WINONA STATE UNIVERSITY

COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT OF MATHEMATICS AND STATISTICS

**Course Outline-MATH 115**

**Course Title:** College Algebra

**Number of Credits**: 3

**Catalog Description:** This course will give students a preparation for conceptual understanding and procedural fluency in algebra. Topics include review of basic algebraic concepts; functions and graphs; polynomial, radical, rational, exponential and logarithmic functions; equations, inequalities, systems of equations and inequalities; and applications.  Meets GOAL 4.

Prerequisite: MATH 050 - Intermediate Algebra; or 22 on ACT Math; or 50 on Accuplacer College Level Math; or 530 on SAT Math Composite; or 1158 on MN Comprehensive Assessment Math.

**Possible Textbooks:** *College Algebra* *(12th edition)* by Lial, Hornsby, Schneider, & Daniels (2015).

References:

* *College Algebra* *(12th edition)* by Lial, Hornsby, Schneider, & Daniels, Pearson (2015).
* *Algebra for College Students (6th edition)* by Dugopolski, McGraw Hill (2012)
* *College Algebra: Building Skills and Modeling Situations* by McKeague, Yoshiwara, & Burzynski, XYZ Textbooks (2013).

Software:

* *ALEKS*, McGraw Hill (2017)
* *MyMathLab*, Pearson (2017)

**Topics Covered:**

1. Basic Concepts
   1. Real Numbers and Their Properties
   2. Integral and Rational Exponents
   3. Radicals
   4. Polynomials
   5. Rational Expressions
2. Linear Equations and Applications
   1. Solving linear equations
   2. Solving number and geometric word problems
   3. Solving rate-time and mixture problems
3. Linear Inequalities
   1. Inequality relations and interval notation
   2. Solving linear inequalities
4. Absolute Value in Equations and Inequalities
   1. Absolute value as a distance
   2. Solving absolute value equations, inequalities
5. Quadratic Functions and Applications
   1. Factoring
   2. Square root property
   3. Completing the square
   4. Quadratic formula
6. Cartesian Coordinate System
   1. Review of Cartesian Coordinate System
   2. Plotting points
   3. Using symmetry
7. Distance in the Plane
   1. Distance between two points
   2. Midpoint of a line segment
   3. Circles
8. Equation of a Line
   1. Graphing lines
   2. Finding slope of a line
   3. Special forms of the equation of a line
   4. Parallel and perpendicular lines
9. Linear Equations and Models
   1. Slope as a rate of change
   2. Linear models
10. Idea of a Function
    1. Domain and Range
    2. Graphing Functions
11. Transformations of Functions
    1. Vertical and Horizontal Shifts
    2. Reflections
    3. Stretching and Shrinking
    4. Even/Odd Functions
12. Quadratic Functions
    1. Graphing quadratics
    2. Max and min values of quadratics
    3. Modeling with quadratics
    4. Solving quadratic inequalities
13. Additional Topics Time Permitting
    1. Composite Functions
    2. Inverse Functions
    3. Polynomial Functions / Models
    4. Exponential and Logarithmic Functions

**Remarks:** None

**Approximate Pace of Coverage:** Determined by instructor.

**Method of Instruction:** This course will be presented in class during Fall and Spring while online in Summer. In-class instruction includes traditional lectures, class handouts, and online homework assignments on MyMathLab. Online instruction is presented on interactive software/platform using computer-enhanced instruction. Group work and discussions are encouraged and facilitated by the instructor under both forms of instruction.

**Evaluation Procedure:**Course requirements may include homework assignments, quizzes, and exams. For online instruction, students may also be required to spend a certain number of hours each week working with interactive software. Students who demonstrate mastered knowledge on all topics may choose to take an early final assessment on computer.

Under in-class instruction, all assessments in the course will be paper-based. Under online instruction, all assessments will be computer-based and proctored by Testing Services approved by the instructor. The assessments will be the same, within the parameters of adaptive testing, across all sections of the course.

**Minnesota Transfer Curriculum:** *The following language should appear on each**instructor’s syllabus for the course:*

**Goal 4 under GEP:** ***Mathematics/Logical Reasoning*** – This is a General Education Program course that satisfies the Mathematics/Logical Reasoning requirement of the Minnesota Transfer Curriculum. The goal of this requirement is to increase students' knowledge about mathematical and logical modes of thinking. This will enable students to appreciate the breadth of applications of mathematics, evaluate arguments, and detect fallacious reasoning. Students will learn to apply mathematics, logic, and/or statistics to help them make decisions in their lives and careers. Minnesota's public higher education systems have agreed that developmental mathematics includes the first three years of a high school mathematics sequence through intermediate algebra.

Students will be able to:

1. Illustrate historical and contemporary applications of mathematics/logical systems.

Nearly all course topics have an application component to them, where students will need to use them to solve real-world problems. Many of these are word problems that force students to critically analyze given information and extract the important elements in order to construct algebraic expressions and equations that can then be solved. Another main focus of the course is the use of different representations of functions (graphical, tabular, symbolic, and verbal) to solve application (word/story) problems

1. Clearly express mathematical/logical ideas in writing.

Solving word problems forces students to extract from given information (or data) the important elements that can then be used to set up equations or other representations that allow them to solve the problem. Students will be required not only to use the data to solve the problems, but will be required to explain and intepret their solution and how they used that data and why their solution is appropriate.

1. Explain what constitutes a valid mathematical/logical argument (proof).

In solving the real-world problems student develop methods of mathematical argument. This involves logically leading from a problem’s statement to its solution through a sequence of mathematically valid steps.

1. Apply higher-order problem-solving and/or modeling strategies.

In working with the different forms of information and developing solutions to problems students will see connections between various approaches. The ability to approach a fresh problem and develop new approaches is stressed.

**MnSCU Learning Outcomes:**

* Students will be able to identify subsets of the real numbers to which a given number is a member.
* Students will be able to simplify expressions with integral and rational exponents.
* Students will be able to rationalize the denominator of a fraction.
* Students will be able to add, subtract, multiply and divide rational expressions.
* Students will be able to factor quadratic and special cubic polynomials.
* Students will be able to find the slope and identify the intercepts of a linear equation.
* Students will be able to solve word problems dealing with rate/time, number/value and mixtures.
* Students will be able to solve inequality problems expressing answers in both interval and set notation.
* Students will be able to solve equality and inequality problems involving absolute values.
* Students will be able to solve quadratic equations by factoring, completing the square, and using the quadratic formula.
* Students will be able to graph points, lines and quadratics using the Cartesian Coordinate System.
* Students will be able to find distance between two points and their midpoints.
* Students will be able to identify functions as even odd or neither.
* Students will be able to use slope to determine if lines are parallel or perpendicular.
* Students will be able to graph functions using vertical and horizontal shifts.
* Students will be able to graph a circle given its equation.

**Last Revised:** Fall 2017 by the Mathematics Subgroup