



BROWARD COMMUNITY COLLEGE COURSE OUTLINE

LAST REVIEW: 2006-2007
(i.e. 2003-2004)

NEXT REVIEW: 2011-2012
(i.e. 2008-2009)

STATUS: A
(A, I, D)

COURSE TITLE: Statistics

COMMON COURSE NUMBER: STA 2023

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN
(per 16 week term)

CLOCK HOURS:
(Voc. Course ONLY)

Lecture: **48** Lab:
Clinic: Other: **3**

PREREQUISITE(S): MAT 1033

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**



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8. Estimation of Parameters
9. Linear Correlation and Regression

I. Course Overview:

Upon successful completion of this course, the students should be able to explain the techniques of descriptive statistics; the utilization of the Central Limit Theorem; the relation of probability theory to statistics; the conduct of hypotheses tests; and the use of correlation and regression as they are related to prediction.



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EVALUATION:

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.

Students may be assessed through a variety of methods at the discretion of the instructor. The assimilation of course outcomes may be measured through in-class written tests, take-home tests, individual or group written projects, oral presentations, graded homework, participation grades and technology based assignments.

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

GENERAL EDUCATION Competencies and Skills*:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	
2. Speak and listen effectively	
3. Write clearly and coherently	Expected throughout course.
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	1.1 – 1.6, 2.1 -2.10, 3.1 -3.7, 4.1 – 4.8, 5.1 – 5.7, 6.1 -6.10, 7.1 - 7.12, 8.1 – 8.6, 9.1 – 9.5
5. Demonstrate and apply literacy in its various forms: (highlight in green ALL that apply) (1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental)	1.1 – 1.6, 2.1 -2.10, 3.1 -3.7, 4.1 – 4.8, 5.1 – 5.7, 6.1 -6.10, 7.1 - 7.12, 8.1 – 8.6, 9.1 – 9.5
6. Apply problem solving techniques to real-world experiences	1.1 – 1.6, 2.1 -2.10, 3.1 -3.7, 4.1 – 4.8, 5.2, 5.3, 5.4, 5.6, 5.7, 6.1 -6.10, 7.1 - 7.12, 8.1 – 8.6, 9.1 – 9.5
7. Apply methods of scientific inquiry	6.8, 6.9, 7.1, 7.2, 7.3, 7.5, 7.6, 7.9, 8.3, 8.5, 9.2, 9.3, 9.4, 9.5
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

* General Education Competencies and Skills endorsed by '05-'06 General Education Task Force



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II. UNITS

Unit 1 **Frequency Table and Graphs**

General Outcome:

- 1.0 The students should 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.



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Unit 2 Descriptive Measures

General Outcome:

- 2.0 The students should 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* Construct 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 grouped data.
- 2.7 Determine the inter-relationships between the mean, median, and mode for skewed and symmetrical distributions.
- 2.8 Calculate and interpret z-scores for a normal distribution.

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



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Unit 3 Probability

General Outcome:

- 3.0 The students should 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 Compute probabilities using the law of complementation.
- 3.4 Compute probabilities using the laws of addition.
- 3.5 Compute probabilities using the laws of multiplication.
- 3.6 Compute conditional probabilities.
- 3.7* Calculate the odds associated with given probabilities.

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



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Unit 4 Discrete Probability Distributions

General Outcome:

- 4.0 The students should 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 Given a distribution, decide whether it satisfies the requirements of a probability distribution.
- 4.3 Calculate the mean (expected value) and standard deviation for a given random variable.
- 4.4 Solve problems involving the expected value.
- 4.5 Decide whether a given distribution is binomial.
- 4.6 Calculate the binomial probability using the table or technology.
- 4.7 Calculate the binomial probability using the binomial formula.
- 4.8 Calculate the mean and standard deviation of a binomial distribution.



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Unit 5 Normal Distribution and Central Limit Theorem

General Outcome:

- 5.0 The students should 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 Use the standard and nonstandard normal distributions to determine probabilities.
- 5.3 Determine 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 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 Use the Central Limit Theorem to determine probabilities for distributions of sample means.

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



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Unit 6 Hypothesis Testing Concepts

General Outcome:

- 6.0 The students should be able to demonstrate an understanding of the concepts and structure of hypothesis testing 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 Determine 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 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 Translate the hypothesis test conclusion into a meaningful holistic answer to the original problem situation.



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Unit 7 Hypothesis Testing Applications

General Outcome:

7.0 The students should 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 students should be able use the traditional method to perform a hypothesis test by stating null and alternative hypotheses for a test, delineating the critical region for rejection of the null hypothesis, computing the appropriate test statistic, formulating the proper conclusion, and applying this structure to the tests of hypotheses regarding:

- 7.1 The mean of a population by using a z statistic.
- 7.2 The mean of a population by using a t statistic.
- 7.3 The difference of two means when given two independent samples.
- 7.4 The differences between means using paired samples.
- 7.5 A proportion using one large sample.
- 7.6 The Chi-square test for independence of two variables.
- 7.7* The use of a computer (via a statistical package) to perform any of the aforementioned hypothesis tests.

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



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Unit 8 Estimation of Parameters

General Outcome:

- 8.0 The students should 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 Determine point estimates for the population mean and population proportion.
- 8.2* Determine a point estimate for the population variance.
- 8.3 Construct confidence intervals for the population mean and population proportion.
- 8.4* Determine confidence intervals for the population variance.
- 8.5 Determine the sample sizes necessary to estimate population means and population proportions within a given error.
- 8.6* Construct confidence intervals for the difference between means and difference between proportions.

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



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Unit 9 Linear Correlation and Regression

General Outcome:

- 9.0 The students should 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 "r," the sample linear correlation coefficient.
- 9.2 Construct and interpret scatter diagrams.
- 9.3 Conduct a test to determine if there is a significant linear correlation between two variables.
- 9.4 Find the equation of the regression line.
- 9.5 Make predictions, when appropriate, based on the equation of the regression line or \bar{y} .