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**LAKELAND COMMUNITY COLLEGE - COURSE OUTLINE FORM\***

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Course ID changed to "MATH 1331" effective spring 2024

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<b>ORIGINATION DATE:</b>	10/12/21	<b>APPROVAL DATE:</b>	5/1/23
<b>LAST MODIFICATION DATE:</b>	5/10/23	<b>EFFECTIVE TERM/YEAR:</b>	SPRING/ 24

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**PRINTED:** 10/3/2023

**COURSE ID:** MATH1331  
**COURSE TITLE:** Statistics for the Health Sciences (B)

	<b>LECTURE</b>	<b>LAB</b>	<b>CLINICAL</b>	<b>TOTAL</b>	<b>OBR MIN</b>	<b>OBR MAX</b>
<b>CREDITS:</b>	4.00	0.00	0.00	4.00	3.00	3.00
<b>CONTACT HOURS:</b>	4.00	0.00	0.00	4.00		

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**PREREQUISITE:**

A grade of "SC" or better in MATH 0745 or placement test

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**COURSE DESCRIPTION:**

This course introduces the fundamental topics in statistics as they relate to the health science field. Topics include experimental design, graphical and numerical descriptive statistics, fundamentals of probability, the binomial and normal distributions, sensitivity analysis, hypothesis testing, analysis of variance, regression analysis, chi-square analysis, and nonparametric tests. Fulfilling all requirements of an introductory statistics course for the health sciences, this course provides additional time designed to address the needs of students who will benefit from additional instruction with fundamental mathematics skills. Because of duplication in course content, students with credit for Math 1330 Statistics for the Health Sciences or its equivalent should not take this course.

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**RATIONALE FOR COURSE:**

For students who will benefit from additional instruction with fundamental mathematics skills, this course introduces elementary topics in statistics for the health sciences. This course is designed for health science students who seek a college-level mathematics course.

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**GENERAL COURSE GOALS:**

**The course will**

1. Develop students' ability to gather data and represent the data using graphical and numerical descriptive techniques.
2. Develop students' ability to summarize, analyze and interpret data.
3. Introduce, develop and apply probability techniques and show how those techniques are used in real life applications.
4. Develop students' ability to use statistical methods to test hypotheses.
5. Utilize appropriate technology to determine solutions to real life statistical applications.
6. Strengthen students' abilities to apply statistical concepts to determine the reasonableness of results.

7. Use nonparametric tests to access hypotheses of nominal and ordinal level data.

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**COURSE OBJECTIVES:**

**Upon completion of the course, the student should be able to**

1. Differentiate between a population and a sample.
2. Differentiate between a statistic and a parameter.
3. Distinguish between an observational study and an experiment.
4. Compare various sampling techniques, including simple random sample, systematic, cluster, and stratified.
5. Identify discrete and continuous data.
6. Identify categorical and quantitative data.
7. Classify data according to its level of measurement.
8. Construct a frequency distribution from a set of data.
9. Construct graphs including histograms, frequency polygons, scatterplots, bar graphs, and boxplots.
10. Identify the skewness and modality of a frequency distribution.
11. Compute the mean, median, and mode for a set of data.
12. Determine which measure of central tendency is most appropriate for a set of data.
13. Compute the range, variance, and ~~the~~ standard deviation for a set of data.
14. Use the Empirical Rule to interpret standard deviation.
15. Convert a percentile to a data value and find the corresponding percentile of a data value.
16. Use the Fundamental Rules to compute probabilities of compound events, independent events, dependent events, and disjoint events.
17. Compute and interpret conditional probability, including tests for sensitivity and specificity.
18. Interpret contingency tables.
19. Solve applications involving the binomial distribution.
20. Solve applications involving the normal distribution.
21. Generate sampling distributions to observe empirically the Central Limit Theorem.
22. Solve applications involving the Central Limit Theorem.
23. Compute confidence intervals for a mean and for a proportion.
24. Determine the minimum sample size for a given confidence level and margin of error.
25. Conduct a hypothesis test for a proportion.

26. Conduct a hypothesis test for a mean.
27. Conduct a hypothesis test for a proportion for two independent samples.
28. Conduct a hypothesis test for the mean for two independent samples.
29. Conduct a hypothesis test for the mean for two dependent samples.
30. Perform One-Way Analysis of Variance for sets of data.
31. Compute and interpret the correlation coefficient for a set of paired data.
32. Determine the linear regression model for a set of paired data and use the model to compute estimates.
33. Determine a logistic regression model for a set of paired data. (As time permits)
34. Compute a Chi-Square Test of independence for a contingency table.
35. Compute the Fisher's Exact Test for a 2 by 2 table of data.
36. Test the hypothesis that three or more independent samples come from populations with the same median using the Kruskal-Wallis Test.
37. Compute and interpret McNemar's Test for matched pairs.
38. Compare two independent samples using the Wilcoxon Rank-Sum Test.
39. Compare two dependent samples using the Wilcoxon Signed-Ranks Test.
40. Compute and interpret odds ratios, relative risk, and absolute risk reduction.
41. Interpret statistical results presented in news stories and journal articles.

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**COURSE OUTLINE:**

- I. Review of the Fundamentals of Statistics (Developmental Topics)
  - A. Performing Operations with Numbers
    1. Fractions, decimals, and percentages
    2. Exponents
    3. Order of operations and evaluating numerical expressions
    4. Scientific notation
    5. Square roots
  - B. Algebraic Expressions
    1. Translating English into Algebra
    2. Simplifying algebraic expressions
  - C. Problem Solving Strategies
    1. Organizing given information
    2. Management of Multi-step Problems
  - D. Graphing Linear Equations in Two Variables
    1. Properties of rectangular coordinate system
    2. Graphing linear equations
    3. Computing slope and average rate of change
    4. Equations of lines
  - E. Inequalities
    1. Basic Linear Inequalities
    2. Compound Inequalities
  - F. Functions
    1. Introduction to functions
- II. Data and Experimental Design

- A. Types of data
- B. Statistics and parameters
- C. Levels of data

III. Graphical Descriptive Statistics

- A. Frequency distributions
- B. Graphs
  - 1. histogram
  - 2. bar chart
  - 3. frequency polygon
  - 3. time sequence graph
  - 4. scatterplot
  - 5. boxplot
- C. Characteristics of frequency distributions
  - 1. skewness
  - 2. modality

IV. Numerical Descriptive Statistics

- A. Measures of central tendency and their properties
- B. Measures of variation and their properties
- C. Applications of numerical descriptive statistics
  - 1. The Empirical Rule
  - 2. skewness coefficient
  - 3. Percentiles

V. Introduction to Probability

- A. Fundamental rules of probability
- B. Contingency tables
- C. Binomial distribution
- D. Normal distribution
  - 1. The Central Limit Theorem

VI. Introduction to Inferential Statistics

- A. Confidence intervals
  - 1. confidence interval for a population proportion
  - 2. confidence interval for a population mean
- B. Sample size determination

VII. Fundamentals of Hypothesis Testing

- A. Writing hypotheses
- B. Test type and level of significance
- C. Critical values
- D. Type I and type II errors
- E. Sample tests of the mean and proportion

VIII. Hypothesis Testing

- A. Test for a proportion
- B. Test for a mean.
- C. Test for the difference of two proportions
- D. Test for the difference of two means from independent samples
- E. Test for the mean of the differences from two dependent samples

IX. Analysis of Variance

- A. One-Way ANOVA

X. Modeling Data

- A. Correlation coefficient and linear significance
- B. Linear regression and estimation
- C. Logistic regression (As time permits)

XI. Chi-Square Analysis

- A. Chi-Square Test for independence
- B. Fisher's Exact Test

- XII. Contingency Tables
  - A. Odds ratio and relative risk
  - B. Sensitivity and specificity test

- XIII. Nonparametric Tests
  - A. Kruskal-Wallis Test
  - B. McNemar's Test
  - C. Wilcoxon Rank-Sum Test
  - D. Wilcoxon Signed-Ranks Test

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**INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:**

Lecture and discussion  
Videos  
Internet activities  
Computer-based activities  
Group or individual activities  
Research projects

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**GRADING PROCEDURES:**

It is recommended that the instructors have at least five evaluative items on which to determine the student's course grade. In general, tests are given covering lecture and homework assignments.

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**COURSE EVALUATION PROCEDURES:**

Student Evaluations  
Department Review

**LAKELAND STUDENT LEARNING OUTCOMES**

<b>LEARNS ACTIVELY</b>	<b>I</b>	<b>R</b>	<b>D</b>
1. Takes responsibility for his/her own learning.			D
2. Uses effective learning strategies.			D
3. Reflects on effectiveness of his/her own learning strategies.			D
<b>THINKS CRITICALLY</b>	<b>I</b>	<b>R</b>	<b>D</b>
4. Identifies an issue or idea.			D
5. Explores perspectives relevant to an issue or idea.			
6a. Identifies options or positions.			D
6b. Critiques options or positions.			D
7. Selects an option or position.			D
8a. Implements a selected option or position.			D
8b. Reflects on a selected option or position.			D
<b>COMMUNICATES CLEARLY</b>	<b>I</b>	<b>R</b>	<b>D</b>
9a. Uses correct spoken English.			
9b. Uses correct written English.			
10. Conveys a clear purpose.			D
11. Presents ideas logically.			D
12a. Comprehends the appropriate form(s) of expression.			D
12b. Uses the appropriate form(s) of expression.			D
13. Engages in an exchange of ideas.			
<b>USES INFORMATION EFFECTIVELY</b>	<b>I</b>	<b>R</b>	<b>D</b>
14. Develops an effective search strategy.			
15a. Uses technology to access information.			D
15b. Uses technology to manage information.			D
16. Uses selection criteria to choose appropriate information.			
17. Uses information responsibly.			
<b>INTERACTS IN DIVERSE ENVIRONMENTS</b>	<b>I</b>	<b>R</b>	<b>D</b>
18a. Demonstrates knowledge of diverse ideas.			
18b. Demonstrates knowledge of diverse values.			
19. Describes ways in which issues are embedded in relevant contexts.			
20a. Collaborates with others.			
20b. Collaborates with others in a variety of situations.			
21. Acts with respect for others.			

**Definitions:**

**Introduces (I)**

Students first learn about key ideas, concepts, or skills related to the performance indicator. This usually happens at a general or very basic level, such as learning one idea or concept related to the broader outcome.

**Reinforces (R)**

Students are given the opportunity to synthesize key ideas of skills related to the performance indicator at increasingly proficient levels.

**Demonstrates (D)**

Students should demonstrate mastery of the performance indicator with the level of independence expected of a student attaining an associate's degree.