



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences Business

COURSE: MTH1008 General Elementary Statistics

Date: Fall 2019

Credit Hours: 3

Prerequisite(s): 1) MTH0910 Foundations of Algebra with a "C" or better, or the equivalent course: or 2) Another approved placement option.

Delivery Method:

| | |
|---|--|
| <input checked="" type="checkbox"/> Lecture | 3 Contact Hours (1 contact = 1 credit hour) |
| <input type="checkbox"/> Seminar | 0 Contact Hours (1 contact = 1 credit hour) |
| <input type="checkbox"/> Lab | 0 Contact Hours (2-3 contact = 1 credit hour) |
| <input type="checkbox"/> Clinical | 0 Contact Hours (3 contact = 1 credit hour) |
| <input checked="" type="checkbox"/> Online | |
| <input checked="" type="checkbox"/> Blended | |

Offered: Fall Spring Summer

IAI Equivalent –**Only for Transfer Courses**-go to <http://www.itransfer.org>: M1902

CATALOG DESCRIPTION:

The course is intended to provide students with a basic understanding of the role of statistics in society along with a workable knowledge of statistical methods. Topics include: graphical methods of organizing data, numerical descriptions of data, basic probability theory, probability distributions, statistical inference, estimation, hypothesis testing, correlation and regression, and analysis of variance.

GENERAL EDUCATION GOALS ADDRESSED

[See last page for Course Competency/Assessment Methods Matrix.]

Upon completion of the course, the student will be able:

[Choose up to three goals that will be formally assessed in this course.]

- To apply analytical and problem solving skills to personal, social, and professional issues and situations.
- To communicate successfully, both orally and in writing, to a variety of audiences.
- To construct a critical awareness of and appreciate diversity.
- To understand and use technology effectively and to understand its impact on the individual and society.
- To develop interpersonal capacity.
- To recognize what it means to act ethically and responsibly as an individual and as a member of society.
- To recognize what it means to develop and maintain a healthy lifestyle in terms of mind, body, and spirit.
- To connect learning to life.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals. See last page for more information.]

Upon completion of the course, the student will be able to:

1. Students will be able to demonstrate knowledge of the fundamental concepts of statistics.
 - 1.1. Students will be able discuss the questions: “What is statistics?”, “Why study statistics?”, “What do statistics do?”
 - 1.2. Students will be able to identify characteristics common to inferential statistics. (Random sampling, collection of data, making inferences.)
 - 1.3. Students will be able to define population and sample.
 - 1.4. Students will be able to analyze newspaper and journal articles from a statistical perspective.
 - 1.5. Students will be able do a research project using statistical methods.
2. Students will be able to demonstrate knowledge of descriptive methods.
 - 2.1. Students will be construct pie charts, bar graphs, line graphs, histograms, and frequency polygons.
 - 2.2. Students will be able interpret a graph.
 - 2.3. Students will be able to define statistics and parameters.
 - 2.4. Students will be able to define and calculate mean, median, mode, range, percentile, rank, variance and standard deviation.
3. Students will be able to demonstrate knowledge of basic probability theory.
 - 3.1. Students will be able to define sample space, events probability, discrete random variable, continuous random variable, and random sample.
 - 3.2. Students will be able to manipulate with factorial notation.

- 3.3. Students will be able to determine the number of elements in an event by use of the basic counting principle, permutations, or combinations.
 - 3.4. Students will be able to calculate the probability of an event using counting techniques and the definition of probability.
 - 3.5. Students will be able to calculate the probability of event A or B, A and B, and A given B (conditional probability).
4. Students will be able to demonstrate knowledge of probability distributions.
 - 4.1. Students will be able to define and graph given examples of probability distributions.
 - 4.2. Students will be able to determine if an experiment possesses the properties of a binomial experiment.
 - 4.3. Students will be able to calculate the probability of an event given that the distribution is binomial.
 - 4.4. Students will be able to calculate the mean and standard deviation of the binomial probability distribution.
 - 4.5. Students will be able to determine whether a probability distribution is a normal probability distribution,
 - 4.6. Students will be able to use the Central Limit Theorem.
 - 4.7. Students will be able to calculate the mean and standard deviation of the Binomial Random Variable.
 - 4.8. Students will be able to evaluate areas under the normal curve.
5. Students will be able to demonstrate knowledge of statistical inference.
 - 5.1. Students will be able to differentiate between testing hypothesis and estimation.
 - 5.2. Students will be able to list the four elements of a statistical test.
 - 5.3. Students will be able to determine whether a hypothesis is accepted or rejected.
 - 5.4. Students will be able to determine the “goodness” of a decision with the aid of Type I and Type II errors.
 - 5.5. Students will be able to make a statistical test for a binomial proportion.
 - 5.6. Students will be able to make a statistical test on an hypothesis concerning the population mean.
 - 5.7. Students will know how to select the null hypothesis concerning the population mean.
 - 5.8. Students will be able to use the Z statistic.
 - 5.9. Students will be able to differentiate between point estimation and interval estimation.
 - 5.10. Students will be able to differentiate between biased and unbiased estimators.
 - 5.11. Students will be able to calculate the point estimate of a population mean.
 - 5.12. Students will be able to make a point estimation of the binomial parameter p .
 - 5.13. Students will be able to calculate the mean and standard deviation for the probability distribution of p .
 - 5.14. Students will be able to find an interval estimation of the binomial parameter p .

- 5.15. Students will be able to test two populations using the same sign test.
- 5.16. Students will be able to calculate the mean and standard deviation of the probability distribution for the difference between two sample means.
- 5.17. Students will be able to test the equality of two binomial proportions.

- 6. Students will be able to demonstrate knowledge of correlation and regression.
 - 6.1. Students will be able to find a prediction equation using the method of least squares.
 - 6.2. Students will be able to calculate the coefficient of linear correlation.

- 7. Students will be able to demonstrate knowledge of analysis of variance.
 - 7.1. Students will be able to use the F-test for comparing two population variances.
 - 7.2. Students will be able to test a hypothesis concerning more than two population means.

MAPPING LEARNING OUTCOMES TO GENERAL EDUCATION GOALS

[For each of the goals selected above, indicate which outcomes align with the goal.]

| Goals | Outcomes |
|---|--|
| First Goal | |
| To apply analytical and problem solving skills to personal, social, and professional issues and situations. | 1. Students will be able to demonstrate knowledge of the fundamental concepts of statistics. 2. Students will be able to demonstrate knowledge of descriptive methods. 3. Students will be able to demonstrate knowledge of basic probability theory 4. Students will be able to demonstrate knowledge of probability distributions 5. Students will be able to demonstrate knowledge of statistical inference. 6. Students will be able to demonstrate knowledge of correlation and regression |

COURSE TOPICS AND CONTENT REQUIREMENTS:

- I. Introduction
 - A. What is statistics
 - 1. Sampling
 - 2. Collecting data
 - 3. Analysis of data
 - 4. Making inferences
 - B. Examples of statistics

- II. Descriptive Methods
 - A. Graphical Methods of Organizing Data
 - 1. Circle or pie graphs
 - 2. Line and bar graphs

- 3. Frequency histogram and polygon
 - B. Numerical Descriptions of Data
 - 1. Measures of location - Mean, Median, Mode, Quartiles, Percentiles
 - 2. Measures of dispersion - Range, Variance, Standard deviation and standard scores
- III. Basic Probability Theory
- A. Basic definitions
 - 1. Sample space
 - 2. Events
 - 3. Probability
 - B. Counting Techniques
 - 1. Basic counting principal
 - 2. Factorials
 - 3. Permutations
 - C. Combinations Rules of Probability
- IV. Probability Distributions
- A. Normal Distribution and Normal Curve
 - B. Binomial Distribution
 - C. The Normal Approximation to the Binomial Distribution
 - D. Random Sampling
- V. Statistical Inference
- A. Estimation by confidence intervals
 - B. Testing statistical hypotheses
 - C. Errors
 - D. Comparisons
- VI. Correlation and Regression
- A. Coefficient of Correlation
 - B. Regression Line
 - C. Other Regressions
- VII. The analysis of variance
- A. Introductory examples
 - B. Total variation formula
 - C. Testing for differences among several means (the F-test)

INSTRUCTIONAL METHODS:

- 1. A lecture on new material
- 2. Example problems discussed in class
- 3. Students assigned homework
- 4. Homework problems discussed in class
- 5. Students assigned homework to be completed on the computer

INSTRUCTIONAL MATERIALS:

Text – Statistics Informed Decisions Using Data, Sullivan, 5th edition 2017
My Math Lab website
Technology guide
Computerized testing
Internet access for research
Graphing calculator for demonstrations
Microsoft EXCEL for assigned exercises

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

A= 90-100

B= 80-89

C= 70-79

D= 60-69

F= 0-59

1. Hand in assignment
2. On-line assignments
3. Class participation
4. Tests
5. Final Exam

OTHER REFERENCES

Course Competency/Assessment Methods Matrix

| (Dept/# Course Name) | Assessment Options | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------------|----------------|--------------|----------------|----------|--------------------|----------------|---------|---------------|------------------------------------|-------------------|---------------------------------|---------------------------|----------------------|-------------|-----------------|----------------------|---------------------|---------------------|-----------------------------------|----------------------|-------------------------------|---------------------------|------------------|------------------|--|----------------|-------------------|------------|-----------|----------------|------------|
| <p>For each competency/outcome place an "X" below the method of assessment to be used.</p> | Assessment of Student Learning | Article Review | Case Studies | Group Projects | Lab Work | Oral Presentations | Pre-Post Tests | Quizzes | Written Exams | Artifact Self Reflection of Growth | Capstone Projects | Comprehensive Written Exit Exam | Course Embedded Questions | Multi-Media Projects | Observation | Writing Samples | Portfolio Evaluation | Real World Projects | Reflective Journals | Applied Application (skills) Test | Oral Exit Interviews | Accreditation Reviews/Reports | Advisory Council Feedback | Employer Surveys | Graduate Surveys | Internship/Practicum /Site Supervisor Evaluation | Licensing Exam | In Class Feedback | Simulation | Interview | Written Report | Assignment |
| <p>Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.</p> | Direct/ Indirect | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | I | I | I | I | D | D | | | | | | |
| <p>Students will be able to demonstrate knowledge of the fundamental concepts of statistics.</p> | | | | X | X | | | X | X | | | X | X | | X | | | | | | | | | | | | | X | | | | X |
| <p>Students will be able to demonstrate knowledge of descriptive methods.</p> | | | X | X | | | X | X | | | | X | X | | X | | | | | | | | | | | | | X | | | | X |
| <p>Students will be able to demonstrate knowledge of basic probability theory.</p> | | | | X | | | X | X | | | | X | X | | X | | | | | | | | | | | | X | | | | | X |
| <p>Students will be able to demonstrate knowledge of probability distributions.</p> | | | X | X | | | X | X | | | | X | X | | X | | | | | | | | | | | | X | | | | | X |

