

## COURSE OUTLINE

### **Mathematics 118 Elementary and Intermediate Algebra for STEM**

#### **Catalog Statement**

MATH 118 is an accelerated course combining the second half of Elementary Algebra with Intermediate Algebra. Topics include fundamental laws, linear and absolute value equations and inequalities, systems of linear and nonlinear equations and inequalities, Cramer's Rule, factoring, quadratic equations and inequalities, fractional exponents, radical and rational expressions and equations, functions and inverse functions, algebra of functions, curve plotting, graphs of functions, exponential and logarithmic functions, conic sections, arithmetic and geometric sequences and series, the binomial theorem. This course is preparation primarily for students entering college algebra, precalculus, or business calculus.

Total Lecture Units: 5.0

Total Laboratory Units: 1.0

**Total Course Units: 6.0**

Total Lecture Hours: 80.0

Total Laboratory Hours: 48.0

Total Laboratory Hours To Be Arranged: 0.0

**Total Faculty Contact Hours: 128.0**

Prerequisite: Placement is based on satisfactory completion of MATH 144, MATH 145, or MATH 245B.

Note: This course may not be taken for credit by students who have completed MATH 101, 120, or 220B. A maximum of 6 units of credit will be granted for Mathematics 118, 146, 246A, and 246B. A maximum of 7 units will be granted for MATH 118 and 131, OR a maximum of 9 units will be granted for MATH 118 and 130.

#### **Course Entry Expectations**

Prior to enrolling in the course, the student should be able to:

- add, subtract, multiply, and divide real numbers;
- solve linear equations and inequalities;
- solve absolute value equations and inequalities;
- simplify exponential expressions;
- add, subtract, multiply, and divide polynomials;
- graph linear equations and inequalities;
- find the equation of a line;
- solve linear systems;
- use algebra to solve applied problems;
- use function notation.

### **Course Exit Standards**

Upon successful completion of the required coursework, the student will be able to:

- solve absolute value equations and inequalities;
- solve linear equations and compound inequalities;
- perform operations with polynomials;
- simplify complex fractions;
- perform operations with radical expressions;
- simplify expressions with rational exponents;
- divide synthetically;
- solve rational equations;
- solve equations with radicals;
- find the equation of a line parallel or perpendicular to a given line;
- solve a system of linear equations using elimination, substitution, and Cramer's rule;
- solve systems of linear inequalities;
- find the composition of two functions;
- solve applied problems;
- solve quadratic equations with real and complex solutions;
- find the inverse of a function;
- use the properties of logarithms to simplify and expand expressions;
- solve logarithmic and exponential equations;
- find the  $n$ th term of arithmetic and geometric sequences;
- find the sum of a finite series and an infinite geometric series;
- graph functions (linear, quadratic, exponential, logarithmic);
- graph conic sections centered at any point;
- solve a non-linear system;
- expand the power of a binomial.

### **Course Content**

**Total Faculty Contact Hours = 128.0**

#### **The Real Number System (2 hours)**

Sets and the real number system  
Equality and properties of real numbers  
Inequalities and graphs of sets of real numbers  
Arithmetic of real numbers

#### **Equations and Inequalities (10 hours)**

Linear equations and their solutions  
Applications  
Formulas and literal equations  
Absolute value equations  
Linear inequalities  
Inequalities with absolute values

**Graphs of Lines, Equations of Lines, and Variation (7 hours)**

- The rectangular coordinate system
- The slope of a line
- Equations of lines
- Graphs of linear inequalities in two variables
- Introduction to functions
- The algebra of functions, composition of functions
- Proportion and variation

**Systems of Equations and Inequalities (7 hours)**

- Solution by graphing
- Solution by substitution
- Solution by elimination
- Solution of three equations in three variables
- Determinants
- Cramer's Rule
- Applications
- Systems of linear inequalities

**Exponents, Polynomials, and Factoring (14 hours)**

- Exponents and scientific notation
- Adding and subtracting polynomials
- Multiplying polynomials and dividing polynomials
- Synthetic division
- The greatest common factor and factoring by grouping
- The difference of two squares; the sum and difference of two cubes
- Factoring trinomials
- Solving equations by factoring
- Applications

**Rational Expressions (8 hours)**

- Simplifying rational expressions
- Multiplying and dividing rational expressions
- Adding and subtracting rational expressions
- Complex fractions
- Equations containing rational expressions
- Applications
- Difference quotients

**Rational Exponents and Radicals (7 hours)**

- Definition and common roots
- Properties of radicals
- Simplified form for radicals
- Rational exponents
- Radical expressions
- Adding and subtracting radical expressions
- Multiplying and dividing radical expressions
- Solving equations with radicals
- Applications of radicals
- Complex numbers

**Quadratic Equations (6 hours)**

Solving using the square root method  
Completing the square  
Quadratic formula  
The discriminant and its applications  
Equations quadratic in form

**Exponential and Logarithmic Functions (9 hours)**

One-to-one functions  
Inverse functions  
Exponential functions  
Logarithmic functions  
Properties of logarithms  
Common and natural logarithms  
Exponential equations and change of base  
Solving logarithmic equations  
Applications

**The Conic Sections (5 hours)**

Parabolas  
Distance formula and circles  
Ellipses and hyperbolas  
Second-degree inequalities  
Nonlinear systems of equations and inequalities

**Sequences and Series (5 hours)**

Sequences  
Series and summation notation  
Arithmetic progressions  
Geometric progressions  
The binomial expansion

**Laboratory Content (48 hours)**

Simplify radical and rational expressions  
Factor polynomials  
Solve systems of equations and inequalities  
Graph lines, quadratic functions, rational functions, radical functions, exponential  
Functions, logarithms, and conics  
Apply the binomial expansion to various binomials  
Apply mathematical models

**Methods of Instruction**

The following methods of instruction may be used in the course:

- lecture/discussion;
- group work/discussion;
- online presentation;
- guest speakers;
- computer software and/or graphing calculator demonstrations and activities.

### **Out of Class Assignments**

The following out of class assignments may be used in the course:

- homework (e.g. problems sets related to course content);
- group assignments and projects.

### **Methods of Evaluation**

The following methods of evaluation may be used in the course:

- quizzes;
- six to nine examinations are required;
- a comprehensive final examination is required.

### **Textbooks**

Tussy, Alan, and David Gustafson. *Elementary Algebra*: Glendale Community College. 5<sup>th</sup> ed. Boston: Cengage Learning, 2016. Print.

8<sup>th</sup> Grade Textbook Reading Level. ISBN: 978-1-111-56766-8

Tussy, Alan, and David Gustafson. *Intermediate Algebra*: Glendale Community College. 5<sup>th</sup> ed. Boston: Cengage Learning, 2016. Print.

8<sup>th</sup> Grade Textbook Reading Level. ISBN: 978-1-111-56767-5

### **Student Learning Outcomes**

Upon successful completion of the required coursework, the student will be able to:

- solve linear, absolute value, rational, radical, quadratic, exponential, and logarithmic equations, solve linear, absolute value, and quadratic inequalities, and solve systems of equations;
- simplify polynomial, rational, radical, exponential, and logarithmic expressions;
- graph linear, quadratic, exponential, and logarithmic functions and graph conic sections;
- use mathematical models including linear, quadratic, rational, radical, exponential, and logarithmic equations, sequences, series, and systems of equations to solve application problems;
- apply the formulas of arithmetic and geometric sequences and series, and apply the binomial theorem.