

**Southern Connecticut State University**  
**MAT 207**  
**Mathematics for Elementary Education III**

I. **Catalog Description:** Topics include real numbers, functions, probability and statistics, discrete mathematics, problem solving, mathematical reasoning and connections

II. **Purpose:**

The purpose of this course is to continue to provide students with a deeper understanding of the mathematics being taught in elementary schools and to familiarize them through practice with the Standards for Mathematical Practice, which is part of the Common Core State Standards. .

III. **Credit**

MAT 207 carries three semester-hours of university credit.

IV. **Prerequisite:**

C- or better in MAT 106

V. **Format**

All activities are hands-on activities and are integrated into the course.

VI. **Course Objectives:** By the end of this course, a successful student should be able to do the following:

- A. Students will be able to distinguish between rational and irrational numbers.
- B. Students will be able to perform arithmetic operations with real numbers.
- C. Students will understand the definition of function, as well as function notation.
- D. Students will understand algebraic combinations of functions and composition of functions.
- E. Students will be able to find the equation of a line given two points and understand what the slope and vertical-intercept represent in the context of a word problem.
- F. Students will be able to algebraically solve linear equations.
- G. Students will understand and apply the basic concepts of probability, odds, and mathematical expectation.
- H. Students will be able to collect data, represent the data in various forms, and draw conclusions from the data.
- I. Students will be able to compute measures of variation (range, variance, standard deviation), understand what each measure indicates for a given set of data, and use the Empirical Rule to answer questions.

- J. Students will know and apply problem-solving strategies and different ways to solve math problems, build new mathematics knowledge, and reflect on the problem-solving process.
- K. Students will know how to solve counting problems involving permutations and combinations, as well as apply counting techniques to computing probabilities.

## VII. Outline

- A. Real Numbers and Algebraic Thinking (35%)
  - 1. Real numbers
    - a. Properties
    - b. Operations
    - c. Rational Numbers vs. Irrational Numbers
  - 2. Functions
    - a. Definition of Functions
    - b. Functions as graphs
    - c. Sequences as functions and inductive reasoning
    - d. Composition of functions
  - 3. Equations in a Cartesian Coordinate System
    - a. Equations of lines in both slope-intercept and point-slope forms
    - b. Determining slope and its meaning in context
    - c. Equations of parallel lines, perpendicular lines
    - d. Systems of linear equations
    - e. Distance between 2 points
- B. Probability (25%)
  - 1. How Probabilities Are Determined
    - a. Theoretical vs. experimental probabilities
    - b. Law of Large Numbers
  - 2. Using Simulations in Probability
  - 3. Odds, Conditional Probability and Expected Value
- C. Statistics (20%)
  - 1. Designing experiments, collecting data
  - 2. Measures of Central Tendency and Variation
  - 3. Normal Distribution and Z-scores
  - 4. Abuses of Statistics
- D. Other topics (20%)

Instructor can choose a topic from the following list:

  - 1. Discrete Mathematics
    - a. Counting Principles

- b. Permutations and Combinations
  - c. Pigeonhole Principle
- 2. Graph Theory
  - a. Definitions (Graph, vertices, edges, trees, cycle, complete graphs)
  - b. Planar Graphs and Graph Coloring
  - c. Hamiltonian Cycles and Paths; Euler Circuits/Trails
- 3. Number Theory
  - a. Divisibility Rules
  - b. Modular Arithmetic
  - c. Cryptography
- 4. Statistics
  - a. Simpson's Paradox
  - b. Hypothesis Testing
  - c. Confidence Intervals

VIII. **Assessment:** Individual instructors may vary assessment modes, but typically grades will be based on a combination of homework assignments, quizzes, and exams.

#### IX. **Proposed Text**

1. *Mathematics for Elementary Teachers: A Conceptual Approach*, Bennett, Burton, Nelson, and Ediger, 10th Edition, McGraw Hill, 2016.

#### X. **Bibliography**

1. *A Problem Solving Approach to Mathematics for Elementary School Teachers*, Billstein, R., Libeskind, S., and Lott, J., 13th Edition, Pearson, 2019.
2. *Introductory Combinatorics*, Brualdi, R., 5th Edition, Prentice Hall, 2009.
3. *Elementary Number Theory and Its Applications*, Rosen, K., 6th Edition, Pearson, 2011.
4. *Introductory Statistics*, Weiss, N., 10th Edition, Pearson, 2015.

XI. **Waiver Policy:** This course may not be waived.

#### XII. **Prepared and Approved**

Prepared in April 2023.

Approved by the Mathematics DCC on .

Approved by the Mathematics Department on .

#### XIII. **Preparers**

2023: K. Kruczek and Y. Lee