ACE College Algebra (3 Semester Credits) - Course Syllabus

Description:
College Algebra provides a comprehensive exploration of algebraic principles and meets scope and sequence requirements for a typical introductory algebra course. Topics covered are: Equations and Inequalities, Linear Functions, Polynomial and Rational Functions, Exponential and Logarithmic Functions, Systems of Equations and Inequalities, Analytic Geometry, and Sequences, Probability, and Counting Theory. *College Algebra* offers a wealth of examples with detailed, conceptual explanations, building a strong foundation in the material before asking students to apply what they've learned.

Textbook: *College Algebra* – Open Stax – Abramson, et al., ISBN-10: 1-947172-12-3,
(This text is provided to students as part of their enrollment.)

Prerequisites: Passing High School-level Algebra 2 is *strongly* recommended.

Course objectives:
Throughout the course, you will meet the following goals:

- Analyze and investigate properties of functions.
- Synthesize results from the graphs and/or equations of functions.
- Apply transformations to the graphs of functions.
- Recognize the relationship between functions and their inverses graphically/algebraically.
- Solve rational, linear, polynomial, absolute value, exponential, and logarithmic equations.
- Graph polynomial functions and solve real-world applications of polynomial equations.
- Graph logarithmic functions and exponential functions and analyze conics.
- Solve linear and nonlinear equations involving two and three variables.
- Use formulas to find sums of finite and infinite series.

Course Evaluation Criteria
A passing percentage is **70%** or higher.

Grading Scale
A = 95-100%
B = 88-94.9%
C = 80-87.9%
D = 70-79.9%
F = below 70%

ACE Course Retake Policy
2 (two) attempts are allowed on every quiz, and 2 (two) attempts are allowed on every final exam.

***Proctorio* – Video Proctoring**
All Final Exams are video proctored with Proctorio. (www.proctorio.com)

ADA Policy
Excel Education Systems is committed to maintaining an inclusive and accessible environment to all students, across all of its schools, in accordance with the 1990 Federal Americans with Disabilities Act (ADA).

There is a **total of 185 points** in this course:

Grade Weighting

Chapter Quizzes	70%
Final Exam	30%
	100%

Assessment	Points Available	Percentage of Final Grade
Chapter 1 Quiz	15	7.77
Chapter 2 Quiz	15	7.77
Chapter 3 Quiz	15	7.77
Chapter 4 Quiz	15	7.77
Chapter 5 Quiz	15	7.77
Chapter 6 Quiz	15	7.77
Chapter 7 Quiz	15	7.77
Chapter 8 Quiz	15	7.77
Chapter 9 Quiz	15	7.77
Final Exam	50	30
Total	**185**	**100**

Course Contents and Objectives

Chapter 1 – Prerequisites	
Lessons	1.1 Real Numbers: Algebra Essentials 1.2 Exponents and Scientific Notation 1.3 Radicals and Rational Exponents 1.4 Polynomials 1.5 Factoring 1.6 Rational Expressions
Objectives	• Classify a real number as a natural, whole, integer, rational, or irrational number. • Perform calculations using order of operations. • Use the following properties of real numbers: commutative, associative, distributive, inverse, and identity. • Evaluate algebraic expressions. • Simplify algebraic expressions. • Use the product rule of exponents.

	• Use the quotient rule of exponents. • Use the power rule of exponents. • Use the zero-exponent rule of exponents. • Use the negative rule of exponents. • Find the power of a product and a quotient. • Simplify exponential expressions. • Use scientific notation. • Evaluate square roots. • Use the product rule to simplify square roots. • Use the quotient rule to simplify square roots. • Add and subtract square roots. • Rationalize denominators. • Use rational roots. • Identify the degree and leading coefficient of polynomials. • Add and subtract polynomials. • Multiply polynomials. • Use FOIL to multiply binomials. • Perform operations with polynomials of several variables. • Factor the greatest common factor of a polynomial. • Factor a trinomial. • Factor by grouping. • Factor a perfect square trinomial. • Factor a difference of squares. • Factor the sum and difference of cubes. • Factor expressions using fractional or negative exponents. • Simplify rational expressions. • Multiply rational expressions. • Divide rational expressions. • Add and subtract rational expressions. • Simplify complex rational expressions.

Chapter 2 – Equations and Inequalities	
Lessons	2.1 The Rectangular Coordinate Systems and Graphs 2.2 Linear Equations in One Variable 2.3 Models and Applications 2.4 Complex Numbers 2.5 Quadratic Equations 2.6 Other Types of Equations 2.7 Linear Inequalities and Absolute Value Inequalities
Objectives	• Plot ordered pairs in a Cartesian coordinate system. • Graph equations by plotting points. • Graph equations with a graphing utility. • Find x-intercepts and y-intercepts. • Use the distance formula. • Use the midpoint formula. • Solve equations in one variable algebraically.

	• Solve a rational equation. • Find a linear equation. • Given the equations of two lines, determine whether their graphs are parallel or perpendicular. • Write the equation of a line parallel or perpendicular to a given line. • Set up a linear equation to solve a real-world application. • Use a formula to solve a real-world application. • Add and subtract complex numbers. • Multiply and divide complex numbers. • Simplify powers of i. • Solve quadratic equations by factoring. • Solve quadratic equations by the square root property. • Solve quadratic equations by completing the square. • Solve quadratic equations by using the quadratic formula. • Solve equations involving rational exponents. • Solve equations using factoring. • Solve radical equations. • Solve absolute value equations. • Solve other types of equations. • Use interval notation. • Use properties of inequalities. • Solve inequalities in one variable algebraically. • Solve absolute value inequalities.

Chapter 3 – Functions	
Lessons	3.1 Functions and Function Notation 3.2 Domain and Range 3.3 Rates of Change and Behavior of Graphs 3.4 Composition of Functions 3.5 Transformation of Functions 3.6 Absolute Value Functions 3.7 Inverse Functions
Objectives	• Determine whether a relation represents a function. • Find the value of a function. • Determine whether a function is one-to-one. • Use the vertical line test to identify functions. • Graph the functions listed in the library of functions. • Find the domain of a function defined by an equation. • Graph piecewise-defined functions. • Find the average rate of change of a function. • Use a graph to determine where a function is increasing, decreasing, or constant. • Use a graph to locate local maxima and local minima. • Use a graph to locate the absolute maximum and absolute minimum.

	• Combine functions using algebraic operations. • Create a new function by composition of functions. • Evaluate composite functions. • Find the domain of a composite function. • Decompose a composite function into its component functions. • Graph functions using vertical and horizontal shifts. • Graph functions using reflections about the x-axis x-axis and the y-axis. y-axis. • Determine whether a function is even, odd, or neither from its graph. • Graph functions using compressions and stretches. • Combine transformations. • Graph an absolute value function. • Solve an absolute value equation. • Verify inverse functions. • Determine the domain and range of an inverse function, and restrict the domain of a function to make it one-to-one. • Find or evaluate the inverse of a function. • Use the graph of a one-to-one function to graph its inverse function on the same axes.

Chapter 4 – Linear Functions	
Lessons	4.1 Linear Functions 4.2 Modeling with Linear Function 4.3 Fitting Linear Models to Data
Objectives	• Represent a linear function. • Determine whether a linear function is increasing, decreasing, or constant. • Interpret slope as a rate of change. • Write and interpret an equation for a linear function. • Graph linear functions. • Determine whether lines are parallel or perpendicular. • Write the equation of a line parallel or perpendicular to a given line. • Build linear models from verbal descriptions. • Model a set of data with a linear function. • Draw and interpret scatter diagrams. • Use a graphing utility to find the line of best fit. • Distinguish between linear and nonlinear relations. • Fit a regression line to a set of data and use the linear model to make predictions.

Chapter 5 – Polynomial and Rational Functions	
Lessons	5.1 Quadratic Functions 5.2 Power Functions and Polynomial Functions

	5.3 Graphs of Polynomial Functions 5.4 Dividing Polynomials 5.5 Zeros of Polynomial Functions 5.6 Rational Functions 5.7 Inverses and Radical Functions 5.8 Modeling Using Variation
Objectives	• Recognize characteristics of parabolas. • Understand how the graph of a parabola is related to its quadratic function. • Determine a quadratic function's minimum or maximum value. • Solve problems involving a quadratic function's minimum or maximum value. • Identify power functions. • Identify end behavior of power functions. • Identify polynomial functions. • Identify the degree and leading coefficient of polynomial functions. • Recognize characteristics of graphs of polynomial functions. • Use factoring to find zeros of polynomial functions. • Identify zeros and their multiplicities. • Determine end behavior. • Understand the relationship between degree and turning points. • Graph polynomial functions. • Use the Intermediate Value Theorem. • Use long division to divide polynomials. • Use synthetic division to divide polynomials. • Evaluate a polynomial using the Remainder Theorem. • Use the Factor Theorem to solve a polynomial equation. • Use the Rational Zero Theorem to find rational zeros. • Find zeros of a polynomial function. • Use the Linear Factorization Theorem to find polynomials with given zeros. • Use Descartes' Rule of Signs. • Solve real-world applications of polynomial equations. • Use arrow notation. • Solve applied problems involving rational functions. • Find the domains of rational functions. • Identify vertical asymptotes. • Identify horizontal asymptotes. • Graph rational functions. • Find the inverse of an invertible polynomial function. • Restrict the domain to find the inverse of a polynomial function. • Solve direct variation problems.

	• Solve inverse variation problems. • Solve problems involving joint variation.

Chapter 6 – Exponential and Logarithmic Functions	
Lessons	6.1 Exponential Functions 6.2 Graphs of Exponential Functions 6.3 Logarithmic Functions 6.4 Graphs of Logarithmic Functions 6.5 Logarithmic Properties 6.6 Exponential and Logarithmic Equations 6.7 Exponential and Logarithmic Models 6.8 Fitting Exponential Models to Data
Objectives	• Evaluate exponential functions. • Find the equation of an exponential function. • Use compound interest formulas. • Evaluate exponential functions with base e. • Graph exponential functions. • Graph exponential functions using transformations. • Convert from logarithmic to exponential form. • Convert from exponential to logarithmic form. • Evaluate logarithms. • Use common logarithms. • Use natural logarithms. • Identify the domain of a logarithmic function. • Graph logarithmic functions. • Use the product rule for logarithms. • Use the quotient rule for logarithms. • Use the power rule for logarithms. • Expand logarithmic expressions. • Condense logarithmic expressions. • Use the change-of-base formula for logarithms. • Use like bases to solve exponential equations. • Use logarithms to solve exponential equations. • Use the definition of a logarithm to solve logarithmic equations. • Use the one-to-one property of logarithms to solve logarithmic equations. • Solve applied problems involving exponential and logarithmic equations. • Model exponential growth and decay. • Use Newton's Law of Cooling. • Use logistic-growth models. • Choose an appropriate model for data. • Express an exponential model in base e. • Build an exponential model from data. • Build a logarithmic model from data.

	• Build a logistic model from data.

Chapter 7 – Systems of Equations and Inequalities	
Lessons	7.1 Systems of Linear Equations: Two Variables 7.2 Systems of Linear Equations: Three Variables 7.3 Systems of Nonlinear Equations and Inequalities: Two Variables 7.4 Partial Fractions 7.5 Matrices and Matrix Operations 7.6 Solving Systems with Gaussian Elimination 7.7 Solving Systems with Inverses 7.8 Solving Systems with Cramer's Rule
Objectives	• Solve systems of equations by graphing. • Solve systems of equations by substitution. • Solve systems of equations by addition. • Identify inconsistent systems of equations containing two variables. • Express the solution of a system of dependent equations containing two variables. • Solve systems of three equations in three variables. • Identify inconsistent systems of equations containing three variables. • Express the solution of a system of dependent equations containing three variables. • Solve a system of nonlinear equations using substitution. • Solve a system of nonlinear equations using elimination. • Graph a nonlinear inequality. • Graph a system of nonlinear inequalities. • Decompose equations with only nonrepeated linear factors. • Decompose equations with repeated linear factors. • Decompose equations that have a nonrepeated irreducible quadratic factor. • Decompose equations that have a repeated irreducible quadratic factor. • Find the sum and difference of two matrices. • Find scalar multiples of a matrix. • Find the product of two matrices. • Write the augmented matrix of a system of equations. • Write the system of equations from an augmented matrix. • Perform row operations on a matrix. • Solve a system of linear equations using matrices. • Find the inverse of a matrix. • Solve a system of linear equations using an inverse matrix. • Evaluate 2×2 determinants. • Use Cramer's Rule to solve a system of equations in two variables. • Evaluate 3×3 determinants.

	• Use Cramer's Rule to solve a system of three equations in three variables. • Know the properties of determinants.

Chapter 8 – Analytic Geometry	
Lessons	8.1 The Ellipse 8.2 The Hyperbola 8.3 The Parabola 8.4 Rotation of Axes 8.5 Conic Sections in Polar Coordinates
Objectives	• Write equations of ellipses in standard form. • Graph ellipses centered at the origin. • Graph ellipses not centered at the origin. • Solve applied problems involving ellipses. • Locate a hyperbola's vertices and foci. • Write equations of hyperbolas in standard form. • Graph hyperbolas centered at the origin. • Graph hyperbolas not centered at the origin. • Solve applied problems involving hyperbolas. • Graph parabolas with vertices at the origin. • Write equations of parabolas in standard form. • Graph parabolas with vertices not at the origin. • Solve applied problems involving parabolas. • Identify nondegenerate conic sections given their general form equations. • Use rotation of axes formulas. • Write equations of rotated conics in standard form. • Identify conics without rotating axes. • Identify a conic in polar form. • Graph the polar equations of conics. • Define conics in terms of a focus and a directrix.

Chapter 9 – Sequences, Probability, and Counting Theory	
Lessons	9.1 Sequences and Their Notations 9.2 Arithmetic Sequences 9.3 Geometric Sequences 9.4 Series and Their Notations 9.5 Counting Principles 9.6 Binomial Theorem 9.7 Probability
Objectives	• Write the terms of a sequence defined by an explicit formula. • Write the terms of a sequence defined by a recursive formula. • Use factorial notation. • Find the common difference for an arithmetic sequence. • Write terms of an arithmetic sequence.

	• Use a recursive formula for an arithmetic sequence. • Use an explicit formula for an arithmetic sequence. • Use summation notation. • Use the formula for the sum of the first n terms of an arithmetic series. • Use the formula for the sum of the first n terms of a geometric series. • Use the formula for the sum of an infinite geometric series. • Solve annuity problems. • Solve counting problems using the Addition Principle. • Solve counting problems using the Multiplication Principle. • Solve counting problems using permutations involving n distinct objects. • Solve counting problems using combinations. • Find the number of subsets of a given set. • Solve counting problems using permutations involving n non-distinct objects. • Apply the Binomial Theorem. • Construct probability models. • Compute probabilities of equally likely outcomes. • Compute probabilities of the union of two events. • Use the complement rule to find probabilities. • Compute probability using counting theory.

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