

**LAST REVIEW: 2010-2011**  
*(i.e. 2006-2007)*

**NEXT REVIEW: 2015-2016**  
*(i.e. 2011-2012)*

**STATUS: A**  
*(A, I, D)*

**COURSE TITLE: Statistics**

**COMMON COURSE NUMBER: STA2023**

**CREDIT HOURS: 3**

**CONTACT HOUR BREAKDOWN**  
*(Per 16 week term)*

**CLOCK HOURS:**  
*(Voc. Course ONLY)*

Lecture: **48**      Lab:  
Clinic:              Other:

**PREREQUISITE(S): MAT1033**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** *(750 characters, maximum):*

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; tests of hypotheses; estimation of parameters; and two variable linear regression and correlation. Use of statistical computer software and/or a scientific/graphing calculator (capable of performing 2-variable statistics) will be required. Meets Areas 4 or 5 of the general education requirement. Recommendation of the Mathematics Department or at least a grade of "C" in the prerequisite course is required.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s):      Area 5  
General Education Requirements – Associate in Science Degree (AS), meets Area(s):      Area 4  
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s):      Area 4

## **UNIT TITLES**

- 1. Frequency Tables and Graphs**
- 2. Descriptive Measures**
- 3. Probability**
- 4. Discrete Probability Distributions**
- 5. Normal Distribution and Central Limit Theorem**
- 6. Hypothesis Testing Concepts**
- 7. Hypothesis Testing Applications**
- 8. Estimation of Parameters**
- 9. Linear Correlation and Regression**

\*\*\* Complete the following only if course is seeking general education status \*\*\*

**GENERAL EDUCATION Competencies and Skills \*:**

In the box to the right of the Competency/Skill, enter all specific **student learning outcome** unit numbers, as indicated in the course outline (i.e. 1.1, 2.7, 4.2, 4.0 and 5.12) that apply.

<b>Course must include <u>all</u> of the following:</b>	
<b>1. Read with critical comprehension**</b>	3.3, 3.4, 3.5, 3.6, 3.7, 4.4, 4.5, 4.6, 4.7, 4.8, 5.2, 5.3, 5.6, 6.1, 6.3, 7.0, 8.0, 9.3, 9.4, 9.5
<b>2. Write clearly and coherently**</b>	5.5, 6.1, 6.2, 6.8, 7.0
<b>3. Demonstrate literacy as appropriate within a given discipline**</b>	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, Quantitative 2.2, 2.3, 2.5, 2.6, 6.6, 7.7, 8.3, 8.4, 8.5, 8.6, 9.1, 9.4 Technology
<b>4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**</b>	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
<b>Course must include at least <u>one</u> of the following:</b>	
<b>5. Differentiate between ethical and unethical behavior</b>	
<b>6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.</b>	3.7, 5.2, 5.3, 5.6, 7.0, 8.3, 8.4, 8.5, 8.6, 9.2, 9.3, 9.4, 9.5
<b>7. Demonstrate an understanding of and appreciation for human diversities and commonalities.</b>	
<b>8. Speak and listen effectively.</b>	

*\*General Education Competencies and Skills endorsed by 2010-2011 General Education Task Force*

**\*\*Required Competencies**

**1) Read with critical comprehension.**

The student will be introduced to the basic texts, concepts, vocabulary, and methods necessary for developing an understanding of the discipline and meeting the required benchmarks as stated in the course outline.

**2) Write clearly and coherently.**

The student will demonstrate an understanding and mastery of subject matter in a variety of ways, including writing. Writing activities may include both graded and ungraded essays, short answer quizzes, summaries, reactions, journals, and various other reports.

**3) Demonstrate and apply literacy across all the disciplines (indicate which ones apply).**

- a) **Information literacy** means understanding how to locate needed information, using the appropriate technology for the task, managing and evaluating the extracted information and using it effectively and ethically.
- b) **Technology literacy** is the ability to responsibly and effectively use appropriate technology to access, manage, integrate, or create information, and/or use technology to accomplish a given task.
- c) **Workplace literacy** is having the appropriate knowledge and skills to communicate and work with others effectively and perform job duties, whether it is through the use of computers and/or other technology.
- d) **Cultural literacy** is recognizing, understanding, and appreciating the similarities and differences between one's own culture and the cultures of others through a study of the arts, customs, beliefs, values, and history that define a culture.
- e) **Quantitative literacy** is having the ability to formulate, solve and interpret mathematical/statistical operations and graphical/tabular representations to make informed decisions.
- f) **Scientific literacy** means understanding the methodology and application of the scientific process, the physical and biological worlds, and recognizing that scientific knowledge is continuously updated or revised as new information is discovered.

**g) Environmental literacy** is creating a context within which environmental issues can be viewed, imparting knowledge to enhance one's ability to analyze the issues, make the connections between humans' decisions and actions and the challenges facing the environment, and instilling the desire to sustain the environment through ethical practices in both one's professional and personal lives.

**4. Apply problem-solving skills or methods to make informed decisions in a variety of contexts.**

The student will use acquired skills or methods to recognize, analyze, adapt, and apply critical thinking to solve problems and make informed decisions.

## EVALUATION:

In the box to the right of the Methods of Assessment, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 4.0, 4.2 and 5.12) that apply.

1. Portfolio	
2. Short essays	
3. Research Papers	
4. Group projects	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
5. Discussions (In class and online)	
6. Multiple Choice tests	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
10. Take-home tests	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
11. Summaries, critiques, and analyses	
12. Reaction papers	
13. Surveys	
14. Performance	
15. Short answer tests	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	
18. Other (Please explain)	

## **UNITS**

### **Unit 1 Frequency Tables and Graphs**

#### **General Outcome:**

- 1.0 The student shall be able to organize summarize, and illustrate data both in table and in graph form, as well as be able to interpret the meanings of such tables and graphs.**

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 1.1 Construct and interpret frequency, relative and cumulative frequency distribution tables.**
- 1.2 Construct and interpret stem-and-leaf distributions.**
- 1.3 Construct and interpret histograms.**
- 1.4\* Construct and interpret frequency and relative frequency polygons.**
- 1.5\* Construct and interpret ogives.**

**\*Optional learning outcome, up to the discretion of the instructor.**

Common Course Number: STA2023

**Unit 2 Descriptive Measures**

**General Outcome:**

- 2.0 The student shall be able to calculate measures of location, central tendency and dispersion, and distinguish between population parameters and sample statistics**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 2.1 Calculate and interpret the mean, median, and mode of a set of numbers.**
- 2.2 Calculate and interpret the weighted mean.**
- 2.3 Calculate and interpret quartiles and percentiles.**
- 2.4\* Calculate and interpret box-and-whisker diagrams.**
- 2.5 Calculate and interpret the range, variance, and standard deviation of a set of numbers.**
- 2.6\* Calculate and interpret the mean, variance, and standard deviation for data from a frequency distribution.**
- 2.7 Determine and interpret the inter-relationships between the mean, median, and mode for skewed and symmetrical distributions.**
- 2.8 Determine if a value is unusual (or range of usual values) based upon given or calculated mean and standard deviation.**
- 2.9 Calculate and interpret z scores for a normal distribution.**

**\*Optional learning outcome, up to the discretion of the instructor.**

Common Course Number: STA2023

**Unit 3 Probability**

**General Outcome:**

- 3.0 The student shall be able to apply the definitions and rules of probability to solve problems involving discrete variables.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 3.1 Apply the classical definition of probability.**
- 3.2 Compute probabilities using the fundamental counting principle, permutations, and combinations.**
- 3.3 Read applied problems and compute probabilities using the law of complementation,**
- 3.4 Read applied problems and compute probabilities using the laws of addition.**
- 3.5 Read applied problems and compute probabilities using the laws of multiplication.**
- 3.6 Read applied problems and compute conditional probabilities.**
- 3.7 Determine whether an event is unusual or not based upon the relevant probability.**
- 3.8\* Read applied problems and calculate the odds associated with given probabilities.**

**\*Optional learning outcome, up to the discretion of the instructor.**

**Unit 4 Discrete Probability Distributions**

**General Outcome:**

- 4.0 The student shall be able to determine the probability distribution for a given experiment and random variable, and calculate its mean and standard deviation.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 4.1 Differentiate between discrete and continuous random variables.**
- 4.2 Decide whether a given distribution satisfies the requirements of a probability distribution.**
- 4.3 Calculate the mean (expected value) and standard deviation for a given random variable.**
- 4.4 Read applied problems and solve problems involving expected value.**
- 4.5 Read applied problems and decide whether a given distribution is binomial.**
- 4.6 Read applied problems and calculate the binomial probability using the table or technology.**
- 4.7 Read applied problems and calculate the binomial probability using the binomial formula.**
- 4.8 Read applied problems and calculate the mean and standard deviation of a binomial distribution.**

Common Course Number: STA2023

**Unit 5 Normal Distributions and Central Limit Theorem**

**General Outcome:**

- 5.0 The student shall be able to solve problems using normal distributions and apply the Central Limit Theorem for sample means.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 5.1 Identify the properties of the standard and nonstandard normal distributions.**
- 5.2 Read applied problems and calculate probabilities using the standard and nonstandard normal distributions.**
- 5.3 Read applied problems and calculate values in the standard and nonstandard normal distributions when given specific probabilities.**
- 5.4\* Determine when the normal distribution can be used to approximate the binomial distribution, and compute the binomial probabilities using the normal approximation.**
- 5.5 Explain the meaning of the Central Limit Theorem and its properties associated with the distribution of sample means.**
- 5.6 Read applied problems and calculate probabilities for the distributions of sample means using the Central Limit Theorem.**

**\*Optional learning outcome, up to the discretion of the instructor.**

**Unit 6 Hypothesis Testing Concepts**

**General Outcome:**

- 6.0 The student shall be able to demonstrate an understanding of the concepts and structure of hypothesis testing and by performing hypothesis tests in various situations.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 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 The student shall be able to apply the hypothesis testing concepts to a wide variety of different situations.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 7.1 Read applied problems and perform a hypothesis test relating to the mean of a population by using the z statistic.**
- 7.2 Read applied problems and perform a hypothesis test relating to the mean of a population by using the t statistic.**
- 7.3 Read applied problems and perform a hypothesis test relating to the difference of two mean when given two independent samples.**
- 7.4 Read applied problems and perform a hypothesis test relating to the difference between mean using paired samples.**
- 7.5 Read applied problems and perform a hypothesis test relating to a proportion using one large sample.**
- 7.6 Read applied problems and perform a hypothesis test relating to the Chi-square test for the independence of two variables.**
- 7.7\* The use of a computer or calculator to perform any of the aforementioned hypothesis tests.**

**\*Optional learning outcome, up to the discretion of the instructor.**

**Unit 8 Estimation of Parameters**

**General Outcome:**

- 8.0 The student shall be able to determine point and interval estimates for population parameters and to determine sample sizes for the estimation of parameters.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 8.1 Read applied problems and determine point estimates for the population mean and population proportion.**
- 8.2\* Read applied problems and determine a point estimate for the population variance.**
- 8.3 Read applied problems and construct and interpret confidence intervals for the population mean and population proportion.**
- 8.4\* Read applied problems and construct and interpret confidence intervals for the population variance.**
- 8.5 Read applied problems and determine the sample sizes necessary to estimate population means and population proportions within a given error.**
- 8.6\* Read applied problems and construct the confidence intervals for the difference between mean and difference between proportions.**

**\*Optional learning outcome, up to the discretion of the instructor.**

**Unit 9 Linear Correlation and Regression**

**General Outcome:**

- 9.0 The student shall be able to calculate the correlation coefficient, determine if there is a significant linear correlation, and find the line of best fit.**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 9.1 Explain the meaning of and calculate the sample linear correlation coefficient,  $r$ .**
- 9.2 Construct and interpret scatter diagrams.**
- 9.3 Read applied problems and conduct a test to determine if there is a significant linear correlation between two variables.**
- 9.4 Read applied problems and 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  $\bar{y}$  as appropriate.**