INSTRUCTOR INFORMATION

Name: Ellen Oliver  
Email: eoliver@nr.edu  
Phone: 540-674-3600, ext. 4405  
Office: Godbey 51  
Office hours: Posted under “Office Hours” link on course web site in Blackboard.

IMPORTANT:

☐ The recommended browser to use with the current version of Blackboard for this course is Mozilla Firefox. For the MyLabsPlus and Hawkes web sites, use Chrome. Other browsers are inconsistent in their performance with Blackboard and MyLabsPlus/Hawkes. When taking tests or quizzes, use a WIRED connection.

☐ Check your VCCS email regularly and respond/keep in touch with your instructor.

COURSE DESCRIPTION

Credits: 1 - 4  
Submissions: Homework & Quizzes online on web-based software provided with text  
Proctored Assessments: Exams – 1 per Unit (All Unit Exams MUST be taken at the Testing Center)  
Online Activities: Required via web-based software provided with text

This course covers mathematics topics in a technology-based setting to prepare students for the study of college level mathematics courses and curricula. Designed for the study of one, two, or three developmental math unit(s) prescribed by the student’s placement test results. Credits not applicable toward graduation.

COURSE MATERIALS

Textbook: Foundations of Mathematics for Virginia, published by Hawkes (Guided Notebook and software access code bundle). ISBN 978-1-941552-88-9. [Previous MTT students may be using the Trigsted book from Pearson, which is fine for this course. If you have this book, DO NOT buy the Hawkes one.]

Required: Internet access (for lessons and assignments from web-based software)

A student access code for the software is required for the course. The access code and Guided Notebook bundle must be purchased through the NRCC bookstore. The access code gives students access to all of the resources, including the e-text, online video lectures, homework, and Unit Exams.

Calculator: No calculator is allowed in Unit 1. A four-function calculator is allowed in the rest of Units 2 - 9. A scientific calculator is recommended for Units 5 – 9. A graphing calculator will not be needed for this course. Cell phones or other electronic devices may NOT be used as a calculator.
Other Materials: Internet access is required in order to complete and submit assignments.

Instructional Activities: Online video instruction, e-text lessons, and online homework assignments using web-based software purchased by student.

This course consists of 9 separate units of developmental math, beginning with operations with fractions, and including operations with decimals and percents, algebra basics, first-degree equations and inequalities in one variable, systems of linear equations, exponents, factoring, polynomial equations, rational expressions and equations, rational exponents and radicals, and functions, quadratic equations, and parabolas. A specific list of outcomes and objectives for each unit is listed separately. Students may enroll in up to 4 credits of MTT units (1 unit = 1 credit) per semester, and their instructor will enroll them into the MTE Unit where they have been placed either from previous courses or placement tests. This course is technology-based.

Note: NRCC assumes no liability for virus, loss of data, or damage to software or computer when a student downloads software for classes.

The Student's Guide to Distance Education is available at http://www.nr.edu/de/pdf/stuguide.pdf
COURSE INFORMATION

Prepared By: Ellen Oliver, Instructor

Approved By: Dr. Janice Shelton

A. INTRODUCTION

This is a Distance Education course designed specifically for those students whose learning styles are best served by providing instructional opportunities beyond the traditional classroom setting. The student will be working with an online textbook and the associated web-based software. Internet access is required to complete assignments. Access to the software is fully described in Blackboard. The web address for the course depends on book purchased; refer to Syllabus.

B. COURSE OUTCOMES

General and specific objectives for each of the 9 Units are included at the end of this Course Plan.

C. COURSE COMMUNICATION

You are responsible for reading and understanding all documents posted in Blackboard and in the web-based software, as well as checking your VCCS email account regularly. Course documents and periodic announcements will be posted in Blackboard, but the remainder of the course will be conducted in the web-based software, and this is where you will log in to complete all your assignments. You are encouraged to email your instructor with any questions. You should expect a response within 24 hours if it's a week day and 48 hours if it's the weekend.

D. GRADING/EVALUATION

Course Grade: This is a pass/fail course (S/U). You must complete all of the Units you have signed up for in the semester in order to earn a grade of S (passing). If not, you will earn a grade of U (failing). You will not have to repeat any Units you pass during this course, but if you do not finish all the Units you have signed up for, you will need to start back at the beginning of the incomplete Unit the next time you enroll in an MTT course.

Homework: Students will be required to complete homework assignments in the web-based software. Refer to the Syllabus for details.

Quizzes: Students will be required to complete quizzes in the web-based software. Refer to the Syllabus for details.

Unit Exam: Testing will occur at the end of each unit. Students will test each Unit when they have completed all the assignments prior to the Unit Exam in the web-based software. Refer to the Syllabus for details.

DE students must take all Unit Exams in the Testing Center. You will have three attempts to score at least a 75% on the Exam. If you do not pass the Exam on the first attempt, you will need to meet with your instructor to go over it. If you do not pass a Unit Exam in three tries, you will restart that unit from the beginning. Each unit must be passed before progressing to the next needed unit.

Unit Exams are password-protected; the test proctor will type in the password for you. Unit Exams may only be taken at the NRCC Testing Center. (The Testing Center info and hours are at the
end of this Course Plan. Exams cannot be started less than 2 hours before the testing center closes.) If you are unable to come to either the Dublin or Christiansburg Testing Centers because you live outside the region or have a documented disability, you can arrange for a proctor for your Unit Exams during the first week of the semester.

You will be given a Pacing Guide to assist you in staying on track to finish your required Units during the semester. Not meeting the due dates will jeopardize your ability to finish your required Units within the semester. Each Unit must be completed before the restart dates, or you will have to restart the Unit from the beginning. The restart dates for Summer 2016 are: June 15 and July 10.

E. WITHDRAWAL POLICY

Student Initiated Withdrawal Policy
A student may drop or withdraw from a class without academic penalty during the first sixty percent (60%) of a session. For purposes of enrollment reporting, the following procedures apply:

a. If a student withdraws from a class prior to the termination of the drop/add period for the session, the student will be removed from the class roll and no grade will be awarded.

b. After the drop/add period, but prior to completion of sixty percent (60%) of a session, a student who withdraws or is withdrawn from a course will be assigned a grade of "W." A grade of “W” implies that the student was making satisfactory progress in the class at the time of withdrawal, that the withdrawal was officially made before the deadline published in the college calendar, or that the student was administratively transferred to a different program.

c. After that time, if a student withdraws from a class, a grade of "F" will be assigned. Exceptions to this policy may be made under documented mitigating circumstances if the student was passing the course at the last date of attendance.

A retroactive grade of “W” may be awarded only if the student would have been eligible under the previously stated policy to receive a “W” on the last date of class attendance. The last date of attendance for a distance education course will be the last date that work was submitted. Late withdrawal appeals will be revised and a decision made by the Coordinator of Admissions and Records.

No-Show Policy
A student must demonstrate participation* in distance learning courses by the last date to drop for a refund. A student who does not meet this deadline will be reported to the Admissions and Records Office and will be withdrawn as a no-show student. No refund will be applicable, and the student will not be allowed to attend/participate in the class or submit assignments. Failure to participate in a course will adversely impact a student’s financial aid award. *For this course, this means students must have no late assignments (fully on track with their Pacing Guide) by midnight on June 2, 2016. If this requirement is not met, the student will be withdrawn as a no-show.

Instructor Initiated Withdrawal
Since attendance is not a valid measurement for Distance Education (DE) courses, a student may be withdrawn due to non-performance. As this policy applies to this course, you will be withdrawn for non-performance from the course if you go for 2 weeks or more without evidence of your work in the course software.

In accordance with the No-Show Policy, a student who has not attended class or requested/accessed distance learning materials by the last day to drop the class and receive a refund must be withdrawn by the instructor during the following week. No refund will be applicable.
The student will be notified of the withdrawal by the Admissions and Records Office. An appeal of reinstatement into the class may be approved only by the instructor.

F. CHEATING/PLAGIARISM POLICY

A grade of zero will be awarded to any writing assignments or tests that show cheating or plagiarism. To plagiarize is “To use and pass off as one’s own the ideas or writings of another.” (Definition adapted from the American Heritage Dictionary.) Remember that plagiarism includes lifting words or ideas from Internet sites, as well as copying from print sources.

G. DIVERSITY STATEMENT

The NRCC community values the pluralistic nature of our society. We recognize diversity including, but not limited to, race, ethnicity, religion, culture, social class, age, gender, sexual orientation and physical or mental capability. We respect the variety of ideas, experiences and practices that such diversity entails. It is our commitment to ensure equal opportunity and to sustain a climate of civility for all who work or study at NRCC or who otherwise participate in the life of the college.

New River Community College does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies: Dr. Mark C. Rowh, Vice President for Workforce Development and External Relations, 217 Edwards Hall, 540-674-3600, ext. 4241.

H. DISABILITY STATEMENT

If you are a student with a documented disability who will require accommodations in this course, please register with the Center for Disabilities Services located in the Advising Center in Rooker Hall for assistance in developing a plan to address your academic needs.
Unit 1 – Operations with Positive Fractions

Unit Description
The student will solve application problems using proper fractions, improper fractions, and mixed numbers. All student learning outcomes for this unit must be completed without the use of a calculator. Emphasis should be placed on applications throughout the unit. Applications will use U.S. customary units of measurement. All fractions in this unit should be expressed in simplest form, unless otherwise indicated.

Broad Learning Outcomes
Upon completion of Unit 1 students will be able to:
1.1 Write, simplify, and compare fractions.
1.2 Perform operations with fractions.
1.3 Solve applications using U.S. customary units of measurement.

Specific Objectives
Upon completion of Unit 1 students will be able to:
1.1 Write, simply and compare fractions.
1.1.1 Express parts of a whole using fraction notation.
1.1.2 Convert between improper fractions and mixed numbers.
1.1.3 Express repeated factors using exponents.
1.1.4 Find the prime factorization of a given number.
1.1.5 Write fractions in simplest form.
1.1.6 Compare two quantities in the form of a ratio or rate in simplest form.
1.1.7 Find the least common multiple (LCM) of two or more whole numbers.
1.1.8 Find the least common denominator (LCD) of two or more fractions.
1.1.9 Determine the relationship (<, >, =) between two fractions with unlike denominators.
1.2 Perform operations with fractions.
1.2.1 Add and subtract fractions and mixed numbers with like denominators.
1.2.2 Add and subtract fractions and mixed numbers with unlike denominators.
1.2.3 Multiply fractions and mixed numbers.
1.2.4 Divide fractions and mixed numbers.
1.2.5 Simplify expressions involving fractions using order of operation.
1.3 Solve application using U.S. customary units of measurement.

Unit 2 – Operations with Positive Decimals and Percents

Unit Description
The student will solve problems using decimals and percents. Emphasis should be placed on applications throughout the unit. Applications will use U.S. customary and metric units of measurement.

Broad Learning Outcomes
Upon completion of Unit 2 students will be able to:
2.1 Demonstrate the meaning of decimal numbers.
2.2 Perform operations with decimals.
2.3 Estimate decimals.
2.4 Demonstrate the relationship among fractions, decimals, and percents.
2.5 Solve basic percent problems.
2.6 Read and interpret basic graphs.
2.7 Convert units of measure.
2.8 Solve application problems using U.S. customary and metric units of measurement.

Specific Objectives
Upon completion of Unit 2 students will be able to:

2.1 Demonstrate the meaning of decimal numbers.
   2.1.1 Convert decimals between standard notation and word notation.
   2.1.2 Identify place values in decimals.

2.2 Perform operations with decimals.
   2.2.1 Add and Subtract decimals.
   2.2.2 Multiply decimals.
   2.2.3 Divide decimals.
   2.2.4 Simplify expressions using order of operations.

2.3 Estimate decimals.
   2.3.1 Round decimals to a specific place value.
   2.3.2 Estimate sums, differences, products, and quotients with decimals.

2.4 Demonstrate the relationship among fractions, decimals, and percents.
   2.4.1 Write parts of a whole using percent notation.
   2.4.2 Convert among fractions, decimals and percents.
   2.4.3 Order a list of fractions and decimals from smallest to largest.

2.5 Solve basic percent problems.
   2.5.1 Calculate all values in the basic percent problem (percent, amount /part, and base).
   2.5.2 Calculate percent increase and percent decrease.
   2.5.3 Calculate sales tax and commission.
   2.5.4 Calculate simple interest.

2.6 Read and interpret basic graphs.
   2.6.1 Read and interpret information from a pie graph.
   2.6.2 Calculate the percentage denoted by a pie graph.
   2.6.3 Read and interpret information from a bar graph.
   2.6.4 Read and interpret information from a line graph.

2.7 Convert units of measure.
   2.7.1 Convert within the U.S. system.
   2.7.2 Convert within the metric system.
   2.7.3 Convert between U.S. and metric units using conversion tables.
   2.7.4 Convert units of time.
   2.7.5 Convert between Fahrenheit and Celsius temperatures.

2.8 Solve application problems using U.S. customary and metric units of measurement.

Unit 3 – Algebra Basics

Unit Description
The student will perform basic operations with algebraic expressions and solve simple algebraic equations using signed numbers. Emphasis should be placed on applications throughout the unit.

Broad Learning Outcomes
Upon completion of Unit 3 students will be able to:
3.1 Determine the absolute value of a number.
3.2 Demonstrate proper use of exponents.
3.3 Find the principal square root of a perfect square.
3.4 Simplify expressions involving signed numbers.
3.5 Write numbers in scientific notation.
3.6 Simplify algebraic expressions.
3.7 Evaluate a formula or algebraic expression for given values of the variables.
3.8 Solve one-step equations using the addition and multiplication properties.
3.9 Solve problems using proportions.
3.10 Solve application problems including finding perimeter, area and volume.

Specific Objectives
Upon completion of Unit 3 students will be able to:

3.1 Determine the absolute value of a number.
3.2 Demonstrate proper use of exponents.
   3.2.1 Express repeated factors using exponents.
   3.2.2 Evaluate powers of numbers.
3.3 Find the principal square root of a perfect square.
3.4 Simplify expressions involving signed numbers.
   3.4.1 Add and subtract signed numbers.
   3.4.2 Multiply and divide signed numbers.
   3.4.3 Use the proper order of operations to simplify expressions containing multiple operations on signed numbers, including powers and square roots.
3.5 Write numbers in scientific notation.
   3.5.1 Convert between integer powers of 10 and equivalent decimal numbers.
   3.5.2 Convert numbers between scientific notation and standard notation.
3.6 Simplify algebraic expressions.
   3.6.1 Identify the properties of real numbers (Commutative, Associative, Distributive, Identity and Inverse Properties).
   3.6.2 Simplify an algebraic expression by combining like terms.
   3.6.3 Simplify algebraic expressions using the order of operations.
3.7 Evaluate a formula or algebraic expression for given values of the variables.
3.8 Solve one-step equations using the addition and multiplication properties.
   3.8.1 Solve one-step equations using rational numbers.
   3.8.2 Solve one-step equations using percents.
3.9 Solve problems using proportions.
3.10 Solve application problems including finding perimeter, area, and volume.

Unit 4 – First Degree Equations and Inequalities in One Variable

Unit Description
The student will solve first degree equations and inequalities containing one variable, and use them to solve application problems. Emphasis should be on learning the steps to solving the equations and inequalities, applications and problem solving.

Broad Learning Outcomes
Upon completion of Unit 4 students will be able to:

4.1 Solve first degree equations in one variable.
4.2 Solve a formula or equation for one of its variables.
4.3 Solve first degree absolute value equations containing a single absolute value.
4.4 Solve first degree inequalities in one variable.
4.5 Solve application problems using a single first degree equation or inequality.

Specific Objectives
Upon completion of Unit 4 students will be able to:

4.1 Solve first degree equations in one variable.
   4.1.1 Solve first degree equations in one variable using the Addition Property of Equality.
   4.1.2 Solve first degree equations in one variable using the Multiplication Property of Equality.
   4.1.3 Solve first degree equations in one variable using the Addition Property of Equality and the Multiplication Property of Equality.
   4.1.4 Solve first degree equations in one variable that contain parentheses.
   4.1.5 Solve first degree equations in one variable with the variable on both sides of the equal sign.
   4.1.6 Solve first degree equations in one variable and identify the solution to an equation as finite, the empty set or all real numbers.

4.2 Solve a formula or equation for one of its variables.
   4.2.1 Solve a formula or equation for one of its variables using the Addition Property of Equality.
   4.2.2 Solve a formula or equation for one of its variables using the Multiplication Property of Equality.
   4.2.3 Solve a formula or equation for one of its variables using the Addition Property of Equality and the Multiplication Property of Equality.
4.3 Solve first degree absolute value equations containing a single absolute value.
4.4 Solve first degree inequalities in one variable.
   4.4.1 Solve first degree inequalities in one variable stating the solution using inequality notation.
   4.4.2 Solve first degree inequalities in one variable stating the solution using interval notation.
   4.4.3 Solve first degree inequalities in one variable and graph the solution on a real number line.
4.5 Solve application problems using a single first degree equation or inequality.

Unit 5 – Linear Equations, Inequalities and Systems of Linear Equations in Two Variables

Unit Description
The student will learn how to find the equation of a line, graph linear equations and inequalities in two variables and solve a system of two linear equations. Emphasis should be on writing and graphing equations using the slope of the line and points on the line, and applications.

Broad Learning Outcomes
Upon completion of Unit 5 students will be able to:
5.1 Define the properties of the rectangular coordinate system.
5.2 Graph a linear equation in two variables.
5.3 Graph a linear inequality in two variables.
5.4 Find the slope of a line.
5.5 Write an equation of a line.
5.6 Solve systems of linear equations.
5.7 Use function notation.
5.8 Solve application problems that require linear equations, inequalities and systems of linear equations in two variables.

Specific Objectives
Upon completion of Unit 5 students will be able to:
5.1 Define the properties of the rectangular coordinate system.
   5.1.1 Determine the coordinates of a point plotted on the coordinate plane.
   5.1.2 Determine whether an ordered pair is a solution to an equation in two variables.
   5.1.3 Graph a linear equation by finding and plotting ordered pair solutions.
5.2 Graph a linear equation in two variables.
   5.2.1 Identify the x and y intercepts of a graph.
   5.2.2 Graph a linear equation by plotting intercepts.
   5.2.3 Graph an equation given in slope-intercept form.
   5.2.4 Graph a horizontal line given its equation.
   5.2.5 Graph a vertical line given its equation.
5.3 Graph a linear inequality in two variables.
5.4 Find the slope of a line.
   5.4.1 Find the slope of a line given two points on the line.
   5.4.2 Find the slope of a line given its equation in slope-intercept form.
   5.4.3 Find the slope of a line given its equation by converting to slope-intercept form.
   5.4.4 Find the slope of a line given its graph.
   5.4.5 Find the slope of horizontal and vertical lines.
5.5 Write an equation of a line.
   5.5.1 Write an equation of a line in slope-intercept form given the slope and the y-intercept.
   5.5.2 Use point-slope form to write an equation of a line in slope intercept form given the slope and a point on the line.
   5.5.3 Use point-slope form to write an equation of a line in slope intercept form given two points on the line.
   5.5.4 Write the equation of a vertical line.
   5.5.5 Write the equation of a horizontal line.
   5.5.6 Find the equation of a line that is parallel or perpendicular to a given line and passes through a given point.
5.6 Solve systems of linear equations.
   5.6.1 Determine if an ordered pair is a solution of system of equations in two variables.
   5.6.2 Solve systems of linear equations by graphing.
   5.6.3 Solve by elimination using substitution.
5.6.4 Solve by elimination using addition.
5.6.5 Identify a system of linear equations as consistent and independent, consistent and dependent, or inconsistent.

5.7 Use function notation.
5.7.1 Evaluate \( y = f(x) \) for specific values of \( x \).
5.7.2 Given the graph of \( y = f(x) \), evaluate \( f(x) \) for specific values of \( x \).
5.7.3 Given the graph of \( y = f(x) \), find \( x \) for specific values of \( f(x) \).

5.8 Solve applications problems that require linear equations, inequalities and systems of linear equations in two variables.

Unit 6 - Exponents, Factoring and Polynomial Equations

Unit Description
The student will learn to perform operations on exponential expressions and polynomials. Students will also learn techniques to factor polynomials and use these techniques to solve polynomial equations. Emphasis should be on learning all the different factoring methods, and solving application problems using polynomial equations.

Broad Learning Outcomes
Upon completion of Unit 6 students will be able to:
6.1 Perform operations on exponential expressions using the rules of exponents.
6.2 Define, add, subtract, multiply and divide polynomials.
6.3 Factor polynomials.
6.4 Solve polynomial equations using factoring techniques.
6.5 Solve application problems involving polynomial equations and factoring.

Specific Objectives
Upon completion of Unit 6 students will be able to:
6.1 Perform operations on exponential expressions using the rules of exponents.
   6.1.1 Evaluate the product of two exponential expressions.
   6.1.2 Evaluate the quotient of two exponential expressions.
   6.1.3 Evaluate the power of a power of an exponential expression.
   6.1.4 Evaluate exponential expressions that contain negative exponents.
   6.1.5 Evaluate exponential expressions that contain combinations of products, quotients, power of a power and negative exponents.
   6.1.6 Multiply and divide numbers in Scientific Notation.
6.2 Define, add, subtract, multiply and divide polynomials.
   6.2.1 Identify an expression as a monomial, binomial, trinomial or polynomial.
   6.2.2 Add, subtract, multiply and divide monomials using the rules of exponents.
   6.2.3 Add, subtract, and multiply binomials.
   6.2.4 Add, subtract, and multiply trinomials.
   6.2.5 Add, subtract, and multiply combinations of binomials and trinomials.
6.3 Factor polynomials.
   6.3.1 Find the greatest common factor from a list of terms.
   6.3.2 Find the greatest common factor from a polynomial.
   6.3.3 Factor a polynomial by grouping.
   6.3.4 Factor trinomials of the form \( x^2 + bx + c \).
   6.3.5 Factor trinomials of the form \( ax^2 + bx + c \), \( a \neq 1 \).
   6.3.6 Factor a difference of squares.
   6.3.7 Factor a sum of two cubes.
   6.3.8 Factor a difference of two cubes.
6.4 Solve polynomial equations using factoring techniques.
6.5 Solve application problems involving polynomial equations and factoring.

Unit 7: Rational Expressions and Equations

Unit Description
The student will simplify rational algebraic expressions, solve rational algebraic equations and use them to solve application problems.

**Broad Learning Outcomes**
Upon completion of Unit 7 students will be able to:

7.1 Identify a rational algebraic expression.
7.2 Simplify rational algebraic expressions.
7.3 Perform arithmetic operations with rational algebraic expressions.
7.4 Solve rational algebraic equations.
7.5 Solve application problems using rational algebraic equations.

**Specific Objectives**
Upon completion of Unit 7 students will be able to:

7.1 **Identify a rational algebraic expression.**
   7.1.1 Identify the real value of the variable for which a rational algebraic expression having a denominator of the form \(ax + b\) is undefined.
   7.1.2 Identify all real values of the variable for which a rational algebraic expression having a denominator of the form \(ax^2 + bx + c\) is undefined.
   7.1.3 Express a rational algebraic expression having negative exponents as an equivalent rational expression without negative exponents.

7.2 **Simplify rational algebraic expressions.**
   7.2.1 Simplify a rational algebraic expression.
   7.2.2 Evaluate a rational algebraic expression given specific integral values for each variable.

7.3 **Perform arithmetic operations with rational algebraic expressions.**
   7.3.1 Perform addition and subtraction of rational algebraic expressions having like denominators.
   7.3.2 Find the Least Common Denominator (LCD) of two or more rational algebraic expressions.
   7.3.3 Perform addition and subtraction of rational algebraic expressions having denominators that have no common factors.
   7.3.4 Perform addition and subtraction of rational algebraic expressions having denominators that have a common monomial factor.
   7.3.5 Perform addition and subtraction of rational algebraic expressions having denominators that have a common binomial factor.
   7.3.6 Perform multiplication of rational algebraic expressions and express the product in simplest terms.
   7.3.7 Use factorization to divide rational algebraic expressions and express the quotient in simplest terms.
   7.3.8 Simplify complex fractions.
   7.3.9 Divide a polynomial by a monomial.
   7.3.10 Perform polynomial long division having binomial divisors of the form \(ax + b\).

7.4 **Solve rational algebraic equations.**

7.5 **Solve application problems using rational algebraic equations.**
   7.5.1 Write a rational equation to match the information given in an application problem.
   7.5.2 Solve an application problem using rational equations.

**Unit 8: Rational Exponents and Radicals**

**Unit Description**
The student will simplify radical expressions, and use rational exponents. The student will solve radical equations and use them to solve application problems.

**Broad Learning Outcomes**
Upon completion of Unit 8 students will be able to:

8.1 Demonstrate the equivalence of radical and rational exponent forms.
8.2 Compute and estimate radicals.
8.3 Simplify radicals and radical expressions.
8.4 Perform operations (add, subtract, multiply) on radicals and radical expressions.
8.5 Rationalize the denominator (one term and two terms).
8.6 Solve radical equations.
8.7 Define the imaginary unit and imaginary numbers.
8.8 Simplify square roots of negative numbers using the imaginary unit.
8.9 Solve application problems involving radicals.

Specific Objectives
Upon completion of Unit 8 students will be able to:

8.1 Demonstrate the equivalence of radical and rational exponent forms.
8.1.1 Convert between square root and $a^{1/2}$ forms.
8.1.2 Convert between nth root and $a^{1/n}$ forms.
8.1.3 Convert between combinations of $n^{th}$ root and $m^{th}$ power and $a^{m/n}$ forms.

8.2 Compute and estimate radicals.
8.2.1 Calculate square roots via calculator.
8.2.2 Estimate square roots.
8.2.3 Calculate $n^{th}$ roots via calculator.

8.3 Simplify radicals and radical expressions.
8.3.1 Simplify using the properties of rational exponents.
8.3.2 Simplify square roots.
8.3.3 Simplify $n^{th}$ roots of variable expressions.
8.3.4 Simplify radicals by using the multiplication property of radicals.
8.3.5 Simplify radicals by using the division property of radicals.

8.4 Perform operations (add, subtract, multiply) on radicals and radical expressions.
8.4.1 Define like radicals.
8.4.2 Combine and simplify like radicals.
8.4.3 Multiply and simplify radicals.

8.5 Rationalize the denominator (one term and two terms).
8.5.1 Simplify radicals by rationalizing a denominator with one term.
8.5.2 Simplify radicals by rationalizing a denominator with two terms.

8.6 Solve radical equations.
8.7 Define the imaginary unit and imaginary numbers.
8.7.1 Define $i = \sqrt{-1}$.
8.7.2 Define imaginary numbers (e.g. $\sqrt{-25}$).

8.8 Simplify square roots of negative numbers using the imaginary unit.

8.9 Solve application problems involving radicals.
8.9.1 Solve problems involving right triangles.
8.9.2 Solve problems involving the Pythagorean Theorem.
8.9.3 Solve problems involving the distance formula.

Unit 9 – Functions, Quadratic Equations, and Parabolas

Unit Description
In this unit the student will have an introduction to functions in ordered pair, graph, and equation form. The student will engage in a thorough introduction to quadratic functions and their properties as they complete preparation for entering STEM or business-administration college-level mathematics courses.

Broad Learning Outcomes
Upon completion of Unit 9 students will be able to:

9.1 Determine if a relation is a function and identify the domain and range of the function.
9.2 Find all roots of quadratic equations using both the square root method and the quadratic formula.
9.3 Analyze a quadratic function to determine its vertex by completing the square and using the formula.
9.4 Graph a quadratic function, using the vertex form, indicating the intercepts and vertex.
9.5 Apply knowledge of quadratic functions to solve application problems from geometry, economics, applied physics, and other disciplines.
Specific Objectives
Upon completion of Unit 9 students will be able to:

9.1 Determine if a relation is a function and identify the domain and range of the function.
   9.1.1 Determine if a list of ordered pairs, graph, or equation is a function.
   9.1.2 Determine the domain and range of a function given as a list of ordered pairs.
   9.1.3 Determine the domain and range of a function given as a graph.
   9.1.4 Determine the domain of a function given as an equation.
   9.1.5 Evaluate \( y = f(x) \) for constant values of and for specific monomials and binomials.

9.2 Find all roots of quadratic equations using both the square root method and the quadratic formula.
   9.2.1 Find the roots of quadratic equations of the form \( ax^2 + c = 0 \).
   9.2.2 Find the roots of quadratic equations of the form \( ax^2 + bx + c = 0 \) when the discriminant is a positive
      perfect square, (i.e. the quadratic is factorable).
   9.2.3 Find the roots of quadratic equations of the form \( ax^2 + bx + c = 0 \) when the discriminant is positive,
      but not a perfect square.
   9.2.4 Find the roots of quadratic equations of the form \( ax^2 + bx + c = 0 \) when the discriminant is zero.
   9.2.5 Find the roots of quadratic equations of the form \( ax^2 + bx + c = 0 \) when the discriminant is negative.
   9.2.6 Describe the roots of a quadratic based upon the discriminant in all cases.

9.3 Analyze a quadratic function to determine its vertex by completing the square and using the formula.
   9.3.1 Write a quadratic function in vertex form \( y = a(x - h)^2 + k \) by completing the square for quadratics
      with \( a = 1 \) and identify the vertex \((h, k)\).
   9.3.2 Write a quadratic function in vertex form \( y = a(x - h)^2 + k \) by completing the square for quadratics
      with \( a \neq 1 \) and identify the vertex \((h, k)\).
   9.3.3 Find the vertex of a quadratic equation \( y = ax^2 + bx + c \) using the formula method \( \left( \frac{-b}{2a}, f \left( \frac{-b}{2a} \right) \right) \).

9.4 Graph a quadratic function, using the vertex form, indicating the intercepts and vertex.
   9.4.1 Determine whether the parabola opens upward or downward.
   9.4.2 Plot the vertex of the parabola.
   9.4.3 Determine the axis of symmetry for the parabola.
   9.4.4 Plot the x-intercepts of the parabola, if they exist.
   9.4.5 Plot the y-intercept of the parabola and complete the graph with additional points as needed.

9.5 Apply knowledge of quadratic functions to solve application problems from geometry, economics, applied
    physics, and other disciplines.
   9.5.1 Solve problems involving area optimization.
   9.5.2 Solve problems involving revenue optimization.
   9.5.3 Solve problems involving the motion of falling objects.
TESTING CENTERS INFORMATION

<table>
<thead>
<tr>
<th>Testing Center - Martin Hall</th>
<th>New River Valley Mall Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone: 540-674-3600 extension 4439</td>
<td>Phone: 540-674-3610 and 540-674-3620</td>
</tr>
<tr>
<td>Fax: 540-674-3643</td>
<td>Fax: 540-381-7128</td>
</tr>
<tr>
<td>Monday &amp; Thursday 8 a.m. - 9 p.m.</td>
<td>Monday-Thursday 8 a.m. - 10 p.m.</td>
</tr>
<tr>
<td>Tuesday &amp; Wednesday 8 a.m. - 6 p.m.</td>
<td>Friday 8 a.m. - 5 p.m.</td>
</tr>
<tr>
<td>Friday 8 a.m. - 5 p.m.</td>
<td>Saturday 9 a.m. - 1 p.m.</td>
</tr>
<tr>
<td>Sunday 1 p.m. - 5 p.m.</td>
<td></td>
</tr>
</tbody>
</table>

*TESTS MUST BE REQUESTED BEFORE THE LAST 2 HOURS OF OPERATION*

IMPORTANT SEMESTER DATES

Classes Begin.............................................................................................................................Monday, May 23
Last day to add class without instructor approval .................................................................Friday, May 27
HOLIDAY/NO CLASSES – College Closed .................................................................................Monday, July 4

Last day to drop with full refund ...................................................................................... Thursday, June 2
HOLIDAY/NO CLASSES – College Closed .................................................................................Monday, July 4
Last day to drop and receive “W” grade ............................................................................... Tuesday, July 5
Last day to submit DE assignments/tests ............................................................................. See Course Plan/Assignment Schedule

Classes End ............................................................................................................................ Tuesday, August 2
Grades due from Faculty ......................................................................................................... (by Noon) Wednesday, August 3
Grades available online for Students ..................................................................................... Thursday, August 4

ESSENTIAL PHONE NUMBERS

NRCC Main Number.................................................................................................................. 540-674-3600
NRV Mall Site .......................................................................................................................... 540-674-3610 and 540-674-3620
NRCC Toll Free ....................................................................................................................... 1-866-462-6722
Distance Education Office ...................................................................................................... 540-674-3614
Blackboard Technical Help ..................................................................................................... 540-674-3614
College Bookstore .................................................................................................................. 540-674-3638

For bookstore operational hours and other information: [www.nr.edu/bookstore](http://www.nr.edu/bookstore)