Department:

Mathematics

Course Description:

College Algebra is a comprehensive study of the fundamental laws of algebra, including exponents, linear and quadratic equations, polynomial and rational inequalities, system of equations, radicals and radical equations, functions and graphing, polynomials and polynomial equations, modeling, logarithms, complex numbers, augmented matrices, determinants, and regression. The course will provide analysis of graphs and linear systems in two or three variables, as well as applications of most of the topics listed above and others as time permits. A graphing calculator is required for this course.

Course Competencies:

The learning outcomes and competencies detailed in this syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups for this course as approved by the Kansas Board of Regents. (Kansas Regents Shared Number Course and Title: **KRSN Course MAT 1010 College Algebra**.)

Upon completion of the course, the student should be able to:

1. Explain basic algebraic concepts, including but not limited to the notations of mathematics, algebraic expressions, exponents, polynomials, factoring, solving rational expressions, radicals, rational exponents, and the mathematical difference between union and intersection.
2. Solve linear equations and formulas, including problem solving of applications and real-world data, and do basic modeling.
3. Write the equation that describes a function (of all types) or a circle given its description.
4. Solve linear inequalities in one variable with applications, including polynomial and rational inequalities with applications, and absolute value inequalities.
5. Solve polynomial equations, rational equations, and quadratic-type, non-routine equations, including applications.
6. Simplify, manipulate, and solve problems involving complex numbers.
7. Solve non-factorable quadratic equations, including applications.
8. Explain basic relations, functions, and a variety of graphs, including piecewise functions, with an emphasis on the use of functional notation.
9. Recognize and distinguish between functions and relations (equations).
10. Analyze linear functions and utilize the concept of rate of change to solve real-world problems.

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11. Use concepts of symmetry, intercepts, left-hand and right-hand behavior, asymptotes, and transformations to sketch the complete, accurate graph of various types of functions (constant, linear, quadratic, absolute value, piecewise-defined, square root, cubic, polynomial, rational, exponential, and logarithmic) or relations (circle) given in a description.
12. Analyze quadratic, cubic, absolute-value, square root, reciprocal, polynomial, linear, piecewise-defined, exponential, and other equation model (or "toolbox") functions or relations (such as a circle) given in a description.
13. Determine the domain and range of a function, supported by appropriate justification (work).
14. Explain the algebra of combinations and composition of functions and find inverses of various functions, including those with domain restrictions.
15. Perform transformations on various functions and graph general quadratic functions, including functions with asymptotes and rational components.
16. Provide a complete analysis of the graph of a non-routine function.
17. Perform polynomial synthetic division.
18. Utilize the remainder and factor theorems, and use a variety of techniques to find the zeroes of polynomial functions.
19. Graph a variety of polynomial and rational functions.
20. Analyze exponential functions, logarithms and logarithmic functions, and the exponential function and natural logarithms, and solve equations of the type with intercepts, left-hand and right-hand behavior, asymptotes, and transformations, plus literal equations, quadratic equations by factoring and use of the quadratic formula, equations involving absolute value expressions.
21. Apply a wide variety of equations to real-world situations and applications, including but not limited to depreciation, growth and decay, and maximum/minimum problems.
22. Solve exponential/logarithmic equations with applications, business and finance application problems, and model linear, quadratic, and cubic regression situations, and solve problems involving exponential, logarithmic, and regression models.
23. Solve inequalities of the following types: linear (in one and two variables), polynomial, rational, and absolute value.
24. Solve linear and non-linear systems in two or more variables, with applications.
25. Solve linear systems using matrices.
26. Solve systems of inequalities by graphing and analysis.
27. Explain the algebra of matrices and solve linear systems using matrix equations.
28. Analyze data, make valid predictions/interpretations, and do basic mathematical modeling based on available data.
29. Use effective writing skills in response to essay questions on examinations and/or quizzes or in written journals in response to questions about course content and direction of online quiz activities administered through the use of an online-medium, if available.

Course Content:

A. Chapter R: Review of Basic Concepts and Skills
   1. Radicals and Rational Exponents

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2. Factoring Polynomials
3. Rational Expressions

B. Chapter 1: Equations and Inequalities
1. Linear Equations, Formulas, and Problem Solving
2. Linear Inequalities in One Variable
3. Complex Numbers
4. Solving Quadratic Equations
5. Solving Other Types of Equations

C. Chapter 2: Relations, Functions, and Graphs
1. Rectangular Coordinates; Graphing with the Graphing Calculator
2. Linear Graphs and Rates of Change
3. Functions, Function Notation, and the Graph of a Function
4. Analyzing the Graph of a Function
5. Linear Functions and Real Data

D. Chapter 3: Functions
1. Toolbox Functions and Transformations
2. Basic Rational Functions and Power Functions
3. Variation: The Toolbox Functions in Action
4. Piecewise-Defined Functions
5. Algebra of Combinations/Compositions of Functions
6. Formulas, Functions, and Problem Solving

E. Chapter 4: Polynomial and Rational Functions
1. Quadratic Functions and Applications
2. Synthetic Division: Remainder and Factor Theorems
3. Zeroes of Polynomial Functions
4. Graphing Polynomial and Rational Functions
5. Polynomial and rational Inequalities

F. Chapter 5: Exponential and Logarithmic Functions
1. One-to-one and Inverse Functions
2. Exponential Functions
3. Logarithms and Logarithmic Functions
4. Properties of Logarithms
5. Solving Exponential and Logarithmic Equations
6. Applications from Business, Finance, and Science

G. Chapter 6: Systems of Equations and Inequalities
1. Linear Systems in Two Variables with Applications
2. Linear Systems in Three Variables with Applications
3. Nonlinear Systems of Equations and Inequalities

H. Chapter 7: Matrices and Matrix Applications
1. Solve Linear Systems Using Matrices
2. The Algebra of Matrices
3. Solving Linear Systems Using Matrix Equations, with Applications including Cramer's Rule

Learning Assessments:

Course competencies will be assessed by written examinations covering all course material, including regular hour-long exams and a required, comprehensive final exam. Additionally, assessment may also occur through any of the following at the discretion of the instructor: regular collection of homework, in-class work, quizzes, journals, and various projects.

Instructional Materials:

College Algebra, Coburn, Coffelt, 3rd Ed., McGraw-Hill, 2014.

Guidelines for Requesting Accommodations Based on Documented Disability or Medical Condition

It is the intention of Highland Community College to work toward full compliance with the Americans with Disabilities Act, to make instructional programs accessible to all people, and to provide reasonable accommodations according to the law.

Students should understand that it is their responsibility to self-identify their need(s) for accommodation and that they must provide current, comprehensive diagnosis of a specific disability or medical condition from a qualified professional in order to receive services. Documentation must include specific recommendations for accommodation(s). Documentation should be provided in a timely manner prior to or early in the semester so that the requested accommodation can be considered and, if warranted, arranged.

In order to begin the process all students **must** complete the "Disabilities Self-Identification Form" at this link: https://highlandcc.edu/pages/disability-services.

This form can also be accessed at the Highland Community College homepage under Students Services/Student Resources/Disability Service or by contacting the Disabilities Coordinator.