#### APPROVED: 4/12/11

#### Middlesex County College

**Edison, NJ**

**Course Abstract**

*If you need accommodations due to a disability, contact Disability Services in*

*Edison Hall Room 100, 732.906.2546.*

*To foster a productive learning environment, the College requires that all students adhere to the Code of Student Conduct which is published in the college catalog and website.*

**Course ID and Name:** MAT 113, Mathematical Structures I

**Department:**

Maria DeLucia, Ph.D., Chair

Office Location: Center II

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Telephone: 732.906.2585

**Prerequisites:** Algebra II – MAT 014 **Co-requisites:**

**Course Description:**

This is the first of a two semester sequence. This first course focuses on selected topics from numeration, mathematical systems, real numbers, and number theory. Designed to develop a deep understanding of the processes of mathematical reasoning, problem solving, and communication of mathematics effectively at different levels of formality, using a variety of representations of mathematical concepts and procedures. Develop a fundamental understanding relating to algebraic thinking. Physical materials and models will be used to explore fundamental concepts of numeration, mathematical systems, real numbers, and number theory. This course is appropriate for those students preparing to be elementary, early childhood, or special education teachers.

**General Education Status:** Yes

**Credits:** 3 **Lecture Hours:** 3  **Lab Hours:** 0

**Learning Outcomes:**

* Recognize processes and algorithms, and the underlying purposes found in the elementary mathematics topics.
* Demonstrate the ability to communicate mathematical ideas appropriately using the language of mathematics.
* Demonstrate the ability to do algebraic thinking.
* Solve various types of mathematical problems using appropriate strategies.
* Establish the relationship of mathematics to other subjects, its applications in society, and relationships within mathematics itself.
* Develop an appreciation of the history, structure, and application of mathematics.

**Course Content Areas:**

* + - Problem-solving and reasoning
      * Introduction to problem-solving strategies and processes, including patterns as a fundamental theme in mathematics.
      * Representing and justifying general arithmetic claims, using a variety of representations; understanding different forms of argument and learning to devise deductive arguments.
      * The power of algebraic notation: developing skill in using algebraic notation to represent calculation, express identities, and solve problems.

These topics will be integrated throughout the course.

* Structures and Concepts of Arithmetic
  + Place value: how place value permits efficient representation of numbers.
  + Operations on whole numbers, including having a large repertoire of interpretations of addition, subtraction, multiplication, and division and of ways they can be applied. Field axioms: recognizing commutativity, associativity, distributivity, identities, and inverses as properties of operations.
  + Standard algorithms and non-standard methods for multidigit calculations: the reasoning behind the procedures and how the base-10 structure is implicated.
  + Concepts of integers, rationals, and real numbers: what integers, fractions, and decimals are; how operations on whole numbers extend to integers and rational numbers and the mathematics that underlies the procedures; and the behavior of units under the operations.
  + Proportional Reasoning
* Sets and Number Theory
  + Set theoretical concepts needed to understand number systems.
  + Fundamental properties of number systems and elementary number theory, including divisibility and the Fundamental Theorem of Arithmetic.
* Patterns and Functions
  + Recognizing and describing mathematical relationships; number sequences and functional relationships.