MATH 251 – STATISTICS │ 4 CREDITS
SYLLABUS

CATALOG DESCRIPTION

Instructs the student in the knowledge of an introduction to descriptive and inferential statistics, which includes the following topics: sampling theory, experimental design, probability, probability distributions, confidence intervals, correlation and regression, tests of hypotheses (using the normal, student –T, Chi-square and F – distributions), and ANOVA. Lab time is provided for data analysis using statistical software.

Prerequisites: ACCUPLACER score: 104 – 120, or MATH-115 or higher with a grade of C or better and English 111 with a grade of C or better.

Semester Offered: Fall, Spring and Summer

Common Student Learning Outcomes
Upon successful completion of San Juan College programs and degrees, the student will demonstrate competency in…

BROAD AND SPECIALIZED LEARNING
  Students will actively and independently acquire, apply, and adapt skills and knowledge with an awareness of global contexts.

CRITICAL THINKING
  Students will think analytically and creatively to explore ideas, make connections, draw conclusions and solve problems.

CULTURAL AND CIVIC ENGAGEMENT
  Students will act purposefully, reflectively, and ethically in diverse and complex environments.

EFFECTIVE COMMUNICATION
  Students will exchange ideas and information with clarity in multiple contexts.

INFORMATION LITERACY
  Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use it effectively.

INTEGRATING TECHNOLOGIES
  Students will demonstrate fluency in the application and use of technologies in multiple contexts.

Student work from this class may be randomly selected and used anonymously for assessment of course, program, and/or institutional learning outcomes. For more information, please refer to the Dean of the appropriate School.

General Learning Outcomes

Upon successful completion of the course, the student will be able to…

A. Descriptive and Inferential Statistics.
B. Regression and Correlation.
C. Probability Theory.
D. Distributions – Normal, Binomial, Student – T, Chi-square.
E. Confidence Intervals

F. Hypothesis Testing.

Specific Learning Outcomes

Upon successful completion of the course, the student will be able to…

A. DESCRIPTIVE AND INFERENTIAL STATISTICS

A1. Be able to organize data into a frequency distribution, relative frequency distribution, and cumulative frequency distribution.
A2. Be able to determine appropriate methods to display data.
A3. Be able to graph data distributions using histograms, frequency polygons, stem-and-leaf plots, box plots, and scatter plots, and draw appropriate inferences.
A4. Be able to compute measures of central tendency (mean, median and mode) and measures of dispersion (range, standard deviation, percentile and variance) for both grouped and ungrouped data.
A5. Be able to use statistical software or a calculator to graph and describe data sets. A6. Understand how to use and compute Z-scores.
A7. Be able to use the normal distribution and standard scores to compare measures.
A8. Know the difference between qualitative and quantitative data.
A9. Be able to select appropriate random sampling techniques.
A10. Know the difference between a parameter and a statistic.
A11. Be able to describe the elements of sampling and experimental design.

B. REGRESSION AND CORRELATION

B1. Be able to find the least-square regression equation and use it to predict values.
B2. Understand the impact of outliers on data representation and inferences. B3. Be able to compute and interpret the correlation coefficient.

Optional Objectives
B4. Be able to compute and interpret the coefficient of determination.
B5. Be able to construct and interpret a prediction interval for y (the response variable).

PROBABILITY THEORY

C1. Be able to determine sample spaces and events.
C2. Be able to determine probabilities of complementary, conditional, mutually exclusive and independent events.
C3. Determine whether random variables are discrete or continuous.
C4. Be able to construct discrete probability distributions including finding means, variances, and cumulative probabilities

C5. Be able to explain the law of large numbers.
C6. Be able to find probabilities using the Fundamental Counting Principle, permutations, and combinations.

D. Distributions – Normal, Binomial, Student-T, Chi-square

D1. Understand the binomial distribution and associated probabilities.
D2. Be able to compute the mean and variance of a binomial distribution.
D3. Understand normal distributions.
D4. Be able to find probabilities associated with student-T and Chi-square distributions.
D5. Know the Central Limit Theorem and be able to apply it appropriately. D6. Compute the mean and standard deviation of sample means.
D7. Be able to determine sample size for a specified margin of error for various statistics and margin of error given sample size.

Optional Objectives
D8. Understand and be able to compute Poisson and geometric distributions.
D9. Be able to approximate binomial distributions with normal distributions, when appropriate.

E. CONFIDENCE INTERVALS

E1. Be able to determine when confidence intervals and significance tests are appropriate.
E2. Explain the conclusions that can be drawn from confidence intervals, how they are drawn and what the limitations are.
E3. Be able to compute confidence intervals for population means and proportion. (2 sample confidence intervals optional.)

Optional Objectives
E4. Be able to compute 2 sample confidence intervals

F. HYPOTHESIS TESTING

F1. Apply knowledge of hypothesis testing.
F2. Be able to write the null hypothesis and alternate hypothesis.
F3. Understand the concepts of significance level and statistically significant.
F4. Be able to test hypotheses, specifically:
    a. 1 sample tests
        i. mean – small sample size ii. mean – large sample size
        iii. proportion,
        iv. standard deviation, variance (optional)
    b. 2 sample tests
        i. mean – independent/small
        ii. mean – independent/large
        iii. paired iv. 2 proportions
        v. variance (optional)
    c. Chi-square
        i. Test for Independence
        ii. Goodness of Fit
    d. ANOVA (optional)
F5. Understand the difference between Type I and Type II errors

OTHER REQUIREMENTS:

A TI-82, TI-83, TI-84, TI-85, or TI-86 Graphing Calculator is required for the course. (TI-Nspire calculators that are equivalent to these are acceptable.) A **TI-83 Plus or TI-84 Plus Graphing Calculator** is strongly recommended. Graphing calculators capable of symbolic manipulation (such as TI-89, TI-92, TI-Nspire CAS systems and other such calculators) will not be allowed on examinations, the final exam, and where the instructor sees fit.