# COURSE OUTLINE

<table>
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<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>MAT116</td>
<td>Algebra and Trigonometry II</td>
<td>3</td>
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### Hours:
- **lecture/Lab/Other**: 3 lecture hours  

### Co- or Pre-requisite
- Completion of MAT115 with a grade of C or better; successful completion of a course equivalent to MAT115, an appropriate score on the College-Level Math Placement Test, or permission of the department chairperson.

### Implementation
- **sem/year**: Fall 2014

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**Catalog description (2012-2014 Catalog):** Primarily for students majoring in engineering technology or related programs. Topics include graphs of linear functions, logarithmic and exponential functions and equations, complex numbers, systems of nonlinear equations, trigonometric identities and equations, inverse trigonometric functions, polar coordinates, and analytic geometry.

**Is course New, Revised, or Modified?** Revised Fall 2019

**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:
- **Fall 2019**  
  Elizabeth Carr  
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**Information resources:** The Mercer County Community College Library has close to 100 reference books that students may use. A student solutions manual is available as well as MyMathLab, on online homework and tutorial system. 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 top 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 and quadratic functions and inequalities. (GE 1,2,4; Core A,B,D,E)
2. define complex numbers, perform operations with them, and apply DeMoivre’s theorem. (GE 2; Core A, B,E)
3. perform polynomial and synthetic division and use it determine roots of polynomial functions. (GE 2,3; Core A,B,E)
4. demonstrate knowledge of exponential and logarithmic functions and equations. (GE 2,4; Core A,B,E)
5. define and use inverse trigonometric functions to solve trigonometric equations and applications. (GE 2,4; Core A,B,E)
6. apply the fundamental trigonometric identities to simplify trigonometric expressions. (GE 2,4; Core A,B,E)
7. recognize algebraically and graphically the conic sections and find pertinent information about them. (GE 1,2,4; Core A,B,D,E)
8. 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.

**Unit I. Graphs and Equations** (4.5 weeks)

The student will be able to:

- plot points and identify quadrants on the coordinate plane. (CG 1)
- define independent (x-variable) and dependent (y-variable) axes. (CG 1)
- read, interpret, and explain trends in graphs which model applications. (CG 1,8)
- define, calculate and interpret slope, especially as a rate of change. (CG 1,8)
- determine relationship between slope and horizontal, vertical, parallel, and perpendicular lines. (CG 2)
- define and graph linear equations in two variables. (CG 1,8)
- identify and graph x- and y-intercepts of a graph, and interpret them in context. (CG 1,8)
- express and graph linear equations in slope-intercept form. (CG 1)
- use linear modeling to find the equation of a line through two given points, or a slope and y-intercept. (CG 1,8)
- find equations of lines that are horizontal, vertical, and parallel/perpendicular to given lines. (CG 1)
- use the imaginary unit, $i$, to write complex numbers. (CG 2)
- perform the algebra of complex numbers. (CG 2)
- use complex conjugates to write the quotient of two complex numbers in standard form(CG 2)
- solve quadratic inequalities by factoring, extracting square roots, completing the square and using the quadratic formula. (CG 1)
- convert Cartesian coordinates to polar coordinates and vice-versa. (CG 2)
- apply DeMoivre’s Theorem. (CG 2)
- perform algebraic long division and synthetic division of polynomials. (CG 3)
- find all real zeros of a polynomial function using polynomial or synthetic division. (CG 3)
- analyze and interpret application problems from other disciplines and/or complete assigned project(s). (CG 1,2,3,8)

**Unit II. Exponential and Logarithmic Functions and Equations** (4 weeks)

The student will be able to:

- distinguish between linear and exponential growth. (CG 2,4)
- solve exponential equations in which it is possible to convert to the same base and equate exponents. (CG 4)
- simplify and evaluate logarithmic expressions. (CG 4)
- write logarithmic expressions in simpler form using the properties of logarithms(CG 4)
- write a given expression as a single logarithm using the properties of logarithms(CG 4)
- solve logarithmic equations using the properties of logarithms. (CG 4,8)
- use a calculator to evaluate expressions involving common and natural logarithms. (CG 4,8)
- solve applications that result in exponential or logarithmic models. (CG 4,8)
- solve exponential equations by converting to logarithmic form. (CG 4)
- solve logarithmic equations by converting to exponential form. (CG 4)
- use the change of base formula to find the logarithm of any number in any base > 0 using base 10 or base $e$. (CG 4)
III. Trigonometric Identities and Equations (4.5 weeks)

The student will be able to:

- find the acute angle $\theta$ when given a trigonometric function value of $\theta$ by using inverse trigonometric functions. (CG 5)
- evaluate given inverse trigonometric expressions. (CG 4)
- solve applications that result in trigonometric or inverse trigonometric equations. (CG 5,8)
- use graphing calculator technology to accomplish these tasks, where applicable. (CG 5,8)
- state and apply the basic trigonometric identities including the reciprocal, quotient, negatives, and Pythagorean identities. (CG 6)
- state and apply the sum and difference identities. (CG 6)
- state and apply the cofunction identities; that is, cofunctions of complementary angles are equal. (CG 6)
- state and apply the double- and half-angle identities. (CG 6)
- solve conditional trigonometric equations. (CG 5,6,8)
- distinguish between trigonometric identities and conditional trigonometric equations. (CG 5,6,8)
- verify trigonometric identities by using definitions or previously verified trigonometric identities such as the reciprocal, quotient, Pythagorean, sum and difference, cofunction, double- or half-angle identities. (CG 5,6,8)
- use appropriate sum/difference identities to find exact values of trigonometric functions of given angles in radical form. (CG 5,6,8)
- solve conditional trigonometric equations by using identities to rewrite in terms of one or two trigonometric functions and factoring, or using a graphing calculator to find all solutions for $0 \leq \theta < 2\pi$ or $0^\circ \leq \theta < 360^\circ$. (CG 5,6,8)
- solve applications that result in trigonometric equations and utilize trigonometric identities(CG 5,6,8)

Unit IV. Analytic Geometry (2.5 weeks)

The student will be able to:

- describe how conic sections are formed and how to recognize from an equation which of the conic sections the equation represents. (CG 7)
- write the equation of a parabola using focus, directrix or vertex. (CG 7)
- find the focus, directrix and vertex given the equation of a parabola. (CG 7)
- sketch a parabola given focus, directrix and vertex or given its equation(CG 7)
- find the equation of an ellipse or hyperbola using center, focus, and vertices or using the eccentricity and vertices(CG 7)
- find the center, vertices, foci and asymptotes of a hyperbola given the equation and vice versa. (CG 7)
- write the equation of a circle given the center and radius. (CG 7)
- find the center and radius of a circle given the equation and vice versa. (CG 7)
- solve application problems involving conic sections. (CG 7,8)
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>
</tr>
<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.