COURSE OUTLINE

Course Number	**Course Title**	**Credits**
MAT 125	Elementary Statistics I	3

Hours: **lecture/Lab/Other**	**Pre-requisite**	**Implementation** **sem/year**
3	MAT037 or MAT042 with a minimum of C grade	Fall 2014

Catalog description (2018-2019 Catalog): This course provides students with a basic introduction to statistical concepts and methods. Topics covered include: descriptive statistics, basic probability concepts, discrete and normal probability distributions, hypothesis testing and confidence intervals with one sample mean and one sample proportion, and regression and correlation. Statistical software will be used.

Is course New, Revised, or Modified? Revised

Required texts/other materials: Elementary Statistics 2nd Edition, Navidi & Monk; McGraw Hill
ConnectMath,
Minitab 18

Revision date: Spring 2019   **Course coordinator:**   (Name, telephone number, email address)

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Information resources:

 The library has many books, CDs and videos available.
 The Library Computer Lab has Internet access
 The Learning Center has tutoring and help available to the students.

Other learning resources: (Describe any other student learning resources that are specific to this course, including any special tutoring or study group support, learning system software, etc.)

Course Competencies/Goals:
 The student will be able to:

1. Construct a data table identifying the cases, variables, and whether the variable is quantitative or categorical. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**
2. Look for patterns and trends and construct graphs using a statistical software package for one and two variables for categorical data. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**
3. Examine center, spread, shape, and outliers and construct graphs by hand or using a statistical software package for one quantitative variable and construct graphs to compare groups within a quantitative data set. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**
4. Find the percentiles for a score and find a score given the percentiles for a normal distribution. **(GE Goal 2; MCCC CS B)**
5. Graph a scatterplot, calculate a correlation coefficient, check the assumptions for straight line regression, calculate the regression coefficients and residuals, and do a residual plot using a statistical software package. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**
6. Calculate probabilities through simulations and probability models. **(GE Goals 2, 4; MCCC CS B, E)**
7. Calculate probabilities for discrete and normal distributions. **(GE Goals 2; MCCC CS B)**
8. Calculate margin of error, construct and interpret a confidence interval, calculate sample size, and perform a hypothesis test for one sample proportion. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**
9. Calculate margin of error, construct and interpret a confidence interval, calculate sample size, and perform a hypothesis test for one sample mean. **(GE Goals 1, 2, 4; MCCC CS A, B, E)**

Course-specific General Education Knowledge Goals and Core Skills.

General Education Knowledge Goals

Goal 1. Communication. Students will communicate effectively in both speech and writing.

Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

MCCC Core Skills

Goal A. Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.

Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.

Units of study in detail.

Unit I   Descriptive Statistics
   Learning Objectives
   The student will be able to…

- Construct a data table identifying the cases, variables, and whether the variable is quantitative or categorical. **(CCG 1)**
- Construct a pie chart and bar chart for categorical data. **(CCG 2)**
- Interpret a contingency table using categorical data. **(CCG 2)**
- Calculate conditional percentages given a contingency table. **(CCG 2)**
- Construct and interpret a histogram, stem-and-leaf display and a dot plot for one quantitative variable using a statistical software package. **(CCG 3)**
- Identify the shape of a distribution. **(CCG 3)**
- Calculate the median, mean, range, quartiles, interquartile range and standard deviation by hand of a quantitative variable. **(CCG 3)**
- Calculate the 5-number summary using a computer software package and determine if the data set has any outliers by calculating the lower and upper fences. **(CCG 3)**
- Construct a side-by-side stem-and-leaf by hand. **(CCG 3)**
- Construct side-by-side boxplots using statistical software. **(CCG 3)**
- Compare data sets using histograms, side-by-side stem-and-leaf and boxplots with respect to shape, outliers, center and spread for each group. **(CCG 3)**

Unit II Regression and Correlations
   Learning Objectives
   The student will be able to…

- Graph a scatterplot between two quantitative variables using statistical software and determine if a linear relationship exists. **(CCG 4)**
- State the assumptions and conditions of a linear correlation. **(CCG 4)**
- Calculate the linear correlation coefficient by hand. **(CCG 4)**
- Check the assumptions and conditions in order to construct a linear regression model. **(CCG 4)**
- Determine the least squares regression equation for a set of data points by hand, interpret the slope of the regression line, and use the regression equation to make predictions. **(CCG 4)**
- Calculate residuals and construct a residual plot of residuals versus predicted values to determine if a linear model is appropriate. **(CCG 4)**

Unit III   Probability Concepts

Learning Objectives
The student will be able to…

- Compute probabilities for experiments having equally likely outcomes. **(CCG 6)**
- State the basic properties of probability. **(CCG 6)**
- Determine if two events are mutually exclusive. **(CCG 6)**
- Apply the complement rule, the addition rule and the multiplication rule for determining probabilities. **(CCG 6)**
- Apply the general addition rule and the general multiplication rule for determining probabilities. **(CCG 6)**
- Calculate conditional probabilities. **(CCG 6)**
- Determine if two events are independent. **(CCG 6)**
- Explain the difference between mutually exclusive events and independent events. **(CCG 6)**

Unit IV   **Binomial and Normal Distributions**

Learning Objectives
The student will be able to…

- Determine the probability distribution of a discrete random variable. **(CCG 7)**
- Find and interpret the mean and standard deviation of a discrete random variable. **(CCG 7)**
- Obtain binomial probabilities and compute the mean and standard deviation of a binomial random variable. **(CCG 7)**
- Identify the basic properties of and sketch a normal curve. **(CCG 7)**
- Calculate and interpret z-scores. **(CCG 7)**
- Determine areas under the standard normal curve and determine the z-scores corresponding to a specified area under the standard normal curve. **(CCG 4)**
- Determine a percentage or probability for a normally distributed variable. **(CCG 7)**
- Determine the observations corresponding to a specified percentage or probability for a normally distributed variable. **(CCG 4)**
- Construct a normal Probability plot to show the appropriateness of the normal model. **(CCG 7)**
- Approximate binomial probabilities by normal-curve areas, when appropriate. **(CCG 7)**

<u>Unit V</u>   **Confidence Intervals and Hypothesis Testing for One Sample Proportion and One Sample Mean.**

Learning Objectives
The student will be able to …

- Define sampling error and explain the need for sampling distributions. **(CCG 8, 9)**
- Simulate the sampling distribution of sample mean given a population distribution. **(CCG 9)**
- Find the mean and standard deviation of the variable, $\bar{x}$, given the mean and standard deviation of the population and the sample size. **(CCG 9)**
- State and apply the central limit theorem. **(CCG 8, 9)**
- Determine the sampling distribution of the sample mean when the variable under consideration is normally distributed and when the sampling size is relatively large. **(CCG 9)**
- Obtain a point estimate for a population mean. **(CCG 9)**
- Find and interpret a confidence interval for a population mean when the population standard deviation is known. **(CCG 9)**
- Compute and interpret the margin of error for the estimate of the population mean, **(CCG 9)**
- Calculate the sample size for a given margin of error and specified confidence interval to estimate the population mean. **(CCG 9)**
- State the basic properties of a t-curve. **(CCG 9)**
- Find and interpret a confidence interval for a population mean when the population standard deviation is unknown. **(CCG 9)**
- Find and interpret a confidence interval for a population proportion. **(CCG 8)**
- Determine the sample size required for a given margin of error and specified confidence level for the estimate of a population proportion. **(CCG 8)**
- Perform a hypothesis test for a population mean when the population standard deviation is known and when the standard deviation is unknown. **(CCG 9)**
- Define and apply the concepts of Type I and Type II errors. **(CCG 8, 9)**
- Perform a hypothesis test for a population proportion. **(CCG 8)**

Evaluation of student learning:

Tests (3)   60%
Projects (3)   20%
Quizzes   20%

  [Describe general guidelines for examinations, required work, course work, assignments, and tests. Explain how assignments evaluate student achievement of course competencies/goals (course-level SLOs). Multiple measures (quizzes, tests, essays, projects, portfolios, practicums, etc.) are recommended.]

Academic Integrity Statement:

Mercer County Community College is committed to Academic Integrity -- the honest, fair and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work, and that faculty and academic support services staff members will take reasonable precautions to prevent the opportunity for academic dishonesty.

Violations

The college recognizes the following general categories of violations of academic integrity, with representative examples of each. Academic integrity is violated whenever a student:

A. **Uses or obtains unauthorized assistance in any academic work.**

- copying from another student's exam
- using notes, books, electronic devices or other aids of any kind during an exam when prohibited.
- stealing an exam or possessing a stolen copy of an exam

B. **Gives fraudulent assistance to another student.**

- completing a graded academic activity or taking an exam for someone else
- giving answers to or sharing answers with another student before, during or after an exam or other graded academic activity.
- sharing answers during an exam by using a system of signals

C. **Knowingly represents the work of others as his/her own, or represents previously completed academic work as current.**

- submitting a paper or other academic work for credit which includes words, ideas, data or creative work of others without acknowledging the source.
- using another author's words without enclosing them in quotation marks, without paraphrasing them or without citing the source appropriately.
- presenting another individual's work as one's own.
- submitting the same paper or academic assignment to another class without the permission of the instructor.

D. **Fabricates data in support of an academic assignment.**

- falsifying bibliographic entries
- submitting any academic assignment which contains falsified or fabricated data or results

E. **Inappropriately or unethically uses technological means to gain academic advantage**

- inappropriately or unethically acquiring material via the Internet or by any other means.
- using any electronic or hidden devices for communication during an exam.

Each instructor and academic support service area is authorized to establish specific guidelines consistent with this policy.

Consequences for Violations of Academic Integrity

For a single violation, the faculty member will determine the course of action to be followed. This may include assigning a lower grade on the assignment, assigning a lower final course grade, failing the

student in the course, or other penalty appropriate to the violation. In all cases, the instructor shall notify the chairperson of the Academic Integrity Committee (AIC) of the violation and the penalty imposed.

When two or more violations of academic integrity are reported on a student, the AIC may impose disciplinary penalties beyond those imposed by course instructors. The student shall have the right to a hearing before the AIC or a designated AIC subcommittee.