# Syllabus

## MAT 180 - Mathematics For Elementary School Teachers I

## General Information

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**Author** Terri Gauthier

**Department** Mathematics

**Course Prefix** MAT

**Course Number** 180

**Course Title** Mathematics For Elementary School Teachers I

## Course Information

**Catalog Description** This is the first of a two-course sequence designed for prospective elementary school teachers. The course presentation is informed by the National Council of Teachers of Mathematics (NCTM) Process Standards, emphasizing problem solving, communication, reasoning and proof, representation, and mathematical connections. Students will explore mathematical concepts and theories underlying the topics which include: set theory; the history of numeration and different number systems, including other base numeration systems; operations on whole numbers, integers, rational numbers, and irrational numbers; and elementary number theory.

**Credit Hours** 3

**Lecture Contact Hours** 3

**Lab Contact Hours** 0

**Other Contact Hours** 0

**Grading Scheme** Letter

## Prerequisites

None

## Co-requisites

None

## First Year Experience/Capstone Designation

**This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.**

## SUNY General Education

**This course is designated as satisfying a requirement in the following SUNY Gen Ed category**
Mathematics (and Quantitative Reasoning)

## FLCC Values

**Institutional Learning Outcomes Addressed by the Course**
Inquiry and Interconnectedness

## Course Learning Outcomes

**Course Learning Outcomes**

1. Interpret information and apply arithmetic procedures to solve problems.
2. Communicate representations of mathematical ideas visually, numerically, and symbolically.
3. Explain the reasoning behind mathematical ideas and their connection to the foundational concepts that underlie the elementary school mathematics curriculum.

## Outline of Topics Covered

A. Problem Solving (Note: the strategies outlined below are threaded throughout this course.)
   1. Polya's Problem Solving Principles
   2. Problem Solving Strategies
      a.) Brute force methods, including guess, test, and revise and use of kinesthetic materials
      b.) Visual representations
      c.) Creating a table
      d.) Using patterns and generalizing
   3. Assessing the Reasonableness of a Solution

B. Set Theory
   1. Basic terminology and notation
   2. Set Representations
      a.) List form

b.) Verbal form
c.) Set-builder notation
d.) Venn Diagram

3. Set Relationships and special sets
   a.) One-to-one correspondence
   b.) Subsets: general versus proper
   c.) Set Equivalence
   d.) Empty set
   e.) Universal set
4. Operations
   a.) Intersection
   b.) Union
   c.) Complement

C. The Number System

1. History of Numeration and Early Numeration Systems
   a.) Egyptian Numerals
   b.) Roman Numerals
   c.) Babylonian Numerals
2. Place Value Systems
   a.) Hindu-Arabic or Base 10 System (Whole Numbers)
   b.) Other Base Numeration Systems
      i.) Binary (Base 2), Base 5, Base 6, Hexadecimal (Base 16)
      ii.) Counting
      iii.) Understanding Place Value
   c.) Using Base Blocks to represent numerals
   d.) Operations: Addition, Subtraction, Multiplication, and Division
3. Fractions
   a.) Definition of Rational Number
   b.) Understanding the Part versus Whole Relationship
   c.) Visual Representations
      i.) Pattern Blocks
      ii.) Cuisenaire Rods
      iii.) Other visual representations (rectangles, circles, Geoboard figures, number lines, etc.)
   d.) Simplifying and Ordering Fractions
4. Decimals
   a.) Place Values
   b.) Representations with Base Blocks
   c.) Connections to fractions
   d.) Equivalent numerals and ordering decimals
5. Integers and Real Numbers

D. Addition and Subtraction

1. Connections to Part versus Whole Relationships
2. Whole Numbers
    a.) Addition and subtraction models
    b.) Using base block visualizations to compute sums and differences
    c.) Traditional and alternative algorithms
    d.) Understand why algorithms work
    e.) Addition and subtraction in Base 2, Base 5, Base 6, and Base 16
    f.) Properties
3. Fractions
    a.) Using visual models to compute sums and differences of fractions
    b.) Applying algorithms to compute sums and differences of fractions
    c.) Understand why algorithms work
4. Decimals
    a.) Using base block visualizations to compute sums and differences of decimals
    b.) Applying algorithms to compute sums and differences of decimals
    c.) Understand why algorithms work
5. Integers
    a.) Using color chip visualizations to compute sums and differences of integers
    b.) Applying algorithms to compute sums and differences of integers
        i.) Addition by position
    c.) Understand why algorithms work

E. Multiplication and Division
1. Meaning of and Contexts for Multiplication and Division
2. Properties
3. Use of visualizations to motivate computations of products and quotients
4. Traditional and Alternative Algorithms
5. Understanding why algorithms work
6. Dimensional Analysis

F. Number Theory
1. Prime and Composite numbers
2. The Fundamental Theorem of Arithmetic
3. Divisibility
    a.) Understanding the definition
    b.) Select divisibility tests
4. Greatest Common Factor and Least Common Multiple