

MA 162 FINITE MATHEMATICS AND ITS APPLICATIONS (UK Course) (3 credit hours)

Official Course Description	Finite mathematics with applications to business, biology, and the social sciences. Linear functions and inequalities, matrix algebra, linear programming, probability. Emphasis on setting up mathematical models from stated problems. Prerequisites: MA 109 or equivalent.
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OFFICIAL COURSE COMPETENCIES/OBJECTIVES

1. State the geometric interpretation of the solution to a linear programming problem.
2. Determine whether two events are independent or not
3. Determine whether two events are mutually exclusive or not
4. Use proper matrix notation to organize arrays of numbers and represent equations
5. Write and understand permutations and combinations in their standard notation
6. Write and understand probabilities in standard notation
7. Write and understand set notation for unions, intersections, and complements
8. Represent sets within Venn Diagrams and understanding such representations
9. Perform matrix operations
10. Find the inverse of a matrix
11. Find the simple, compound, or conditional probability
12. Determine unions, intersections, and complements of sets and events
13. Determine the number of ways a task can be performed using counting principles
14. Solve a system of linear equations by substitution, elimination, using matrix row operations, and using matrix equations.
15. Solve a linear programming problem graphically and by the simplex method.
16. Determine whether a problem involves permutations, combinations, or basic counting methods
17. Determine whether a problem involves simple, compound, or conditional probability.
18. Set up and solve an application involving systems of equations.
19. Set up and solve an application involving linear programming.
20. Solve multi-step problems that contain simple, compound and conditional probabilities.

OFFICIAL COURSE OUTLINE (Approved Spring 2003)

- I. Linear Systems
 - A. Solve linear systems of two or more variables by graphing, substitution, elimination or Gauss-Jordan methods.
 - B. Recognize consistent, inconsistent, and dependent systems
 - C. Write solutions in parametric form
 - D. Set up and solve applied problems
- II. Matrix Operations
 - A. Recognize and be able to write coefficient matrices and augmented matrices
 - B. Be able to define and identify square matrices, equal matrices, and matrices dimensions.
 - C. Add and subtract matrices
 - D. Perform scalar multiplication
 - E. Perform matrix multiplication
 - F. Find inverses
 - G. Use inverses to solve systems
- III. Linear Inequalities
 - A. Graph inequalities
 - B. Graph systems of inequalities
 - C. Identify corner points and feasible regions
 - D. Solve optimization problems by substituting corner points into objective functions.
 - E. Identify standard maximization and minimization problems.
 - F. Solve standard maximization simplex problems
 - G. Solve duality problems using simplex

- H. Convert non-standard optimization problems to standard maximum problems:
 - i. Problems with \geq constraints
 - ii. Problems with $=$ constraints
 - iii. Problems with negative numbers on the right-hand side of constraints
 - iv. Problems with a minimized objective function.
 - I. Identify simplex problems without a single solution
 - i. Multiple solutions
 - ii. Unbounded solutions
 - iii. No solutions
 - J. Solve applied optimization problems using simplex and/or graphing methods.
- IV. Sets
- A. Use, define and identify set builder notation, empty or null set, universal set, equal sets, subsets, proper subsets, elements, union, intersection, complements, disjoint sets
 - B. Use and solve applied problems with Venn Diagrams.
 - C. Identify the number of elements in sets
- V. Combinatorics
- A. Define and use the Multiplication Rule on applied counting problems.
 - B. Define and use the Addition Rule on applied counting problems.
 - C. Solve applied permutation problems.
 - D. Solve applied combination problems
- VI. Probability
- A. Identify and define experiment, outcome, trial, sample space, event, empirical probability, random outcomes
 - B. Find probabilities of equally likely events in applied problems
 - C. Find probabilities of compound events in applied problems
 - i. union
 - ii. intersection
 - iii. complement
 - D. Define and identify mutually exclusive events and independent events.
 - E. Solve applied conditional probability problems.
 - F. Solve applied probability problems using Baye's Rule

OPTIONAL

- VII. Markov Chains
- A. Identify and define state matrices, transition matrices, markov chains, and steady-state matrices
 - B. Solve applied problems involving Markov Chains
 - C. Find steady-state matrices
 - D. Identify regular matrices
- VIII. Solve applied problems using Bernouilli's Formula

GENERAL EDUCATION COMPETENCIES

- A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.
- B. Intellectual and practical skills, including
 - inquiry and analysis
 - critical and creative thinking
 - written and oral communication
 - quantitative literacy
 - information literacy
 - teamwork and problem solving
- C. Personal and social responsibility, including
 - civic knowledge and engagement (local and global)
 - intercultural knowledge and competence
 - ethical reasoning and action
 - foundations and skills for lifelong learning
- D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

STUDENT LEARNING OUTCOMES FOR QUANTITATIVE REASONING (Approved Fall 2017)

In MA 162, students will learn to:

1. Interpret information presented in mathematical and/or statistical forms by (Gen Ed Comp B):
 - Determining whether a problem involves permutations, combinations, or basic counting methods
 - Determining whether a problem involves simple, compound, or conditional probability.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically by (Gen Ed Comp A, B, C):
 - Stating the geometric interpretation of the solution to a linear programming problem.
 - Using proper matrix notation to organize arrays of numbers and represent equations.
 - Writing and understanding probabilities in standard notation.
 - Representing sets within Venn Diagrams and understanding such representations.
3. Determine when computations are needed and execute the appropriate computations by (Gen Ed Comp A, B):
 - Performing matrix operations.
 - Finding the simple, compound, or conditional probability.
 - Determining unions, intersections, and complements of sets and events.
 - Determining the number of ways a task can be performed using counting principles.
4. Apply an appropriate model to the problem to be solved by (Gen Ed Comp A, B, C):
 - Solving a system of linear equations by substitution, elimination, using matrix row operations, and using matrix equations.
 - Solving a linear programming problem graphically and by the simplex method.
 - Solving multi-step problems that contain simple, compound and conditional probabilities.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis by (Gen Ed Comp A, D):
 - Setting up and solving an application involving systems of equations.
 - Setting up and solving an application involving linear programming.