MAT 121 FINITE MATHEMATICS WITH CALCULUS MASTER SYLLABUS

CATALOG DESCRIPTION
MAT 121 Finite Mathematics with Calculus (4) Concepts, techniques and applications of systems of linear equations, probability, data and distributions, function concepts and graphs, limits, differentiation, optimization, and applications related to business. *Prerequisite:* MAT 108 or MAT 110 with a grade of C or better.

LEARNING OUTCOMES Upon completion of the course, students will be able to:
1. Express an understanding of linear functions and systems of linear equations. Use related skills in applications.
2. Use basic set theory and operations and apply to probability, including the calculation of expected values.
3. Use Bayes' Theorem to solve conditional probability problems.
4. Identify data types and data distributions, and perform calculations or use tables appropriately, including the 68-95-99.7 rule or z-tables.
5. Express an understanding of the basic notions of functions, including graphs, domain/range and properties of functions such as polynomial, rational, absolute value, power, square root, exponential, and logarithmic.
6. Express an understanding of the basic notions and properties of limits.
7. Express an understanding of and use the concept of the derivative. Be able to interpret the derivative graphically and as a rate of change.
8. Calculate exact and approximate limits and derivatives from formulas, tables and graphs.
9. Analyze functions and combinations of functions graphically and analytically using calculus.
10. Solve optimization problems and express an understanding of their application to maximizing profit, minimizing cost or time, and optimizing the use of resources.
11. Apply the derivative to analyze elementary models of market behavior and other applied situations using function models; construct appropriate function models to permit such an analysis.

COURSE CONTENT
1. Linear Analysis (7 days)
   a. Linear functions and applications: linear equations, percentage change, linear functions, slope and intercept, linear revenue and cost models, break even points (3 days)
   b. Systems of linear equations mostly in the plane (2 days)
   c. Dimensional analysis and unit conversions; applications (2 days)
2. Probability (10 days)
   a. Sets. Union, intersection, complement, Venn diagrams (1 day)
   b. Basic probability notions: properties of probability, expected value, independence and dependence, conditional probability and applications (7 days)

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      c. Bayes theorem and applications (2 days)
3. Data and Distributions (7 days)
      a. Data types: categorical, ordinal, interval, ratio (1 day)
      b. Data distributions, mean and median, variation – standard deviation (3 days)
      c. Working with Normal curves: probability viewed as area, probability calculations for normal random variables using Excel (e.g. $X<10$, $5 < X < 10$), approximation using the normal distribution, empirical rule (3 days)
4. Functions and Graphs: basic notions such as domain, range, operations; library of functions such as polynomial, rational, absolute value, power, square root (4 days)
5. Limits: basic notion, properties, calculation (3 days)
6. Differentiation (9 days)
      a. Definition using limits; graphical interpretation; interpretation as rate of change (4 days)
      b. Differentiation properties and rules, combinations of functions (5 days)
7. Optimization using derivatives and applications (8 days)
      a. Relation of the derivative to the graph of a function (3 days)
      b. Interpretation in terms of marginal and elasticity (2 days)
      c. Optimization (3 days)
8. Exponential and Logarithm functions (8 days)
      a. Definitions and properties (4 days)
      b. Calculus using the exponential and logarithm functions; applications (4 days)

STRUCTURE AND APPROACH
The course will use any or all of: lecture, discussion, student presentations, in-class work, or group work. In addition, students may use technology, especially a spreadsheet such as Excel. The content of this course is chosen with applications to business and management concepts and processes in mind. The course will emphasize critical thinking, problem solving, and, where appropriate, use of spreadsheet analysis.

ASSESSMENT
Assessment methods and grading scale may vary by section and semester, under the guidance provided by a course coordinator, within the general framework provided here. The assessment procedures include: a minimum of three in-class exams (or equivalent), a comprehensive final exam (minimum 20%), and some selection of (a) graded homework assignments, (b) in-class work, (c) quizzes, (d) writing assignments, (e) applied individual or group projects.

A typical grading scale: Grades will be based on percentages as follows.
A: 90 – 100%; B: 80 – 89%; C: 70 – 79%; D: 60 – 69%; F: 0 – 59%

TEXTBOOK – POSSIBLE CHOICES
Finite Mathematics and Calculus with Applications, 9th ed., Lial, Greenwell, Ritchie, Pearson.
Finite Mathematics and Applied Calculus, 6th ed., by Warner and Constable, Brooks-Cole.