# COURSE OUTLINE

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MAT115</td>
<td>Algebra and Trigonometry I</td>
<td>3</td>
</tr>
</tbody>
</table>

## Hours:
- **lecture/Lab/Other**: 3 lecture hours

## Co- or Pre-requisite
- Completion of MAT037 (formerly MAT034) or MAT042 with a grade of C or better or MAT037A and MAT037B with a grade of C or better in both courses, successful completion of a course equivalent to MAT037, an appropriate score on the College-Level Math Placement Test, or permission of the department chairperson.

## Implementation
- sem/year: Fall 2014

## Catalog description (2012-2014 Catalog):
Primarily for students majoring in engineering technology or related programs. Topics include polynomial and rational expressions and equations, an introduction to trigonometric functions and applications of trigonometry, linear and quadratic equations and inequalities, systems of equations, operations on functions and function composition, and application problems.

## Is course New, Revised, or Modified?
Revised Fall 2020

## Required texts/other materials:
2. Calculator: A graphing calculator such as the TI-83 or TI-84 is required. No calculator with a symbolic manipulator is allowed.

## Revision date: Course coordinator:
- **Revision date**: Fall 2020
- **Course coordinator**: Elizabeth Car 609.570.3409 carre@mccc.edu

## Information resources:
The Mercer County Community College Library has close to 100 reference books that students may use. DVDs will be available in the library for students to use at home or on campus. Students are also encouraged to utilize the Learning Centers for additional resources and/or tutoring.
Course-specific General Education Knowledge Goals and Core Skills:

General Education Knowledge Goals

Goal 1. Communication. Students will communicate effectively in both speech and writing.
Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

MCCC Core Skills

Goal A. Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.
Goal D. Information Literacy. Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.

In the list below, GE refers to General Education Knowledge Goals and Core refers to MCCC Core Skills.

Course Competencies/Goals:

Students will be able to demonstrate through tests, projects and quizzes/homework the ability to:

1. solve and graph linear, quadratic, and absolute value equations. (GE 2,4; Core B,E)
2. Solve and graph linear and compound inequalities including absolute value inequalities. (GE 2,4; Core B,E)
3. factor a second degree polynomial and some special higher degree polynomials. (GE 2,4; Core B,D, E)
4. recognize and work with functions and function notation. (GE 2,4; Core B)
5. perform operations and solve equations involving polynomial, radical and rational expressions. (GE 2,4; Core B)
6. solve a system of two linear equations. (GE 2,4; Core B,E)
7. demonstrate knowledge of right triangle trigonometry. (GE 2,4; Core A,B,D,E)
8. identify the graphs of trigonometric functions. (GE 2,4; Core A,B,D,E)
9. solve triangles other than right triangles. (GE 1, 2,4; Core B,D,E)
10. construct and/or analyze both linear and quadratic models of real life phenomenon and predict future data values from these models. (GE 1,2,4; Core A,B,D,E)

11. apply each of the above techniques to various applications. (GE 1,2,4; Core A,B,D,E)

In the following outline of the units of study, CG matches each objective with its course goal and the associated general education and MCCC core skills.

**Units of study in detail:**

**Unit I: Trigonometric Functions**

The student will be able to:

- define relations and functions. (CG 4)
- use function notation to evaluate outputs for given inputs. (CG 4)
- identify the domain and range of a function. (CG 4)
- display proficiency in working with positive, negative, coterminal, straight, right, acute, obtuse, complementary, quadrantal, and supplementary angles. (CG 7)
- convert from radian measure to degree measure and vice-versa. (CG 4)
- use the formula \( \theta = \frac{s}{r} \) to find the radian measure for a central angle which subtends an arc \( s \) on a circle of radius \( r \). (CG 4)
- find a positive and a negative coterminal angle for a given angle in degrees and radians. (CG 4)
- find linear speed and angular speed in applications. (CG 4)
- define the six circular or trigonometric functions in terms of the unit circle; in terms of \( a, b, \) and \( r \); or in terms of the sides of a right triangle. (CG 4)
- determine the signs of the trigonometric functions in any given quadrant. (CG 4)
- find the reference angle for a given angle. (CG 4)
- find the values of the six trigonometric functions for an angle \( \theta \) in standard position that has a terminal side passing through a given point \((a,b)\) or when given the value of one of the trigonometric functions of the angle by hand or by calculator where appropriate. (CG 4)
- display proficiency in applying reciprocal and Pythagorean identities with trigonometric functions. (CG 4)
- solve for the missing sides and angles of a right triangle when given one other angle and a side or when given two sides. (CG 9,11)
- solve right triangles in contextual applications. (CG 9,11)
- sketch the graphs of equations of the form \( y = A \sin (Bx + C) + k \) or \( y = A \cos (Bx + C) + k \), and determine the amplitude, period, phase shift and vertical shift, as well as the intercepts, domain and range. (CG 9,11)
- use graphing calculator technology to accomplish these tasks, where applicable. (CG 7,8,9)
Unit II: Polynomial, Rational, and Radical Expressions and Operations (4.0 weeks)

The student will be able to:

- define monomial and polynomial. (CG 5)
- add and subtract polynomials. (CG 5)
- multiply monomials and binomials and special products (squares of binomials, etc.) (CG 5)
- divide polynomials. (CG 5)
- factor the GCF from polynomials and expressions. (CG 5)
- factor polynomials by grouping. (CG 3)
- factor various trinomials. (CG 3)
- factor the difference of two squares, and the sum/difference of two cubes. (CG 3)
- define and solve quadratic equations by the zero product property. (CG 1,3)
- define rational expressions and identify where they’re undefined (CG 5)
- simplify rational expressions. (CG 5)
- multiply and divide rational expressions. (CG 5)
- find the LCD (least common denominator) for given rational expressions. (CG 5)
- add and subtract rational expressions (CG 5)
- define and calculate square, cube, and n-th root of a number. (CG 5)
- calculate and/or simplify expressions with radicals or rational exponents. (CG 5)
- add and subtract radical expressions. (CG 5)
- multiply and divide radical expressions (CG 5)
- analyze and interpret application problems from other disciplines and/or complete assigned project(s). (CG 1, 2, 3, 10, & 11)

III. Equations and Inequalities (4.5 weeks)

The student will be able to:

- define and solve linear equations in one variable. (CG 2,4)
- determine if a given number is a solution to a given linear equation. (CG 11)
- define and solve linear inequalities in one variable. (CG 2)
- determine if a given number is a solution to a given linear inequality (CG 2)
- graph solutions to linear inequalities on a real number line and express solutions in interval notation. (CG 2)
- define, solve, and graph solutions to compound linear inequalities, as well as compound linear inequalities using “and” & “or” terminology. (CG 2)
- solve linear systems of equations having solutions. (CG 6)
- solve rational equations. (CG 5)
- define and solve quadratic equations by completing the square and/or the quadratic formula. (CG 3,5)
- analyze and interpret application problems from other disciplines and/or complete assigned project(s). (CG 1, 2, 5, 10)
- use graphing calculator technology to accomplish these tasks, where applicable. (CG 7,8,9)
Unit IV: Further Topics in Trigonometry (1.5 weeks)

The student will be able to:

• state and apply the Laws of Sines and Cosines in standard skills and word problems. (CG 9)
• define and represent vectors and perform standard operations with vectors. (CG 9)
• use graphing calculator technology to accomplish these tasks, where appropriate. (CG 9,11)

Evaluation of student learning:

Students should receive regular feedback on their work through tests, projects, and quizzes/homework. The syllabus for this course should describe the schedule for classes and assessments. A suggested day-to-day schedule (based on a 30-class semester) and a list of minimum suggested homework exercises from the text are available from the course coordinator.

A minimum of 4 tests must be given per semester, as well as a comprehensive final exam. Exams used by instructors must be submitted to the course coordinators in a timely fashion for review to determine appropriate content coverage and exam readability. A suggested grading scheme for the course is provided below, although the individual instructor can modify it, provided that the minimum requirements above are met.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Unit Tests (4)</td>
<td>60%</td>
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<tr>
<td>In-class Quizzes, Assigned Homework, etc</td>
<td>15%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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Academic Integrity Statement:

Under no circumstance should students knowingly represent the work of another as one’s own. Students may not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to the Student Handbook for more details.