

Course Outline

Course Title: Statistics

Common Course Title: STA2023

Effective Term: Fall 2021 (Aug 9, 2021)

Credit Hours: 3 Units

Next Review : Aug 8, 2026

Contact Hour Breakdown: *(Per 16 week Term)*

Total: 48

Lecture:

Lab:

Clinic:

Other:

Requirements

Pre-requisite(s) with minimum grade required

MAC1105 (C) OR MAC1105C (C) OR MAC1114 (C) OR MAC1140 (C) OR MAC2233 (C) OR MAC2311 (C) OR MAC2312 (C) OR MAC2313 (C) OR MAP2302 (C) OR MAS2103 (C) OR MAT1033 (C) OR MGF1106 (C) OR STA1001 (C)

Course Description:

A first course in statistical methods including such topics as collecting, grouping, and presenting data; measures of central tendency, position, and variation; theoretical distributions; probability; test of hypotheses; estimation of parameters; and regression and correlation. Use of statistical computer software and/or a scientific calculator (capable of performing 2-variable statistics) will be required. Recommendation of the Mathematics Department or at least a grade of C in the prerequisite course is required.

Course Outline

Alignment of General Education Competencies with General Outcomes of this Course (for general education assessment purposes)

1. Critical Thinking

- 3.0, 9.0

2. Effective Communication

- 5.0

3. Ethical Reasoning

4. Global Awareness

5. Information Literacy

6. Mathematical and Scientific Reasoning

- 1.0, 7.0

UNITS

Unit 1: Frequency Tables and Graphs

General Outcome

1.0 Organize, summarize, and illustrate data in tables and in graphs and interpret the meanings of such tables and graphs.

Specific Learning Outcomes

- 1.1 Construct and interpret frequency, relative frequency, and cumulative frequency distribution tables.
- 1.2 Construct and interpret stem-and-leaf distributions.
- 1.3 Construct and interpret histograms.
- 1.4 Identify misuses of statistics, misleading statistics, and sources of bias.

Unit 2: Descriptive Measures

General Outcome

2.0 Calculate measures of location, central tendency and dispersion, and distinguish between population parameters and sample statistics

Specific Learning Outcomes

- 2.1 Differentiate between population parameter and sample statistic.
- 2.2 Calculate and interpret the mean, median, and mode of a given data set.
- 2.3 Calculate and interpret the weighted mean and determine when the weighted mean is appropriate.
- 2.4 Calculate and interpret quartiles and percentiles.
- 2.5 Calculate and interpret the range, variance, and standard deviation of a given data set.
- 2.6 Determine and interpret the inter-relationships between the mean, median, and mode for skewed and symmetrical distributions.
- 2.7 Determine if a value is unusual or significant (or range of usual values) based upon given or calculated mean and standard deviation.
- 2.8 Calculate and interpret z scores for a normal distribution.

Unit 3: Probability

General Outcome

3.0 Apply the definitions and rules of probability to solve problems involving discrete variables.

Specific Learning Outcomes

- 3.1 Calculate probabilities by applying the classical definition of probability and by applying the relative frequency approach.
- 3.2 Calculate probabilities using the fundamental counting principle, permutations, and combinations.
- 3.3 Read applied problems, solve by calculating probabilities using the complement rule, and interpret the results.
- 3.4 Read applied problems, solve by calculating probabilities using the addition rule, and interpret the results.
- 3.5 Read applied problems, solve by calculating probabilities using the multiplication rule, and interpret the results.
- 3.6 Read applied problems, solve by calculating conditional probabilities, and interpret the results.
- 3.7 Determine whether an event is unusual or significant based upon the relevant probability.

Unit 4: Discrete Probability Distributions

General Outcome

4.0 Determine the probability distribution for a given experiment and random variable, and calculate its mean and standard deviation.

Specific Learning Outcomes

- 4.1 Differentiate between quantitative and categorical variables.
- 4.2 Differentiate between discrete and continuous random variables.

- 4.3 Decide whether a given distribution satisfies the requirements of a probability distribution.
- 4.4 Calculate the mean (expected value) and standard deviation for a given random variable.
- 4.5 Read applied problems and solve by calculating expected values.
- 4.6 Read applied problems and decide whether a given distribution is binomial.
- 4.7 Read applied problems and calculate the binomial probability using the binomial formula, a table, or technology.
- 4.8 Read applied problems, solve by calculating and calculate the mean and standard deviation of a binomial distribution, and interpret the results.

Unit 5: Normal Distribution and Central Limit Theorem

General Outcome

- 5.0 Solve problems using normal distributions and apply the Central Limit Theorem for sample means.

Specific Learning Outcomes

- 5.1 Identify the properties of the standard and nonstandard normal distributions.
- 5.2 Read applied problems, solve by calculating probabilities using the standard and nonstandard normal distributions, and interpret the results.
- 5.3 Read applied problems, solve by calculating values in the standard and nonstandard normal distributions when given specific probabilities, and interpret the results.
- 5.4 Explain the meaning of the Central Limit Theorem and its properties associated with the distribution of sample means.
- 5.5 Read applied problems, solve by calculating probabilities for the distributions of sample means using the Central Limit Theorem, and interpret the results.

Unit 6: Hypothesis Testing Concepts

General Outcome

- 6.0 Demonstrate an understanding of the concepts and structure of hypothesis testing and by performing hypothesis tests in various situations.

Specific Learning Outcomes

- 6.1 Read applied problems and formulate the null and alternative hypotheses that would be used to test a claim.
- 6.2 Describe, analyze, and differentiate between Type I and Type II errors.
- 6.3 Read applied problems and decide when to use the t or z statistic, and be able to determine the correct values for these statistics for various hypothesis tests.
- 6.4 Determine the rejection region(s), and construct a sketch of the region(s).
- 6.5 Determine the p-value for a hypothesis test involving the z test statistic.
- 6.6 Calculate the sample z or t test statistic for given sample data.
- 6.7 Decide whether to reject or fail to reject the null hypothesis based upon comparison of the test statistic value and the rejection region, or comparison of the p-value and the level of significance.
- 6.8 Write the hypothesis test conclusion as a meaningful holistic answer to the original problem situation.

Unit 7: Hypothesis Testing Applications

General Outcome

- 7.0 Perform hypothesis tests and apply the hypothesis testing concepts to a wide variety of different situations.

Specific Learning Outcomes

- 7.1 Read applied problems, perform a hypothesis test relating to the mean of a population by using the z statistic, and interpret the results.
- 7.2 Read applied problems, perform a hypothesis test relating to the mean of a population by using the t statistic, and interpret the results.

7.3 Read applied problems, perform a hypothesis test relating to the difference of two mean when given two independent samples, and interpret the results.

7.4 Read applied problems, perform a hypothesis test relating to the difference between mean using paired samples, and interpret the results.

7.5 Read applied problems, perform a hypothesis test relating to a proportion using one large sample, and interpret the results.

7.6 Read applied problems, perform a hypothesis test relating to the Chi-square test for the independence of two variables, and interpret the results.

Unit 8: Estimation of Parameters

General Outcome

8.0 Determine point and interval estimates for population parameters and to determine sample sizes for the estimation of parameters.

Specific Learning Outcomes

8.1 Read applied problems, determine point estimates for the population mean and population proportion, and interpret the results.

8.2 Read applied problems, construct confidence intervals for the population mean and population proportion, and interpret the results.

8.3 Read applied problems, determine the sample sizes necessary to estimate population means and population proportions within a given error, and interpret the results.

Unit 9: Linear Correlation and Regression

General Outcome

9.0 Calculate the correlation coefficient, determine if there is significant linear correlation, and make predictions based on the given data.

Specific Learning Outcomes

9.1 Explain the meaning of and calculate the sample linear correlation coefficient, .

9.2 Construct and interpret scatter diagrams.

9.3 Read applied problems, perform a test to determine if there is a significant linear correlation between two variables, and interpret the results.

9.4 Read applied problems, determine the equation of the regression line, .

9.5 Determine the best predicted y value for a given x value using the strength of the linear correlation and then either the regression equation or as appropriate.