# COURSE OUTLINE

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<th>Course Number</th>
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<td>MAT 126</td>
<td>Elementary Statistics II</td>
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**Hours:**
- lecture/Lab/Other
- 3

**Pre-requisite:**
- MAT 125 Elementary Statistics I

**Implementation:**
- sem/year
- Spring 2015

**Catalog description (2014-2015 Catalog):**
This course is designed to follow Elementary Statistics I. Topics covered include: random sampling, experimental and observational studies, fundamentals of probability, confidence intervals and hypothesis testing on two populations and two proportions, F and Chi-Square distributions, analysis of variance, and basic nonparametric tests. Statistical software will be used.

**Is course New, Revised, or Modified?** New

**Required texts/other materials:**
- Statcrunch, SPSS, Minitab

**Revision date:** NA

**Course coordinator:** (Name, telephone number, email address)

Charlene Sharkey, 609-570-3892, sharkeyc@mccc.edu

**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.)

MCCC Course Outline; Approved by the Curriculum Committee 12/6/07
Course Competencies/Goals:

The student will be able to:

I. Analyze a study to determine whether the study is descriptive or inferential and either observational or experimental. (GE Goal 1, MCCC CS A, B)

II. Explain what is meant by a representative sample, determine the sampling procedure in which a sample was taken and take a random sample using different sampling procedures. (GE Goal 1, 2; MCCC CS A, B)

III. Analyze an experimental design study. (GE Goal 1; MCCC CS A, B)

IV. Perform hypothesis tests and construct and interpret confidence intervals for differences between two means and two proportions. (GE Goal 1, 2; MCCC CS A, B, C)

V. Compare means of several populations using the methods of analysis of variance (ANOVA). (GE Goal 1, 2, 4; MCCC CS A, B, C)

VI. Perform a chi-square goodness-of-fit test to make inferences about the distribution of a variable. (GE Goal 1, 2, 4; MCCC CS A, B, C)

VII. Perform a chi-square independence test to decide whether an association exists between two variables of a population, given bivariate data for a sample of the population. (GE Goal 1, 2, 4; MCCC CS A, B, C)

VIII. Perform nonparametric tests when testing the population median or distributions that are non-normal or unknown. (GE Goal 1, 2, 4; MCCC CS A, B, C)

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  Data Collection

Learning Objectives
The student will be able to…

- Explain the difference between an observational study (association) and designed experiment (causation). (CG I)
- Classify a statistical study as either descriptive or inferential study. (CG I)
- Explain what is meant by a representative sample. (CG II)
- Describe simple random sampling, systematic random sampling, cluster sampling and stratified sampling. (CG II)
- Determine the sampling procedure (simple random sampling, systematic random sampling, cluster sampling and stratified sampling) in which a sample was taken. (CG II)
- Take a random sample using different sampling procedures. (CG II)
- State the three basic principles (control, randomization, and replication) of experimental design. (CG III)
- Identify the response variable, experimental units, the factor, levels of the factor, treatments, blocks (if applicable), and randomization of the experimental units to each treatment for an experimental design. (CG III)
- Determine whether an experimental design is a completely randomized design, a randomized block design or a matched pair design. (CG III)

Unit II  Confidence Intervals and Hypothesis Testing for Two Population Means and Two Population Proportions

Learning Objectives
The student will be able to…

- Construct and interpret a confidence interval and perform a hypothesis test based on independent simple random samples to compare the means of two populations when the population standard deviations are unknown, but assumed to be equal; by hand and using a statistical software package. (CG IV)
- Construct and interpret a confidence interval and perform a hypothesis test based on independent simple random samples to compare the means of two populations when the population standard deviations are unknown, but are not assumed to be equal; both by hand and using a statistical software package. (CG IV)
- Construct and interpret a confidence interval and perform a hypothesis test based on a simple random paired sample to compare the means of two populations; by hand and using a statistical software package. (CG IV)
- Perform a hypothesis test based on a simple random paired sample to compare the means of two populations, when the paired-difference variable has a symmetric distribution; by hand and using a statistical software package. (CG IV)
- Decide which procedure should be used to perform a hypothesis test to compare the means of two populations. (CG IV)
- Construct and interpret a confidence interval and perform a hypothesis test based on large and independent samples to compare two population proportions by hand and using a statistical software package. (CG IV)
Unit II  Analysis of Variance (ANOVA)

Learning Objectives
The student will be able to…

- Explain the basic properties of an F-distribution. (CCG V)
- Calculate the F-statistic by hand and using a statistical software package. (CCG V)
- Explain the essential ideas behind a one-way analysis of variance. (CCG V)
- State and check the assumptions for a one-way ANOVA. (CCG V)
- Perform and interpret a one-way ANOVA test using a statistical software package. (CCG V)

Unit IV  Chi Square

Learning Objectives
The student will be able to…

- Use the Chi-Square table. (CCG VI)
- Explain the reasoning behind the chi-square goodness-of-fit test. (CCG VI)
- Preform a chi-square goodness-of-fit test; by hand and using a statistical software package. (CCG VI)
- Decide whether an association exists between two variables of a population, given bivariate data for the entire population, by hand and using a statistical software package. (CCG VII)
- Explain the reasoning behind the chi-square independence test. (CCG VII)
- Perform a chi-square independence test to decide whether an association exists between two variables of a population, given bivariate data for a sample of the population; by hand and using a statistical software package. (CCG VII)

Unit V  Nonparametric Statistics

Learning Objectives
The student will be able to …

- Explain what a nonparametric test is. (CCG VIII)
- Preform the sign test to test a population median by hand and using a statistical software package. (CCG VIII)
- Preform the paired-sample sign test to test the difference between two population medians (dependent samples) by hand and using a statistical software package. (CCG VIII)
- Preform the Wilcoxon signed-rank test and the Wilcoxon rank sum test to test the difference between two population distributions by hand and using a statistical software package. (CCG VIII)
- Preform the Kruskal-Wallis test to determine whether three or more samples were selected from populations having the same distribution by hand and using a statistical software package. (CCG VIII)
• Preform the Spearman rank correlation coefficient to determine whether the correlation between two variables is significant. (CCG VIII)
• Preform the runs test to determine whether a data set is random. (CCG VIII)

**Evaluation of student learning:**

Tests (4) 45%
Projects (3) 45%
Quizzes 10%

[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.