

**Southern Connecticut State University**  
**School of Arts and Sciences**  
**Department of Mathematics**

**OUTLINE FOR MAT 105**  
**Mathematics for Elementary Education I**

**I. Catalog Description.**

Topics include problem solving, mathematical reasoning, sets, whole numbers, numeration systems, number theory and integers.

**II. Purpose.**

The purpose of this course is to provide students with a deeper conceptual understanding of mathematics being taught in elementary schools. It is required of all students in an elementary school certification program.

**III. Credit.**

MAT 105 carries 3 semester hours of university credit. This course does not satisfy the Quantitative Reasoning requirement of the Liberal Education Program. This course does satisfy the All University requirement in Mathematics and it satisfies part of the mathematics requirement for all students in an elementary school certification program.

**IV. Prerequisites.**

MAT 100 or 100P or 102 or an established placement level appropriate for the course.

**V. Format.**

MAT 105 is offered in the lecture-discussion format. This course will have three contact hours per week and carry a faculty teaching load of three credits.

**VI. Technology.**

A graphing calculator is recommended.

**VII. Course Objectives.**

1. 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. (NCATE/NCTM 1.1-4; CCCT 2.6; INTASC 4).
2. Students will explore and analyze patterns, and use mathematical models to represent and understand quantitative relationships (NCATE/NCTM 5.1, 10.4), Analyze relations, and functions of one and two variables (NCATE/NCTM 10.1).
3. Students will develop the meaning and use of whole numbers operations, set operations, and elementary logic. (NCATE/NCTM 9.1).
4. Students will demonstrate proficiency to perform and explain multi-digit whole number computation using algorithms, mental mathematics, and estimation. (NCATE/NCTM 9.3).
5. Students will recognize the meaning and use of place value in the base-10 numeration system and experience numeration systems from different cultures and operations in different bases (two through twelve) (NCATE/NCTM 9.2, 9.5).
6. Students will develop the meaning and use of integers and integer operations (NCATE/NCTM 9.4).
7. Students will apply the fundamental ideas of number theory including prime and composite numbers, least common multiple, greatest common factor, and divisibility (NCATE/NCTM 9.1).

## VIII. Outline.

**Percentages are based on a 28 class semester, with 5 classes reserved for testing and review.** The starred \* sections are optional. The section numbers refer to the current text.

- A. Problem Solving, Sequences and Algebraic Thinking 15% (Chapter 1)
  - 1. Mathematics and Problem Solving
  - 2. Explorations with Patterns (include “find the  $n^{\text{th}}$  term for the sequence,” and formulas for geometric and arithmetic sequences)
  - 3. Reasoning and Logic
  - 4. Algebraic Thinking \*
- B. Numeration Systems and Sets 25% (Chapter 2)
  - 1. Numeration Systems
    - a. Place value
    - b. Historical numeration systems
    - c. Bases other than base 10 (such as bases 2-12)
  - 2. Set concept
  - 3. Describing Sets
  - 4. Other Set Operations and Their Properties
- C. Whole Numbers and Their Operations 30% (Chapter 3)
  - 1. Addition and Subtraction of Whole Numbers
  - 2. Algorithms for Whole-Number Addition and Subtraction (include other bases)
  - 3. Multiplication and Division of Whole Numbers
  - 4. Algorithms for Whole-Number Multiplication and Division (include other bases)
  - 5. Mental Mathematics and Estimation for Whole-Number Operations
- D. Functions \* (Chapter 4, section 3)
- E. Integers and Number Theory 30% (Chapter 5)
  - 1. Addition and Subtraction of Integers
  - 2. Multiplication and Division of Integers
  - 3. Divisibility
  - 4. Prime and Composite Numbers
  - 5. Greatest Common Divisor and Least Common Multiple  
(Include preparation for adding fractions in MAT 106)
  - 6. Clock and Modular Arithmetic \*

## IX. Texts.

Billstein, R., Libeskind, S. & Lott, J. *A Problem Solving Approach to Mathematics for Elementary School Teachers*, 10<sup>th</sup> Ed., Pearson Addison-Wesley, 2010.

## X. Waiver Policy.

There is no waiver for MAT 105.

## XI. MAT 105 and MAT 106 Bibliography.

Billstein, R., Libeskind, S. & Lott, J. *A Problem Solving Approach to Mathematics for Elementary School Teachers*, 10<sup>th</sup> Ed., Pearson Addison-Wesley, 2010.

Burns, M. (1992). *Math and Literature (K-3) Book One*. Math Solutions Publications: Sausalito, CA.

Bresser, R. (1995). *Math and Literature (4-6)*. Math Solutions Publications: Sausalito, CA.

Cathcart, W., Pothier, Y., Vance, J. & Bezuk, N. (2006). Learning Mathematics in Elementary and Middle Schools: A Learner-Centered Approach, 4<sup>th</sup> edition (multimedia edition). Pearson Merrill Prentice Hall: Upper Saddle River, NJ.

Dolan, D., Williamson, J., & Muri, M. (2000). Mathematics Activities for Elementary School Teachers: A Problem-Solving Approach, 2<sup>nd</sup> Ed. Addison Wesley: Boston.

Krause, M. (2000). Multicultural Mathematics Materials, 2<sup>nd</sup> Ed. NCTM: Reston, VA.

National Council for Teachers of Mathematics (NCTM). Principles and Standards for School Mathematics Navigations Series. [Activity books on probability, data analysis, numbers and operations, algebra and geometry and measurement.] Author: Reston, VA

NCTM (2000). Principles and Standards for School Mathematics. Author: Reston, VA.

NCTM (1992). Addenda Series for Grades K-6 [several books that include Developing Number Sense, Dealing with Data and Change, Geometry, Patterns and Functions and Rational Numbers and Proportions. Books are available by grade level.] Author: Reston, VA.

NCTM (ongoing). Yearbook series. [includes titles such as: Making Sense of Fractions, Ratios, and Proportions: 2002 Yearbook,

Mathematical Association of America (MAA) (1991). A Call for Change: Recommendations for the Mathematical Preparation of Teachers of Mathematics.

Moore, D. & McCabe, G. (2003) Introduction to the Practice of Statistics, fourth edition, pp. 617-618 [for Simpson's Paradox]. W.H. Freeman: New York.

Schifter, D., Bastable, V., & Russell, S. (1999). Developing Mathematical Ideas. [This series has several options including Building a System of Tens, part 1, Making Meaning of Operations, part 2.] Dale Seymour publications: Parsippany, NJ.

Sheffield, S. (1995). Math and Literature (K-3) Book Two. Math Solutions Publications: Sausalito, CA.

Stenmark, J., Thompson, V & Cossey, R. Family Math. Lawrence Hall of Science: Berkeley, CA.

Thompson, V & Mayfield-Ingram, K. Family Math – The Middle School Years. Lawrence Hall of Science: Berkeley, CA.

**XII. Website References.** The easiest way to find these is to Google the name of the site, but the current websites are listed as well.

National Library of Virtual Manipulatives – choose the topic and/or the grade level

IMAP videos

Arcytech

NCTM Illuminations web sites

Base 5 blocks – paper version for students

Prepared.

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**XIII. Preparer.**  
Kathleen Rondinone.