# Stat 1: Introduction to Statistics

### California State University, Sacramento · Department of Mathematics & Statistics

## CATALOG DESCRIPTION

Descriptive statistics, basic concepts of probability and sampling with the aim of introducing fundamental notions and techniques of statistical inference.  **Graded:** A-F.  **Units:** 3.0

## PREREQUISITES

Math 10 or a score of 51 or higher on a proctored ALEKS PPL exam.

## AREA B-4 MATHEMATICAL CONCEPTS AND QUANTITATIVE REASONING STUDENT LEARNING OUTCOMES

Students will be able to:

1.  Solve problems by thinking logically, making conjectures, and constructing valid mathematical arguments.
2.  Make valid inferences from numerical, graphical and symbolic information.
3.  Apply mathematical reasoning to both abstract and applied problems, and to both scientific and non-scientific problems.

## WRITING COMPONENT

Stat 1 is an area B4 GE course and has a writing component.  There will be assignments that require students to think through the concepts of the course and present solutions in clear and concise written language. These assignments will be evaluated for clarity and accuracy.

## LEARNING OUTCOMES

Students will be able to:

1.  Organize, summarize, and interpret data in tabular, graphical, and pictorial formats.
2.  Organize and interpret bivariate data and learn simple linear regression and correlation.
3.  Understand the basic rules of probability.
4.  Use the binomial distribution as a model for discrete variables.
5.  Use the normal distribution as a model for continuous variables.
6.  Apply statistical inference techniques of parameter estimation such as point estimation and confidence interval estimation.
7.  Apply techniques of testing various statistical hypotheses concerning population parameters.

## SAMPLE TEXT AND MATERIALS

- *Introductory Statistics, 10th edition* by Neil A. Wiess.
- *MyStatLab* Account

## METHODS OF EVALUATION (GRADING SYSTEM, EXAMINATIONS, ETC)

There will be midterm examinations and a comprehensive final examination for this course. A variety of assignments (for example, homework, quizzes, projects, etc.) will be required.

I.   Descriptive Statistics (3 ½ weeks)

1. What is statistics?

2. Basic terminology and concepts

3. Graphical presentations of statistical data

4. Frequency distributions, histograms, and ogives

5. Measures of central tendency

6. Measures of variability

7. Measures of position

8. Bivariate data and scatter diagrams

9. Linear correlation

10. Linear regression


II.   Probability (2 weeks)

1. Experiments, sample space, events

2. Different approaches to probability

3. Probability axioms

4. Rules of probability:

   a. generalized addition rule

   b. complement rule

5. Conditional probability, independence, and the  multiplication rule

6. Bayes' rule (Optional)


III.   Discrete Random Variables (2 weeks)

1. Random variables and their probability distributions

2. Connection between relative frequency distributions and probability distributions of discrete random variables

3. Mean and variance

4. The binomial probability distribution

5. Using the binomial distribution tables; mean and variance of the binomial distribution (Optional)

IV.   The Normal Probability Distribution (3 weeks)

1. Continuous random variables

2. The normal distribution

3. The standard normal distribution

4. Normal approximation of the binomial distribution

5. Digression:  How to MINITAB! (Optional)

6. Sampling distributions

7. The Central Limit Theorem and its applications


V.   Inference (4 ½  weeks)

1. Introduction to inference – estimation and testing of hypotheses

2. Point and interval estimation

3. Testing statistical hypotheses:

    a. Type I and Type II errors

    b. Critical regions

    c. $p$ - values

4. Inferences concerning one population

    a. Tests and confidence intervals for the population mean (large and small populations)

    b. Tests and confidence intervals for proportions

    c. Inference about the population variance

5. Inferences concerning two populations

    a. The differences of two means (large and small samples)

    b. Paired $t$-tests and the pooled  $t$-test

    c. The difference between two proportions

    d. The ratio of two variances

6. Uses of chi-square statistics

    a. Tests of goodness of fit

    b. Contingency tables

7. Introduction to one-way ANOVA (Optional)

8. Nonparametric methods (Optional)