LAKELAND COMMUNITY COLLEGE – COURSE OUTLINE FORM*

Course ID changed to "MATH 1551" effective spring 2024

ORIGINATION DATE:	10/12/21	**APPROVAL DATE:**	5/1/24
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COURSE ID: **MATH1551**
COURSE TITLE: Statistics (B)

	LECTURE	**LAB**	**CLINICAL**	**TOTAL**	**OBR MIN**	**OBR MAX**
CREDITS:	5.00	0.00	0.00	5.00	4.00	4.00
CONTACT HOURS:	5.00	0.00	0.00	5.00		

PREREQUISITE:

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

COURSE DESCRIPTION:

This course covers introductory topics in statistics, including statistical methods used to gather, analyze, and present data; fundamentals of probability and probability distributions; inferential statistics through estimation and hypothesis testing; correlation and regression; tests for independence; and analysis of variance. Fulfilling all requirements of an introductory statistics course, 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 1550 Statistics or its equivalent should not take this course.

RATIONALE FOR COURSE:

For students who will benefit from additional instruction with fundamental mathematics skills, this course introduces elementary topics in statistics. It is required for many baccalaureate programs in business, management, biology, psychology, political science, education, health sciences, and agriculture.

OUTCOMES:
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 demonstrate how these techniques are used in real-life applications.

4. Develop students' ability to form a hypothesis and use statistical methods to test that hypothesis.

5. Develop students' ability to apply the Central Limit Theorem to real-life applications.

6. Further develop the use of technology as a tool for determining solutions to real-life applications.

7. Strengthen students' abilities to critically apply statistical concepts to solve problems and to determine the reasonableness of results.

PERFORMANCE INDICATORS:
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, convenience, and stratified.

5. Identify discrete and continuous data.

6. Identify categorical and quantitative data.

7. Classify data according to its level of measurement.

8. Describe the fundamental types of experimental design, including completely randomized design, randomized block design, and matched pairs design.

9. Construct a frequency distribution, given a set of data.

10. Construct graphs including histograms, dot plots, frequency polygons,time-sequence graphs, boxplots, stemplots, and scatterplots.

11. Compute the measures of centrality and identify their properties.

12. Compute the measures of dispersion and identify their properties and applications.

13. Use the Empirical Rule to interpret standard deviation.

14. Convert a percentile to a data value and find the corresponding percentile of a data value.

15. Solve application problems involving combinatorics.

16. Distinguish between independent and dependent events.

17. Compute probabilities using the Fundamental Rules, including the Addition Rule, the Multiplication Rule, and the Rule of Complementary Events.

18. Compute conditional probability.

19. Distinguish between discrete and continuous random variables.

20. Compute probabilities using discrete probability distribution models including the binomial and Poisson.

21. Identify properties and compute probabilities using the normal distribution.

22. Use the Central Limit Theorem to solve sampling distribution applications.

23. Generate sampling distributions to observe empirically the Central Limit Theorem.

24. Compute confidence intervals of the mean given large and small samples.

25. Compute confidence interval for a proportion.

26. Determine the minimum sample size for a given confidence level and margin of error.

27. Compute confidence interval for a standard deviation.

28. Conduct a hypothesis test on the mean.

29. Conduct a hypothesis test for a proportion.

30. Conduct a hypothesis test for a proportion for two independent samples.

31. Conduct a hypothesis test for the mean for two independent samples.

32. Conduct a hypothesis test for the mean for two dependent samples.

33. Perform Chi-square tests for Goodness of Fit and Independence.

34. Compute and interpret the correlation coefficient for a set of paired data.

35. Determine the linear regression model for a set of paired data and use the model to compute estimates.

36. Compute and utilize the multiple linear regression equation using matched data from three or more variables.

37. Use Analysis of Variance to practice writing hypotheses and interpreting results.

38. Interpret statistical results presented in news stories and journal articles.

COURSE OUTLINE:

Sample:
This outline does not imply an order of instruction or priority, and instructors may employ a variety of approaches to achieve the goals and objectives, but the following should be included in all courses:

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. Levels of data
    B. Types of Data
    C. Types of sampling techniques

III. Describing data
    A. Frequency distributions
    B. Graphical descriptions of data
        1. Histogram
        2. Frequency Polygon
        3. Boxplot
        4. Time sequence graph
    C. Numerical descriptions of data
        1. Measures of centrality
        2. Measures of dispersion
        3. Measures of position

IV. Probability
    A. Fundamental rules and sample spaces
    B. Addition and multiplication rules
    C. Conditional probability
    D. Counting techniques

V. Probability Distributions
    A. Discrete distributions
        1. Properties and computation of mean and standard deviation
        2. Binomial Distribution
        3. Poisson Distribution
    B. Continuous Models
    C. Central Limit Theorem and sampling distributions

VI. Estimation
    A. Confidence intervals of large samples (n>30)
    B. Confidence intervals of small samples via the student's t-distribution
    C. Sample size determination
    D. Confidence interval for standard deviation
    E. Confidence interval for proportion

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

VIII. Hypothesis Testing
    A. Hypothesis test for a proportion
    B. Completing a hypothesis test of the mean with large samples
    C. Hypothesis tests of two means
        1. Independent samples
        2. Dependent samples
    D. Hypothesis tests of two proportions

IX. Regression and Correlation
    A. Constructing scatterplots
    B. Computing and interpreting the correlation coefficient
    C. Testing the significance of the correlation coefficient
    D. Computing the least squares regression on a set of data
    E. Computing estimates and residuals
    F. Computing and utilizing the multiple linear regression equation

X. Chi-square Analysis
    A. Goodness of Fit
    B. Tests for Independence

XI. Analysis of Variance
    A. One-Way ANOVA

INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

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

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.

COURSE EVALUATION PROCEDURES:

Student Evaluations
Department Review

See pages 17-19 of Curriculum Procedures & Guidelines for definitions of course outline terms.

LAKELAND STUDENT LEARNING OUTCOMES

		I	R	D
	LEARNS ACTIVELY			
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
	THINKS CRITICALLY	**I**	**R**	**D**
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
	COMMUNICATES CLEARLY	**I**	**R**	**D**
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.			
	USES INFORMATION EFFECTIVELY	**I**	**R**	**D**
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.			
	INTERACTS IN DIVERSE ENVIRONMENTS	**I**	**R**	**D**
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.