Las Positas College
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Course Outline for MATH 40

STATISTICS AND PROBABILITY

Effective: Fall 2014

I. CATALOG DESCRIPTION:
MATH 40 — STATISTICS AND PROBABILITY — 4.00 units

Descriptive statistics, including measures of central tendency, dispersion and position; elements of probability; confidence intervals; hypothesis tests; two-population comparisons; correlation and regression; goodness of fit; analysis of variance; applications in various fields. Introduction to the use of a computer software package to complete both descriptive and inferential statistics problems.

4.00 Units Lecture

Prerequisite
MATH 55 - Intermediate Algebra for STEM
with a minimum grade of C

MATH 55B - Intermediate Algebra for STEM B
with a minimum grade of C
or

MATH 55Y - Intermediate Algebra
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	72.00
No Unit Value Lab	18.00
Total Hours:	90.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:
Before entering the course a student should be able to:

A. MATH55
B. MATH55B
C. MATH55Y

IV. MEASURABLE OBJECTIVES:
Upon completion of this course, the student should be able to:

A. Define different types of statistics, how they are used and misused;
B. Take raw data and organize it into tables, charts, and/or graphs;
C. Calculate and understand the meaning of the mean, median, mode, range, variance, and standard deviation as they relate to a population, sample, or distribution;
D. Determine the fundamentals concepts of probability and be able to calculate probabilities using some basic rules;
E. Solve problems involving the binomial, normal, or chi-squared distribution;
F. Find confidence intervals and perform hypothesis tests for single populations and two-populations comparisons;
G. Apply concepts of analysis of variance;
H. Apply concepts of correlation and linear regression;
I. Perform descriptive and inferential statistics, using a software package.

V. CONTENT:
A. Introduction to Statistics
1. Descriptive vs. Inferential
2. Types of data
3. Basic concepts of random selection, population, samples
4. Misuse of statistics

B. Analysis of data
    1. Ungrouped data
        a. Measure of central tendency – mean median, mode
        b. Measure of dispersion – range, mean absolute deviation, variance, standard deviation
        c. Measure of position – percentiles, deciles, quartiles, z - score
        d. Graphs – stem and leaf, box plot
    2. Grouped data
        a. Frequency distributions
        b. Measures of central tendency – mean
        c. Measures of dispersion – variance and standard deviation
        d. Graphs – histograms, frequency polygons, ogives
C. Probability
    1. Counting techniques, permutations, combinations
    2. Finding sample spaces
    3. Solve by addition and multiplication rules
    4. Solve using complements and conditional probability
    5. Bayes Theorem
D. Probability distribution – discrete variable
    1. Find mean and standard deviation for a probability distribution in general
    2. Binomial distributions
        a. Basic concepts of binomial distribution
        b. Find probabilities using the binomial distribution
        c. Find mean and standard deviation for a binomial distribution
    3. Graph using histograms
E. Normal distributions
    1. Basic concepts of normal distribution and the standard normal distribution
    2. Find probabilities using the standard normal distribution
    3. Approximate binomials using the standard normal distribution
F. Confidence intervals
    1. Mean, proportion, and variance of a single population
    2. Means, proportions, and variances of two populations
G. Hypothesis tests
    1. Mean, proportion, and variance of a single population
    2. Comparison of means, proportions, and variances of two independent populations
    3. Difference of means and mean of differences of two dependent populations
    4. One-way analysis of variance
    5. Goodness of fit
    6. Contingency tables
H. Correlation and regression
    1. Scatter diagrams
    2. Find correlation coefficient and regression equation for a bivariate set of data
    3. Graph regression equation
    4. Predication using regression equation
    5. Hypothesis test for correlation coefficient

VI. METHODS OF INSTRUCTION:

A. **Lecture** -
B. Demonstration in computer lab
C. Collaborative learning and class projects where applicable
D. Classroom discussion

VII. TYPICAL ASSIGNMENTS:

A. Hypothesis testing problems tend to be long. A typical assignment in hypothesis testing for a single population might be problems 1 through 11 odd.
B. A class project might be to have students select a random sample and find confidence intervals or perform hypothesis tests (optional).
C. A typical lab assignment might be to randomly generate a sample, and then perform specified statistical calculations (mean, median, mode, standard deviation, etc) and graphs (histogram, line graph, pie chart, etc).
D. Problem solving
    1. Calculate the mean, median, and mode for a set of ungrouped data;
    2. Roll a die twice; find the probability of rolling a pair.

VIII. EVALUATION:

A. **Methods**

    1. Exams/Tests
    2. Quizzes
    3. Projects
    4. Home Work
    5. Lab Activities
    6. Other:
        a. Examinations
            1. Questions involving calculations should be open-ended;
            2. Types of problems:
                a. A study of 40 bowlers showed that their average score was 186. The standard deviation was 6. Find the following:
                    1. 95% confidence interval for the true average score;
                    2. test the claim that the true average score was at least 190;
                    3. 3 types of computer disks are selected, and the number of defects in each is as recorded below. At a=5%, can one conclude that there is a difference in the average number of defects for the 3 groups?
            3. Questions testing properties and definitions can be true/false, multiple choice, completion, or fill-in:
                a. List the 6 properties of a binomial probability distribution;
                b. True or False: P(A and B) = P(A)+P(B)-P(A or B);
                c. _____and_____are the two types of statistics;
                d. Give an example of qualitative data?
                e. The median is the same as which one of the following:
                f. P50 b) D5 c) Q2 d) x e) all
        b. Announced or unannounced quizzes at the option of the instructor

c. Collect homework at the option of the instructor
d. Computer assignments
e. Graphing calculator assignments
f. Term project at option of instructor
g. Lab final at option of instructor

B. **Frequency**

1. Minimum of 4 exams
2. 5 to 15 computer lab assignments
3. 5 to 15 graphing calculator assignments

IX. TYPICAL TEXTS:

1. Larson, R., F. Farber. *Elementary Statistics: Picturing the World.* 5th ed., Pearson, 2011.
2. Bluman, A. G. *Elementary Statistics.* 8th ed., McGraw-Hall Publishers, 2012.
3. Sullivan *Statistics: Informed Decisions Using Data.* 4th ed., Pearson-Prentice Hall Publishers, 2012.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Scientific or graphing calculator may be required.