MATH M15: INTRODUCTORY STATISTICS

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College
Moorpark College

Discipline (CB01A)
MATH - Mathematics

Course Number (CB01B)
M15

Course Title (CB02)
Introductory Statistics

Banner/Short Title
Introductory Statistics

Credit Type
Credit

Start Term
Fall 2023

Catalog Course Description
Explores the nature of statistical methods, including description of sample data, probability, theoretical frequency distributions, sampling, estimation, testing hypotheses and special topics. Provides problem-solving techniques.

Course Credit Limitations: Credit will not be awarded for both the honors and regular versions of a course. Credit will be awarded only for the first course completed with a grade of "C" or better or "P". Moorpark College Honors Program requires a letter grade.

Taxonomy of Programs (TOP) Code (CB03)
1701.00 - Mathematics, General

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
B - Satisfies Math/Quantitative Reasoning req (CSUGE-B B4, IGETC 2, or 4-yr)

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
(L) Letter Graded

Alternate grading methods
(O) Student Option- Letter/Pass
(P) Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
70
Maximum Contact/In-Class Lecture Hours
70

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
70
Total Maximum Contact/In-Class Hours
70

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
140
Maximum Outside-of-Class Hours
140

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
210
Total Maximum Student Learning Hours
210

Minimum Units (CB07)
4
Maximum Units (CB06)
4

Prerequisites
Intermediate Algebra or Pathways to Statistics or placement as determined by the college's multiple measures assessment process.

Entrance Skills
Entrance Skills

Intermediate Algebra:
- graph and interpret linear and quadratic functions.
- analyze and solve various equations, inequalities, and systems of equations.

Entrance Skills

Pathways to Statistics:
- compute the mean and standard deviation of sample data.
- graph a scatter plot and compute the linear regression line for the data.
- graphing an exponential function.
- given two points on a line, find the point slope and slope intercepts forms of the graph.
- calculate the z-score giving a mean and standard deviation and then find a probability.

Requisite Justification

Requisite Type
Prerequisite

Requisite
Intermediate Algebra

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Required by 4 year institution

Requisite Type
Prerequisite

Requisite
Pathways to Statistics

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Required by 4 year institution

Student Learning Outcomes (CSLOs)	
	Upon satisfactory completion of the course, students will be able to:
1	construct a single-sample confidence interval, and draw an appropriate conclusion. This can be done by hand, with a graphing calculator, or with statistical software.
2	construct a single-sample hypothesis test based on a given claim, and draw an appropriate conclusion. This can be done by hand, with a graphing calculator, or with statistical software.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	summarize data graphically by displaying data using methods from descriptive statistics, interpreting data in tables graphically by using histograms, frequency distributions, box-and whisker plots (five-number summary); find measures of central tendency for data sets: mean, median, and mode; find measures of variation for data sets: standard deviation, variance, and range; determine relative positions of data and distinguish among scales of measurements and their implications; distinguish between populations and samples; and identify the standard method of obtaining data and the advantages and disadvantages of each.
2	find simple probabilities and probabilities of compound events and compute probabilities using the complement, discrete probability distributions; apply concepts of sample space, and the binomial probability distribution.
3	standardize a normally distributed random variable; use normal distribution tables to find probabilities for normally distributed random variables and the t-distribution; use the Central Limit Theorem to find probabilities for sampling distributions.
4	construct and interpret confidence intervals for proportions and means.
5	identify the basics of hypothesis testing and perform hypothesis testing for means, proportions and standard deviations from one population, and difference of means and proportions from two populations, including finding and interpreting p-value and examining Type I and Type II error.
6	find linear least-squares regression equations for appropriate data sets; graph least-square regression equations on the scatter plot for the data sets; find and apply the coefficient of correlation.
7	use the chi-square distribution to test independence and to test goodness of fit.
8	conduct a one-way Analysis of Variance (ANOVA) hypothesis test.

9	select an appropriate hypothesis test and interpret the result using p-value; use appropriate statistical technique to analyze and interpret applications based on data related to business, social sciences, psychology, life sciences, health sciences or education, and interpret results using technology-based statistical analysis.

Course Content

Lecture/Course Content

4% A. Descriptive Statistics and Summarizing Data Graphically
 1. Histograms
 2. Frequency distributions
 3. Measures of central tendency
 4. Measures of variation
 5. Relative positions and scales of measurements
 6. Box-and-Whisker plot (optional*)

10% B. Probability and the Binomial Distribution
 1. Definition of probability and sample space
 2. Probability of independent events, mutually exclusive events
 3. Complement rule and conditional probability
 4. Random variables and expected value
 5. Binomial probability distribution
 6. Poisson probability distribution (optional*)

15% C. Normal Distribution
 1. Normal distributions
 2. Standard normal distribution
 3. Using the standard normal distribution table
 4. Probabilities of normally-distributed random variables
 5. Sampling distributions and the Central Limit Theorem
 6. Applying Central Limit Theorem to find probabilities of sampling distributions

20% D. Confidence Intervals
 1. Confidence levels
 2. Using standard normal distribution to find confidence interval estimate of the mean when population standard deviation is known
 3. Using student's t distribution to find confidence interval estimate for population mean when population standard deviation is unknown
 4. Confidence intervals for proportions

25% E. Hypothesis Testing
 1. Method of hypothesis testing
 2. Using normal distribution to perform hypothesis testing when population standard deviation is known
 3. Using t-distribution to perform hypothesis testing when population standard deviation is unknown
 4. Hypothesis testing for proportions
 5. Hypothesis testing for difference of two means with standard deviations known and unknown using t-distribution
 6. Hypothesis test for difference of two proportions
 7. Applications of hypothesis testing using data from areas such as business, social sciences, psychology, life sciences, health sciences or education
 8. Performing hypothesis testing using technology such as Statistical Package for the Social Sciences (SPSS), EXCEL, minitab or graphics calculators
 9. F-test for difference of standard deviations (optional*)

15% F. Linear Correlation
 1. Scatterplots and fitting lines to data
 2. Least-squares regression lines
 3. Graphing least-squares line on scatterplot for data
 4. Coefficients of correlation
 5. Applications of correlation and regression analysis from areas such as business, social sciences, psychology, life sciences, health sciences, or education

8% G. Chi-Square Distribution
 1. Testing for independence using chi-square
 2. Testing for goodness of fit using chi-square

3% H. Analysis of Variance (ANOVA)
 1. Overview of analysis of variance and the F distribution
 2. One-way ANOVA hypothesis tests

*Optional topics should be covered if time allows, but may be omitted without loss of continuity in the mathematics program

Laboratory or Activity Content
n/a

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):
Written expression
Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):
Computational homework
Individual projects
Objective exams
Problem-solving exams
Problem-solving homework
Quizzes
Other (specify)
Classroom Discussion
Projects

Other
Quizzes and/or graded work will be used to evaluate students for the critical thinking skills needed to solve math problems. Problems must require students to demonstrate analytic skills and the step-bystep details required for the solution.

Instructional Methodology

Specify the methods of instruction that may be employed in this course
Class activities
Class discussions
Collaborative group work
Computer-aided presentations
Demonstrations
Distance Education
Group discussions
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Lecture
Problem-solving examples
Other (specify)

Specify other method of instruction
All instructors will use best practices to provide an inclusive learning environment that respects all forms of racial, ethnic, age, and gender diversity, and provides for the individual needs of students of all learning styles.

Describe specific examples of the methods the instructor will use:
1. Use of whiteboard or document camera to draw diagrams or pictures to illustrate computations of probabilities from standard distributions.
2. Classroom discussion, with student response, such as discussing whether to reject, or not reject a claim about a parameter with sufficient justification.
3. Data collection activities, done either in class or outside of class, whereby students collect data and illustrate their distributions in charts or graphs.

Representative Course Assignments

Writing Assignments
1. Homework problems selected from the statistics textbook where answers require a written explanation of the solution, such as interpreting a confidence interval.
2. Short answer problems on exams such as stating conclusions to hypothesis tests.

3. Graded assignments: in-class and/or homework assignments requiring complete solutions using both written English and symbolic mathematical language.

Critical Thinking Assignments

1. Describing and applying algorithmic steps for obtaining the solution to a mathematical problem, such as describing the steps and conducting a hypothesis test and stating the conclusion.

2. Comparing and contrasting methods of solution to mathematical problems, such as comparing hypothesis testing with generating confidence intervals.

Reading Assignments

1. Reading from textbook descriptions of different types of sampling and the advantages and disadvantages of each.

2. Viewing diagrams in textbook illustrating different types of distributions of data such as centrally distributed data, skewed data, or data that si bimodal or trimodal.

3. Reading from textbook definitions of different types of standard distributions such as the Normal Distribution and the t-Distribution and aspects of their behaviors and properties.

Skills Demonstrations

1. Using calculator or computer to determine cut-off values using the reverse Normal Distribution.

2. Computing confidence intervals for pre-determined confidence levels and using them to determine whether to reject a claim about a parameter.

Problem-Solving and Other Assignments (if applicable)

1. Computing basic probabilities to a specified number of decimal places using various rules of probability such as the Addition Rule, Multiplication Rule and Complement Rule.

2. Applying analytic techniques for solving mathematical and application problems, such as finding probabilities of events.

Outside Assignments

Representative Outside Assignments

1. Developing and completing projects performing probability experiments, such as using a deck of cards, dice, or coins.

2. Finding statistical examples in the media and interpreting the results.

3. Gathering real life data and analyzing the data set by finding the mean, median, mode, standard deviation, and variance.

Articulation

C-ID Descriptor Number
MATH 110

Status
Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU Channel Islands	MATH 201	Elementary Statistics	3
UC Berkeley	STAT 2	Introduction to Statistics	4
CSU Northridge	MATH 140	Introductory Statistics	4
CSU Long Beach	PSY 110/SOC 170	Elementary Statistics	4
CSU Chico	MATH 105	Introduction to Statistics	3

Comparable Courses within the VCCCD

MATH V44 - Elementary Statistics
MATH M15H - Honors: Introductory Statistics
MATH R105 - Introductory Statistics
MATH R105H - Honors: Introductory Statistics

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Santa Monica College	MATH 54	Elementary Statistics	4
Santa Barbara City College Math 54 Elementary Statistics 4 Santa Barbara City College	MATH 117	Elementary Statistics	4

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

D2. Communication/Analytical Thinking
Approved

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
F1995

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B4 Mathematical/Quantitative Reasoning
Approved

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 2A: Mathematical Concepts & Quantitative Reasoning
Approved

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals
Resource Type
Textbook

Classic Textbook
No

Description
Triola, Mario. *Elementary Statistics.* 14th ed., Pearson, 2022.

Resource Type
Textbook

Classic Textbook
No

Description
Sullivan III, Michael. *Statistics: Informed Decisions Using Data.* 6th ed., Pearson, 2021.

Resource Type
Textbook

Classic Textbook
No

Description
Utts, Jessica M., and Robert F. Heckard. *Mind on Statistics.* 6th ed., Cengage, 2022.

Resource Type
Textbook

Description
Illowsky, Barbara, and Susan Dean. *Introductory Statistics.* E-book, Open Stax, 2022, https://openstax.org/details/books/introductory-statistics. Accessed 20 Oct 2022.

Library Resources

Assignments requiring library resources
Using the Library's print and online resources, locate articles discussing the use of statistics and mathematical formulas in current events, such as elections, national census, and other population trends.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Reading current magazines or other periodicals to identify examples of statistics in economics, politics, finance, current affairs or science and to use data observed to create confidence intervals or test claims about a hypothesis.

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (1%−50% online)
Hybrid (51%−99% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%−50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.

Hybrid (51%−99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.

Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.

Examinations

Hybrid (1%–50% online) Modality

On campus
Online

Hybrid (51%–99% online) Modality

On campus
Online

Primary Minimum Qualification
MATHEMATICS

Review and Approval Dates

Department Chair
10/12/2022

Dean
10/17/2022

Technical Review
10/20/2022

Curriculum Committee
11/01/2022

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000536281

DOE/accreditation approval date
MM/DD/YYYY