

# MATH 014: STATISTICAL METHODS

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**Originator**

jamortada

**Co-Contributor(s)****Name(s)**

Flora, Melissa

**Justification / Rationale**

Periodic update.

**Effective Term**

Fall 2022

**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

100% Online

Hybrid

**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 prerequisites. 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 &amp; 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

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**Resource Type**

Book

**Open Educational Resource**

Yes

**Author**

Barbara Illowsky, Susan Dean

**Title**

Introductory Statistics

**Edition**

1st

**City**

Houston

**Publisher**

OpenStax

**Year**

2013

**College Level**

Yes

**ISBN #**

1-938168-20-8

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**Resource Type**

Web/Other

**Open Educational Resource**

No

**Description**

WebAssign for Introductory Statistics - 1st edition by Barbara Illowsky Susan Dean  
([www.webassign.net](http://www.webassign.net)):

May be used with the textbook "Introductory Statistics", 1st edition published by OpenStax.

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**Class Size Maximum**

30

**Entrance Skills**

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

**Requisite 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.

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**Entrance Skills**

Interpret slope as a rate of change.

**Requisite 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.

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**Entrance Skills**

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

**Requisite 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.

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**Entrance Skills**

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

**Requisite 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.

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**Entrance Skills**

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

**Requisite 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.

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**Entrance Skills**

Understand and manipulate rational exponents and Nth roots.

**Requisite 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.

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**Entrance Skills**

Evaluate root expressions and functions.

**Requisite 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.

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**Entrance Skills**

ADVISORY SKILLS:

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

**Requisite 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.

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**Entrance Skills**

Demonstrate independent study skills and learning habits.

**Requisite 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.

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**Entrance Skills**

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

**Requisite 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.

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### Entrance Skills

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

### Requisite 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.

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### Entrance Skills

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

### Requisite 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.

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### Entrance Skills

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

### Requisite 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.

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### 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.

### Requisite 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	Lab will be used, in groups or individually, for student exploration of course topics.
Discussion	Discussion will be used to 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, or Excel.
Activity	Activities in the lab portion of the class will include performing probability experiments and using various tools for developing problem solving skills.
Lecture	Lecture will be used for introduction 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

- Attend classroom lectures and take notes.
- Participate in classroom discussions to review, analyze, diagnose, and evaluate various methods of solution used in homework assignments.
- Complete laboratory assignments using technology as a tool in statistical analysis.
- 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

### Distance Education Checklist

Include the percentage of online and on-campus instruction you anticipate.

#### Online %

100

#### On-campus %

0

#### What will you be doing in the face-to-face sections of your course that necessitates a hybrid delivery vs a fully online delivery?

Although the course can be offered entirely online, it may also be offered hybrid to take advantage of collaboration activities that are more suited to in-person interaction.

Examinations can be given in a controlled location.

### Lab Courses

#### How will the lab component of your course be differentiated from the lecture component of the course?

Labs help students practice and apply what they have learned in lecture. They engage students in active learning, which is crucial for topic mastery.

#### From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?

Lab activities include problem sheets that are posted on Canvas. They also involve Canvas discussions. These lab activities are designed to reiterate important concepts from lecture, and students are allowed to ask questions while completing their labs.

Labs are monitored by the instructor through Canvas.

#### How will you assess the online delivery of lab activities?

Labs will be submitted as write-ups or discussion responses in Canvas for evaluation and feedback.

### Instructional Materials and Resources

#### If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?

Depending on the textbook used, the professor may choose to use the free OER My OpenMath, or Pearson MyLab and Mastering, or Cengage WebAssign. All of these are considered to be safe for use in education for both faculty and students. All can also be integrated with the college LMS (Canvas), which decreases the amount of times students will need to sign-in-and-out of accounts and open them up to data breaches.

#### If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.

Professors who choose to use MyOpenMath, Pearson MyLab and Mastering, or Cengage WebAssign, do so in order to assign a wide range of problems for students to work on. By solving a variety of problems and receiving instantaneous feedback, students can enhance their learning.

### Effective Student/Faculty Contact

#### Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?

##### Within Course Management System:

- Discussion forums with substantive instructor participation
- Online quizzes and examinations
- Private messages
- Regular virtual office hours
- Timely feedback and return of student work as specified in the syllabus
- Weekly announcements



**External to Course Management System:**

Direct e-mail  
Posted audio/video (including YouTube, 3cm mediasolutions, etc.)  
Synchronous audio/video  
Telephone contact/voicemail

**Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.**

Faculty will regularly contact students individually and as a group through Canvas messages and/or COD email. Students will also receive regular announcements with information about the course, COD as a whole, or other relevant information. In discussions and through other lab assignments, students will communicate with each other and their professor regularly and frequently.

**If interacting with students outside the LMS, explain how additional interactions with students outside the LMS will enhance student learning.**

Students may prefer to contact their professor via email or on the phone, which allows for an improved experience for those who communicate better in those contexts. The professor may direct students to access free supplemental resources as well.

**Other Information****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

**General Education Status**

B = Mathematics/Quantitative Reasoning/Analytical Thinking

**Support Course Status**

N = Course is not a support course

**C-ID**

MATH 110

**Allow Audit**

No

**Repeatability**

No

**Materials Fee**

No

**Additional Fees?**

No

**Approvals****Curriculum Committee Approval Date**

11/18/2021

**Academic Senate Approval Date**

12/09/2021

**Board of Trustees Approval Date**

01/21/2022

**Chancellor's Office Approval Date**

03/11/2022

**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>)  
Sociology AA-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=20>)  
Psychology AA Degree (<http://catalog.collegeofthedesert.eduundefined/?key=21>)  
Environmental Science AS-T (<http://catalog.collegeofthedesert.eduundefined/?key=216>)  
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>)  
Hospitality Management AS-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=338>)  
Business Administration AS-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=34>)  
Social Justice Studies AA-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=354>)  
Business Administration 2.0 AS-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=355>)  
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>)

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 Degree (<http://catalog.collegeofthedesert.eduundefined/?key=9>)