find the equation of a line and apply it to solve financial and social sciences problems involving constant rates of change.

Entrance Skills

Understand and manipulate rational exponents and Nth roots.

Prerequisite Course Objectives

MATH 040-Comprehend and manipulate rational exponents and Nth roots.
MATH 045-Comprehend and manipulate rational exponents and Nth roots, including those used in financial mathematical formulas such as compound interest.

Entrance Skills

Evaluate root expressions and functions.

Prerequisite Course Objectives

MATH 040-Solve root equations.
MATH 045-Comprehend and manipulate rational exponents and Nth roots, including those used in financial mathematical formulas such as compound interest.
MATH 045-Understand the definition of a function including the use of function notation, arrow diagrams, graphs, and terminology such as domain, range, independent variables, and dependent variables.
MATH 045-Evaluate root functions, including multivariate functions such as the standard deviation.

Entrance Skills

ADVISORY SKILLS:
Demonstrate critical thinking skills when reading, composing and participating in class discussions.

Prerequisite Course Objectives

ENG 061-Demonstrate the ability to think critically and express ideas using various patterns of development.
ENG 061-Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

Entrance Skills

Demonstrate independent study skills and learning habits.

Prerequisite Course Objectives

ENG 061-Demonstrate the ability to think critically and express ideas using various patterns of development.
ENG 061-Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

Entrance Skills

Connect information gained from textbook readings and lectures to other disciplines.

Prerequisite Course Objectives

ENG 061-Demonstrate the ability to use research skills including library resources such as books, periodicals, electronic databases and online resources such as the internet.
ENG 061-Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.
RDG 061-Use SQ3R /or SOAR along with outlining, note-taking, mapping summarizing and other strategies to prepare, read, comprehend expository text.
RDG 061-Read a variety of texts fluently.
RDG 061-Write organized summaries reactions that capture main idea and supporting details.

Entrance Skills

Recognize when a table, graph, equation, or function is exponential and be able to graph and evaluate exponential functions.

Prerequisite Course Objectives

MATH 040-Comprehend that the key characteristic of an exponential function is its constant growth (decay) factor.
MATH 040-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function.
MATH 045-Understand the definition of a function including the use of function notation, arrow diagrams, graphs, and terminology such as domain, range, independent variables, and dependent variables.
MATH 045-Comprehend that the key characteristic of an exponential function is its constant growth (or decay) factor and relate this to the differences between linear and exponential change with applications involving simple and compound interest.
MATH 045-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function, including equations and graphs of functions similar to continuous probability distributions.

Entrance Skills

Apply formulas and evaluate expressions that use summation notation and multiple variables.

Prerequisite Course Objectives

MATH 045-Evaluate multivariate formulas useful in statistics and financial mathematics such as Max, Min, Arithmetic Mean, Median, Combinations, Permutations, and simple and compound interest formulas; know the mathematical and statistical symbols used in them; and become familiar with when each formula is applicable.
MATH 045-Evaluate expressions using summation notation, including those requiring the use of the order of operations involving sums of many values.

Entrance Skills

Understand function notation, evaluate functions, and recognize when a function is appropriate for a given application.

Prerequisite Course Objectives

MATH 040-Apply the definition of a function including function notation and terminology (domain and range).
MATH 045-Understand the definition of a function including the use of function notation, arrow diagrams, graphs, and terminology such as domain, range, independent variables, and dependent variables.
MATH 045-Apply functions to topics from social sciences and consumer mathematics, including ceiling and floor functions.
MATH 045-Evaluate root functions, including multivariate functions such as the standard deviation.
MATH 045-Comprehend that the key characteristic of an exponential function is its constant growth (or decay) factor and relate this to the differences between linear and exponential change with applications involving simple and compound interest.
MATH 045-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function, including equations and graphs of functions similar to continuous probability distributions.
MATH 045-Understand the definitions one-to-one and inverse functions, including log functions, and observe them in applications from statistics and financial mathematics.

Entrance Skills

Be able to read a given table or chart, create a table or chart displaying relevant information, and apply formulas to tables and charts.

Prerequisite Course Objectives

MATH 040-Recognize when a table, graph, or equation is linear.
MATH 040-Recognize when a table, graph, or equation is linear.
MATH 040-Recognize when a table, graph, or equation is quadratic.
MATH 040-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function.
MATH 045-Recognize when a table, graph, or equation is linear and recognize when a scatterplot appears to show linear correlation and be able to describe this relationship and discuss how it does not necessarily reflect causation in written form.
MATH 045-Create a linear model in the form of a table, graph, or equation, including a line of best fit for a set of given points.
MATH 045-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function, including equations and graphs of functions similar to continuous probability distributions.
MATH 045-Create, manipulate, and analyze tables and charts including an introduction to writing basic formulas in spreadsheets, describing shapes of frequency distributions, reading histograms, and the advantages disadvantages of a variety of diagrams such as Venn and Euler diagrams, pie/circle graphs, scatterplots, bar graphs, and time series.

Course Content

1. Summarizing data graphically and numerically;
2. Descriptive statistics: measures of central tendency, variation, relative position, skewness and levels/scales of measurement;
3. Sample spaces and probability;
4. Random variables and expected value;
5. Sampling and sampling distributions;
6. Discrete distributions – Binomial, Poisson;
7. Continuous distributions – Normal;
8. The Central Limit Theorem;
9. Estimation and confidence intervals;
10. Hypothesis Testing and inference, including t-tests for one and two populations, and Chi-square test; and
11. Correlation and linear regression and analysis of variance (ANOVA).

Lab Content

1. Applications using data from disciplines including business, social sciences, psychology, life science, health science, and education; and
2. Statistical analysis using technology such as SPSS, EXCEL, Minitab, or graphing calculators.

Course Objectives

	Objectives
Objective 1	Distinguish among different scales of measurement and their implications;
Objective 2	Interpret data displayed in tables and graphically;
Objective 3	Calculate measures of central tendency and dispersion including median, mean, variance and standard deviation for a given data set;
Objective 4	Apply concepts of sample space and probability;
Objective 5	Use combinations and permutations to count.
Objective 6	Identify the standard methods of obtaining data and identify advantages and disadvantages of each;
Objective 7	Calculate the mean and variance of a discrete distribution;
Objective 8	Calculate probabilities using normal, t-distributions, chi-squared and F-distributions;
Objective 9	Distinguish the difference between sample and population distributions and analyze the role played by the Central Limit Theorem;
Objective 10	Construct and interpret confidence intervals for population proportions, means and variances;
Objective 11	Compute confidence intervals for the difference between population proportions and means;
Objective 12	Determine and interpret levels of statistical significance including p-values;
Objective 13	Interpret the output of a technology-based statistical analysis;
Objective 14	Identify the basic concept of hypothesis testing including Type I and II errors;
Objective 15	Formulate hypothesis tests involving samples from one and two populations regarding population proportions, means and variances;

Objective 16	Select the appropriate technique for testing a hypothesis and interpret the result;
Objective 17	Use the chi-squared distribution to test for goodness of fit, independence and homogeneity;
Objective 18	Use linear regression and ANOVA analysis for estimation and inference, and interpret the associated statistics;
Objective 19	Use calculator and statistical package on computer to describe and analyze data;
Objective 20	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.
Objective 21	Communicate effectively with and about statistics and mathematics.

Student Learning Outcomes

	Upon satisfactory completion of this course, students will be able to:
Outcome 1	Use random variables to model random phenomena and analyze said phenomena in terms of expected values and measures of uncertainty.
Outcome 2	Apply probability and statistics to model and solve real-world problems.
Outcome 3	Use statistical models to describe random data, and draw inferences from them.
Outcome 4	Describe the breadth of statistical applications in real-world situations.

Methods of Instruction

Method	**Please provide a description or examples of how each instructional method will be used in this course.**
Laboratory	Individual and group exploration of course topics with instructor guidance.
Discussion	Review, analyze, and evaluate various methods of solution.
Technology-based instruction	Students explore course content and solve problems using statistical software such as StatCrunch, R, and Excel.
Collaborative/Team	Students work together to solve problems and evaluate methods of solution.
Lecture	Presentation, demonstration, and explanation of course topics.

Methods of Evaluation

Method	**Please provide a description or examples of how each evaluation method will be used in this course.**	Type of Assignment
Written homework	Students will be evaluated by homework assignments, necessitating the expenditure of, minimally, six hours per week.	Out of Class Only
Student participation/contribution	Students will be evaluated by their participation in lab activities and may be required to submit written summaries of these activities.	In Class Only
Mid-term and final evaluations	Students will be evaluated by examinations involving problems that require the application of studied principles and skills to new situations as well as problems that mimic those done on homework and in class. Students will be evaluated using a comprehensive two-hour final exam.	In Class Only
Computational/problem-solving evaluations	Students will be evaluated by completing challenging problem sets requiring careful reasoning and application of a variety of course topics.	In and Out of Class
Laboratory projects	Students will apply course topics to solve significant problems in probability and statistics.	In Class Only

Assignments

Other In-class Assignments

1. Attend classroom lectures and take notes.

2. Participate in classroom discussions to review, analyze, diagnose, and evaluate various methods of solution used in homework assignments.
3. Complete laboratory assignments using technology as a tool in statistical analysis.
4. Complete examinations involving problems that apply studied principles to new situations.

Other Out-of-class Assignments
1. Read textbooks and supplementary assignments.
2. Complete assigned homework including problem solving, exercises to improve skills and mathematical understanding, and laboratory assignments.
3. Complete examinations involving problems that apply studied principles to new situations.

Grade Methods
Letter Grade Only

COD GE
C4.B - Language and Rationality - Communication and Analytical Thinking

CSU GE
B4 - Mathematics

IGETC GE
2A - Mathematical Concepts & Quantitative Reasoning

MIS Course Data

CIP Code
27.0101 - Mathematics, General.

TOP Code
170100 - Mathematics, General

SAM Code
E - Non-Occupational

Basic Skills Status
Not Basic Skills

Prior College Level
Not applicable

Cooperative Work Experience
Not a Coop Course

Course Classification Status
Credit Course

Approved Special Class
Not special class

Noncredit Category
Not Applicable, Credit Course

Funding Agency Category
Not Applicable

Program Status
Program Applicable

Transfer Status
Transfer CSU, limited UC

C-ID

MATH 110

Allow Audit

No

Repeatability

No

Materials Fee

No

Additional Fees?

No

Approvals

Curriculum Committee Approval Date

02/05/2019

Academic Senate Approval Date

02/14/2019

Board of Trustees Approval Date

03/15/2019

Course Control Number

CCC000282414

Programs referencing this course

Anthropology AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=14)
Political Science AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=18)
Psychology AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=19)
Child and Adolescent Development AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=194)
Psychology AA Degree (http://catalog.collegeofthedesert.eduundefined?key=21)
Environmental Science AS-T (http://catalog.collegeofthedesert.eduundefined?key=216)
Computer Information Systems Associate of Science and Transfer Preparation (http://catalog.collegeofthedesert.eduundefined?key=221)
Liberal Arts: Business and Technology AA Degree (http://catalog.collegeofthedesert.eduundefined?key=27)
Liberal Arts: Math and Science AA Degree (http://catalog.collegeofthedesert.eduundefined?key=29)
Liberal Arts: Social and Behavioral Sciences AA Degree (http://catalog.collegeofthedesert.eduundefined?key=30)
Administration of Justice AS-T Degree (http://catalog.collegeofthedesert.eduundefined?key=33)
Business Administration AS-T Degree (http://catalog.collegeofthedesert.eduundefined?key=34)
Public Health Science AS-T Degree (http://catalog.collegeofthedesert.eduundefined?key=37)
Economics AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=4)
Agri-Business AS Degree (http://catalog.collegeofthedesert.eduundefined?key=46)
General Agriculture AS Degree (http://catalog.collegeofthedesert.eduundefined?key=49)
Nutrition and Dietetics AS-T Degree (http://catalog.collegeofthedesert.eduundefined?key=7)
Environmental Sciences AS Degree (http://catalog.collegeofthedesert.eduundefined?key=76)
Interdepartmental Environmental Studies AS Degree (http://catalog.collegeofthedesert.eduundefined?key=77)
Kinesiology AA-T Degree (http://catalog.collegeofthedesert.eduundefined?key=8)
Agriculture Office Assistant Certificate of Achievement (http://catalog.collegeofthedesert.eduundefined?key=84)
Agriculture Office Professional Certificate of Achievement (http://catalog.collegeofthedesert.eduundefined?key=85)
Agriculture Plant Science AS-T Degree (http://catalog.collegeofthedesert.eduundefined?key=89)
Journalism AA-T (http://catalog.collegeofthedesert.eduundefined?key=9)