ORIGINATION DATE:	10/31/01	**APPROVAL DATE:**	2/27/23
LAST MODIFICATION DATE:	04/14/21	**EFFECTIVE TERM/YEAR:**	FALL/ 23

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COURSE ID: **MATH1890**

COURSE TITLE: Finite Mathematics

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

PREREQUISITE:

MATH1650 OR PERMISSION OF INSTRUCTOR

COURSE DESCRIPTION:

This course explores finite mathematics as applied to business, social sciences, and life sciences. Topics include linear systems of equations, Gauss-Jordan, matrices, matrix algebra, Leontief Input-Output analysis, linear programming, simplex method, mathematics of finance, probability, statistics, random variables, binomial and normal distributions, Markov chains, and game theory. Students must supply a graphing calculator.

RATIONALE FOR COURSE:

Finite mathematics and its concepts are an important tool for applications in business, social and biological sciences, and operations research. This course is required in many baccalaureate business, accounting, and economics programs.

OUTCOMES:
The course will

1.   Further develop students' ability to use the language of mathematics correctly in speaking and writing.

2.   Introduce, develop, and apply finite mathematics techniques and demonstrate their utility towards solving real-life problems.

3.   Further develop the use of technology (graphing calculator and computer) as a tool for determining solutions to real-life problems.

4.   Further develop students' abilities to solve real-life problems utilizing finite mathematics and to analyze and solve these problems analytically and graphically.

5.   Engage students in the exploration of the central ideas of finite mathematics through laboratory experiments, individually, and/or in groups.

6.   Further strengthen students' ability to critically apply mathematical thinking to solve problems and to determine reasonableness of results.

PERFORMANCE INDICATORS:
Upon completion of the course, the student should be able to

1. Apply the linear systems of equations concept to real-world problems.

2. Utilize matrices to represent real-world data.

3. Apply matrix algebra to solve real-world applications.

4. Utilize matrix inverses to solve linear systems of equations.

5. Utilize matrices in Leontief Input-Output analysis.

6. Set up the mathematical model for a linear programming problem.

7. Solve linear programming problems graphically.

8. Solve linear programming problems using the simplex method.

9. Utilize duality to solve linear programming problems.

10. Compute simple and compound interest.

11. Compute present value and future value of an annuity.

12. Compute outstanding balance on an amortized loan.

13. Differentiate between permutations and combinations.

14. Utilize counting techniques in probability theory.

15. Determine probabilities for events and complements of events.

16. Compute conditional probabilities.

17. Compute probabilities for dependent and independent events.

18. Interpret statistical graphs including the histogram, bar graph, pie graph, and o-give.

19. Compute mean, median, mode, midrange, range, and standard deviation for a set of data.

20. Utilize random variables in probability experiments and the construction of probability histograms.

21. Recognize a binomial experiment.

22. Compute a probability for a binomial distribution.

23. Compute a probability for a normal distribution.

24. Compute expected value and standard deviation for binomial and normal distribution.

25. Interpret transition diagram in a Markov process.

26. Determine a steady state vector.

27. Recognize a two-person zero-sum game.

28. Determine optimal strategy for a two-person zero-sum game.

29. Develop analytic as well as graphic and numeric techniques using technology for solving problems.

30. Apply appropriate technology to solve mathematical problems and judge the reasonableness of the results.

COURSE OUTLINE:

I.   Systems of Linear Equations
    A.   Linear Functions
        1.   Domain and range
        2.   Graphs
    B.   Solving Systems of Linear Equations
        1.   Solving systems graphically
        2.   Solving systems algebraically

II. Matrices
    A.   Matrix Algebra
        1.   Addition
        2.   Subtraction
        3.   Scalar multiplication
        4.   Matrix multiplication
    B.   Gauss-Jordan
        1.   Augmented matrices
        2.   Row-reduced echelon form
    C.   Matrix Inverses
        1.   Identity matrix
        2.   Systems of linear equations
    D.   Leontief Input-Output Models

III. Linear Programming
    A.   Mathematical Model
        1.   Objective function
        2.   Constraints
    B.   Systems of Linear Inequalities
        1.   Graphs
        2.   Corner point theorem
    C.   Simplex Method
        1.   Initial simplex tableau
            a.   Slack variables
            b.   Surplus variables
        2.   Pivot elements
            a.   Pivot row
            b.   Pivot column
        3.   Standard Maximum Form Problems
        4.   Standard Minimum Form Problems
            a.   Duality
            b.   Matrix transpose
        5.   Nonstandard Problems
            a.   Two-phase method

IV. Mathematics of Finance
    A.   Interest
        1.   Simple
        2.   Compound
    B.   Annuities
        1.   Present value
        2.   Future value

V.   Probability
    A.   Sets
        1.   Notation
        2.   Elements
        3.   Cardinality
    B.   Set Operations
        1.   Union

2.   Intersection
        3.   Complement
    C.   Counting Techniques
        1.   Multiplication principle
        2.   Permutations
        3.   Combinations
    D.   Events
        1.   Independent
        2.   Dependent
    E.   Computing Probabilities
        1.   Probability of an event
        2.   Probability of independent events
        3.   Probability of dependent events
        4.   Addition rule
        5.   Multiplication rule
        6.   Bayes' Theorem
    F.   Distributions
        1.   Random variables
            a.   Discrete
            b.   Continuous
        2.   Probability histograms
        3.   Binomial distribution
            a.   Binomial experiment
            b.   Expected Value
            c.   Standard deviation
        4.   Normal distribution
            a.   Normal (bell) curve
            b.   Standard normal curve
            c.   Z-score
            d.   Expected value
            e.   Standard deviation

VI.   Statistics
    A.   Data
        1.   Qualitative
            a.   Graphs
        2.   Quantitative
            a.   Graphs
        3.   Measures of centrality
            a.   Mean
            b.   Median
            c.   Mode
        4.   Measures of dispersion
            a.   Midrange
            b.   Range
            c.   Standard deviation

VII.   Markov Chains
    A.   Transition Diagrams
        1.   States
            a.   Transient
            b.   Absorbing
    B.   Matrices
        1.   Transition
        2.   Limiting
        3.   Regular transition
        4.   Fundamental
    C.   Vectors
        1.   Initial state
        2.   Kth state
        3.   Steady state
    D.   Markov Chains
        1.   Regular

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                    2.    Absorbing

VIII. Games
      A.    Two-person zero-sum
      B.    Matrices
            1.    Payoff
            2.    Row
            3.    Column
      C.    Strategy
            1.    Optimal
            2.    Saddle point
            3.    Value of a game
            4.    Mixed
      D.    Solutions
            1.    Strictly determined games
            2.    Non-strictly determined games
            3.    Linear programming
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INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

Lecture/discussion
Computer/graphing calculator based activities
Group and/or individual activities
Research projects utilizing real data gathered from the Internet or other sources

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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.

COURSE EVALUATION PROCEDURES:

Student course evaluations
Department review

LEARNS ACTIVELY

	I	R	D
1. Takes responsibility for his/her own learning.			D
2. Uses effective learning strategies.			
3. Reflects on effectiveness of his/her own learning strategies.			

THINKS CRITICALLY

	I	R	D
4. Identifies an issue or idea.			
5. Explores perspectives relevant to an issue or idea.			
6a. Identifies options or positions.			
6b. Critiques options or positions.			
7. Selects an option or position.			D
8a. Implements a selected option or position.			
8b. Reflects on a selected option or position.			

COMMUNICATES CLEARLY

	I	R	D
9a. Uses correct spoken English.			
9b. Uses correct written English.			
10. Conveys a clear purpose.			
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.			
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.