I. Basic Course Information

A. Course Number and Title: MATH 107
   Mathematical Reasoning for Educators I

B. New or Modified Course: New

C. Date of Proposal: Spring 2015

D. Effective Term: Fall 2015

E. Sponsoring Department: Mathematics

F. Semester Credit Hours: 3.0

G. Weekly Contact Hours:
   Lecture: 2.0
   Laboratory: 2.0

H. Prerequisites/Corequisites:
   MATH 030 Intermediate Algebra (or MATH 030R Intermediate Algebra)

I. Laboratory Fees: none

J. Name and Telephone Number or E-Mail Address of Department Chair at time of approval: Rosemarie Gorini (908-526-1200 ext. 8546) rosemarie.gorini@raritanval.edu

II. Catalog Description

Prerequisites: MATH 030 Intermediate Algebra or satisfactory score on a placement test.

This course is designed as a transfer course for students seeking degrees in Elementary & Middle School Education and Early Childhood Education. Emphasis is placed on computational skills, problem solving and teaching via a hands-on approach. Topics include problem solving strategies, number theory, and algebraic structures.
III. Statement of Course Need

Background:

The Mathematical Reasoning for Educators I and II sequence is a result of a dialogue which began fall 2009 and has continued through and probably beyond 2015. Representatives from two and four year schools in New Jersey (members of the New Jersey Association of Mathematics Teacher Educators, NJAMTE) met several times to discuss appropriate teacher preparation courses in Mathematics. Discussions and presentations revolved around a comprehensive aligned curriculum that would prepare students to successfully complete the Mathematics portion of the Praxis Core and ensure that teachers at the elementary and middle school levels are well prepared to teach Common Core Mathematics in their classrooms. During the 2013 Mathematics Program Review, external consultant, Bonnie Gold recommended a two course sequence “to do a better job of preparing future elementary teachers to teach the new standards”. Several of the four year colleges have moved to a two course sequence aimed at eliminating redundancy and fostering a more in-depth study of the concepts relative to the K-6 curriculum. This is consistent with a report issued by the Conference Board of Mathematical Sciences entitled The Mathematical Education of Teachers. This report which was done in conjunction with the American Mathematical Society and the Mathematical Association of America makes two major recommendations:

- Future teachers need mathematics courses that develop an in-depth understanding of the mathematics they will teach
- Elementary and middle school programs should include at least 9 semester hours in the mathematical knowledge needed to teach school mathematics well.

MATH-107 Mathematical Reasoning for Educators I is designed to be the first course in that sequence. It is designed to provide students with an in-depth understanding of elementary mathematics while providing content knowledge for the Praxis Core exam.

IV. Place of Course in College Curriculum

A. Free elective. (This applies automatically to all credit courses in the College.)
B. The course may serve as a General Education Elective in Mathematics for Education Majors.
C. This course meets a mathematics requirement for the AA in Education: P-5 degree for those students pursuing Early Childhood, Elementary Teacher or Middle School certification.
D. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.
V. Outline of Course Content

Prospective teachers need a solid understanding of mathematics so that they can teach it as a coherent, reasoned activity and communicate its elegance and power.

In this course, students will work cooperatively to explore different ways of solving problems, build connections among concepts, and solve problems growing out of their explorations. They will use physical materials to explore properties of number systems, model algorithms and algebraic structures.

They will be expected to reason mathematically using the laws of logic, set theory and algebraic structures. They will be expected to communicate mathematical ideas effectively using the language of mathematics.

This course will address the fundamental principles that underlie elementary school mathematics from advanced viewpoint.

Topics addressed include:

A. Problem Solving
   1. Strategies and processes
   2. Set Theory
   3. Logic and Problem Solving

B. Number Theory
   1. Place Value
   2. Whole Numbers/Integers/Rational Numbers
      i. Operations
      ii. Field axioms
      iii. Standard and non-standard algorithms for multi-digit operations and the reasoning behind them
   3. Divisibility theorems
   4. Fundamental Theorem of Arithmetic
   5. Order of Operations
   6. Prime and Composite numbers

C. Algebraic Structure and Thinking
   1. Ratios & Proportional reasoning
   2. Percent’s
   3. Variables, Algebraic Expressions & Equations, Functions
VI. General Education and Course Learning Outcomes

A. General Education Learning Outcomes:
At the completion of the course, students will be able to:
1. Solve mathematical application problems using problem solving strategies learned. (GE - NJ2)
2. Gather information and analyze data using set theory and logic. (GE - NJ2)
3. Solve mathematical problems involving various operations of numbers and concepts such as least common multiple and greatest common factor. (GE - NJ2)
4. Solve mathematical application problems using percent and proportional reasoning where appropriate. (GE - NJ2)
5. Translate application problems to algebraic equations for solving (GE - NJ2)

B. Course Learning Outcomes:
See above

C. Assessment Instruments

The following assessment methods may be used.
A. laboratory reports
B. research papers
C. presentations
D. math games
E. quizzes, tests, cumulative exams

VII. Grade Determinants

A. lab reports resulting from work with manipulatives and problem solving activities
B. oral presentations
C. creative math games
D. tests or midterm
E. cumulative final exam

Given the goals and outcomes described above, LIST the primary formats, modes, and methods for teaching and learning that may be used in the course:
A. lecture/discussion
B. small-group work
C. computer-assisted instruction
D. guest speakers
E. laboratory
F. student oral presentations
G. student collaboration
H. paper or computer homework
I. independent study
VIII. Texts and Materials

A. suggested textbook
B. paper and/or online homework assignments to accompany textbook
C. film and video
D. web sources
E. other computer-based sources
F. manipulatives

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

A. student computer labs
B. fraction bars
C. base ten blocks
D. Cuisenaire rods
E. counters
F. Unifix cubes