

# **MAT116 Algebra and Trigonometry II Syllabus Revised Fall 2009**

## ***Course Information***

<b>Organization</b>	Liberal Arts – Mathematics
<b>Course Number</b>	MAT116
<b>Credits</b>	3
<b>Contact Hours</b>	3
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## **Description**

Continuation of MAT115. Topics include complex numbers, logarithmic and exponential functions, solving systems of non-linear equations, trigonometric identities and equations, inverse trig functions, and analytic geometry.

## **Prerequisites**

MAT115 with a minimum of C grade or satisfaction of initial placement guidelines.

## **Textbooks**

Washington. *Basic Technical Mathematics*. Pearson, Prentice Hall. **Edition:** 9th.  
**ISBN-13: 978-** 0-13-814225-4. **ISBN-10:** 0-13-814225-4.

## **Learner Supplies**

Calculator.

## **Core Abilities**

- A. Recognize critical thinking and problem solving skills in analyzing information.
- B. Recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
- C. Use computers to access, analyze or present information, solve problems, and communicate with others.

## **General Education Outcomes**

- A. Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
- B. Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

## Competencies

1. Recognize, manipulate, perform operations on, represent in rectangular and polar forms and apply to electrical word problems complex numbers.

### Linked Core Abilities

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Use computers to access, analyze or present information, solve problems, and communicate with others.

### General Education Outcomes

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.

### Learning Objectives

- a. Define imaginary unit, complex number, pure imaginary numbers, rectangular form of a complex number, conjugate of a complex number, and equality of two complex numbers
  - b. Perform the indicated operations and/or simplify to the form  $a + bj$  using complex numbers
  - c. Solve equations using the definition of equality of complex numbers
  - d. Multiply, divide, add and subtract complex numbers in standard rectangular form.
  - e. Graph any complex number in rectangular form on the complex plane and illustrate the operations of addition and subtraction of two or more complex numbers graphically.
  - f. Use DeMoivre's Theorem to establish formulas for multiplication, division and for raising a complex number to any  $n$ th power, is introduced.
  - g. Use complex numbers to solve problems with alternating current (a-c) circuits, measure voltage between any two points in a simple a-c circuit and define terms such as resistance, capacitance, inductance, reactance, impedance, phase and out of phase.
2. Define, solve and manipulate logarithmic and exponential equations and their inverses.

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### General Education Outcomes

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### Learning Objectives

- a. Define and graph exponential, logarithmic and inverse functions
- b. Convert an equation in logarithmic form to exponential form and conversely.
- c. Use the basic properties of logarithms in solve various types of problems.
- d. Use common logs or natural logs on a calculator for computations
- e. Use a calculator to solve triangle and vector problems.
- f. Change logarithms to base 10 or base  $e$
- g. Solve equations using the "inverse" relationship between the exponential and the logarithm

function along with electric circuit applications

h. Graph of functions using semi-logarithmic and logarithmic paper

3. Recognize, manipulate and simplify expressions using trigonometric identities

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**General Education Outcomes**

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**Learning Objectives**

- a. Use fundamental trigonometric identities to prove unfamiliar identities
- b. Apply trigonometric sum and difference formulas and double-angle and half-angle identities, in particular for the sine and cosine functions, in solving various identities, simplifying trigonometric expressions and evaluating expressions without using the tables or the hand held calculator.
- c. Use the various trigonometric identities to solve a variety of trigonometric equations.
- d. Evaluate inverse trigonometric relations and functions utilizing their graphs
- e. Find an equivalent algebraic expression for inverse trigonometric expressions

4. Solve and graph solutions to polar equations and equations involving lines and conic sections.

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**Learning Objectives**

- a. Define and apply slope, inclination of a line, parallel and perpendicular lines and the distance formula
- b. Solve problems including the general form, slope-intercept form and the point-slope form of the equation of a straight line.
- c. Define and apply to problems the circle and its standard form
- d. Determine the focus, the equation of the directrix and sketch the graph given the equation of a parabola and vice versa
- e. Apply the definition of the ellipse to problem solving involving calculations of major and minor axes, intercepts and foci.
- f. Apply the definition of the hyperbola to problem solving involving calculations of transverse and conjugate axis, vertices, foci, and asymptotes
- g. Find equations of conic section given type of curve, center, vertex, directrix, etc

- h. Solve problems using polar coordinates
  - i. Change equations in polar form to corresponding equations in rectangular form.
  - j. Graph polar equations such as:
5. Solve systems of equations and reduce equations to quadratic form

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**General Education Outcomes**

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Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Learning Objectives**

- a. Solve graphically quadratic, conic section, logarithmic, etc. equations
  - b. Solve systems of quadratic equations (in two variables) or systems consisting of a quadratic and a linear equation by the methods of substitution and addition-subtraction.
  - c. Solve equations in quadratic form by methods applicable to quadratic equations, even though they are not actually quadratic themselves
  - d. Reduce radical equations to a quadratic or linear form by the technique of squaring both sides of the equation and test for extraneous roots
6. Use synthetic division to find remainder, factors, and solutions to polynomial equations

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**Learning Objectives**

- a. Find the remainder by both long division and the remainder theorem.
- b. Use the factor theorem to determine whether or not the divisor is a factor of the dividend.
- c. Divide a polynomial  $f(x)$  by a binomial  $(x - r)$  by synthetic division. Using this synthetic division and the factor theorem to determine if one given polynomial is a factor of another using synthetic division
- d. Apply the fundamental theorem of algebra and synthetic division to find the roots of a polynomial equation
- e. Solve completely 3rd, 4th, 5th and 6th degree polynomial equations
- f. Solve polynomial equations which have more than 2 rational roots by the method of linear interpolation.
- g. Solve polynomial equations which have irrational roots

## ***Grading Information***

### **Grading Rationale**

Instructor created tests, quizzes, homework assignments and projects may be used in evaluating the students' progress. The instructor will create and administer a cumulative final exam. A suggested day-by-day schedule and suggested homework problems are available to the instructors. These are available from the course coordinators.

A possible plan for determining the students' final grades is as follows:

Four Unit tests 60%

Cumulative Final Exam 25%

Homework, Projects and quizzes 15%

## ***Guidelines for Success***

### **General guidelines**

1. Students will develop a confidence and competence in computational mathematics.
2. Students will more fully develop skills in algebra and plane analytic geometry which the students may apply to future technical pursuits as well as being vital to the study of calculus.
3. Students will develop an appreciation for mathematical theory to reinforce the understanding of the applications presented.

### **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.