ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences and Business

COURSE: MTH 1005 Precalculus

Date: Spring 2022

Credit Hours: 5

Complete all that apply or mark "None" where appropriate:
        Prerequisite(s): MTH 0908 and MTH 0920 with a C or better

        Enrollment by assessment or other measure? ☒ Yes ☐ No
        If yes, please describe: By appropriate assessment

        Corequisite(s): None

        Pre- or Corequiste(s): None

        Consent of Instructor: ☒ Yes ☐ No

Delivery Method: ☒ **Lecture**   5 **Contact Hours (1 contact = 1 credit hour)**
                        ☐ **Seminar**   0 **Contact Hours (1 contact = 1 credit hour)**
                        ☐ **Lab**   0 **Contact Hours (2-3 contact = 1 credit hour)**
                        ☐ **Clinical**   0 **Contact Hours (3 contact = 1 credit hour)**
                        ☒ **Online**
                        ☒ **Blended**
                        ☒ **Virtual Class Meeting (VCM)**

Offered: ☒ **Fall**   ☒ **Spring**   ☒ **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):
This course covers the same topics as College Algebra (MTH 1003) and Trigonometry (MTH 1004) with emphasis on functions approach and curve sketching. It is recommended for students planning to take the calculus sequence but have not met the prerequisites.

ACCREDITATION STATEMENTS AND COURSE NOTES:
None

COURSE TOPICS AND CONTENT REQUIREMENTS:
I.   Fundamental Concepts of Algebra
      A.   Real Number System
      B.   Properties of exponents
      C.   Basic operations on polynomials
      D.   Factor polynomials
      E.   Simplify rational expressions

II.   Linear and Quadratic Equations and Inequalities
      A.   Linear equations and their graphs and applications
      B.   Quadratic equations, their graphs and applications
      C.   Complex numbers
      D.   Radical and Quadratic type equations
      E.   Inequalities - linear, quadratic and rational

III. Functions
      A.   Cartesian plane - distance formula and graphing
      B.   Linear functions and their graphs
      C.   Combination of functions
      D.   Inverse functions
      E.   Mathematical Models - variation

IV.   Polynomial Functions
      A.   Quadratic functions
      B.   Higher degree polynomial functions
      C.   Polynomial division
      D.   Real zeros
      E.   Complex zeros
      F.   Approximation of irrational zeros

V.   Other Functions
      A.   Rational functions
      B.   Exponential functions
      C.   Logarithmic functions
      D.   Properties of exponential and logarithmic functions
      E.   Solve exponential and logarithmic equations
      F.   Applications of rational, exponential, and logarithmic
            functions

VI.   Trigonometric Functions
      A.   Trigonometric functions
      B.   Basic trigonometric identities
      C.   Graph trigonometric functions

VII. Analytic Trigonometry
      A.   Verify identities

B. Trigonometric formulas
C. Trigonometric equations

VIII. Additional Topics in Trigonometry
A. Laws to solve triangles
B. Polar coordinates, equations, and graphs
C. Vectors

IX. Systems of Equations and Inequalities
A. Systems of linear equations in two variables
B. Systems of linear equations in three more variables
C. Matrices used in solving linear systems of equations
D. Systems of inequalities

X. Further Topics (as time permits)
A. Sequences and series
B. Arithmetic sequences and series
C. Geometric sequences and series
D. The Binomial Theorem

INSTRUCTIONAL METHODS:
1. Lecture
2. Class discussion
3. Class participation
4. Audio-visual aids - calculator, overheads, computer, etc.
5. Quizzes and exams

EVALUATION OF STUDENT ACHIEVEMENT:
Unit Tests
Comprehensive final exam
Projects
MyMathLab assignments
Quizzes

INSTRUCTIONAL MATERIALS:
Textbooks
PreCalculus, Blitzer, Pearson
MyMathLab

Resources
Test generation software.
Printed test bank.
Online Videos.

LEARNING OUTCOMES AND GOALS:
Institutional Learning Outcomes
☐ 1) Communication – to communicate effectively;
☒ 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;

☐ 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;

☐ 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

1. Students will be able to demonstrate knowledge of the fundamental concepts of algebra.
1.1. Students will be able to identify the subsets of the real number system.
1.2. Students will be able to calculate with various real numbers.
1.3. Students will be able to simplify radical expressions and expressions involving rational exponents.
1.4. Students will be able to perform basic operations on polynomials and special products.
1.5. Students will be able to factor expressions.
1.6. Students will be able to simplify fractional expressions.

2. Students will be able to demonstrate knowledge of linear and quadratic equations and inequalities.
2.1. Students will be able to solve linear equations.
2.2. Students will be able to solve word problems involving linear equations.
2.3. Students will be able to solve quadratic equations.
2.4. Students will be able to solve applied problems involving quadratic equations.
2.5. Students will be able to solve quadratic type equations.
2.6. Students will be able to solve radical equations.
2.7. Students will be able to solve linear, quadratic, and rational inequalities.
2.8. Students will be able to perform basic operations on complex numbers.

3. Students will be able to demonstrate knowledge of functions.
3.1. Students will be able to identify functions.
3.2. Students will be able to graph functions.
3.3. Students will be able to identify and graph linear functions.
3.4. Students will be able to combine functions by addition, multiplication, and composition.
3.5. Students will be able to find the inverse of one-to-one functions.
3.6. Students will be able to solve problems involving variation.

4. Students will be able to demonstrate knowledge of polynomial functions.
4.1. Students will be able to identify and graph quadratics.
4.2. Students will be able to identify and graph higher degree polynomial functions.
4.3. Students will be able to find rational zeros of polynomial functions.
4.4. Students will be able to find all zeros of polynomial functions.

5. Students will be able to demonstrate knowledge of other functions.
5.1. Students will be able to identify and graph rational functions.
5.2. Students will be able to identify and graph exponential functions.
5.3. Students will be able to identify and graph logarithmic functions.
5.4. Students will be able to simplify expressions using properties of exponential and logarithmic functions.
5.5. Students will be able to solve exponential and logarithmic equations.

5.6. Students will be able to solve applied problems using exponential and logarithmic functions.

6. Students will be able to work with Trigonometric Functions.
6.1. Students will be able to determine the quadrant in which an angle lies.
6.2. Students will be able to draw angles in standard position.
6.3. Students will be able to find the central angle, given the radius and arc length.
6.4. Students will be able to convert from radian measure to degree measure and vice-versa.
6.5. Students will be able to find an arc length
6.6. Students will be able to define the six trigonometric functions (sin, cos, tan, cot, sec, csc) in relation to a unit circle.
6.7. Students will be able to use the basic trigonometric identities to evaluate trigonometric functions.
6.8. Students will be able to use a calculator to evaluate the trigonometric function values for any angle.
6.9. Students will be able to define the six trigonometric functions in relation to a right triangle.
6.10. Students will be able to solve basic application problems using trigonometric functions.
6.11. Students will be able to define the six trigonometric functions for any angle in terms of the coordinates of a point on the terminal.
6.12. Students will be able to evaluate trigonometric functions for angles that have one of the special angles as a reference angle.
6.13. Students will be able to graph the trigonometric functions.
6.14. Students will be able to determine the amplitude, period, and phase shift for a given trigonometric function.
6.15. Students will be able to find exact values of inverse trigonometric functions.
6.16. Students will be able to find exact values of composite inverse trigonometric expressions.
6.17. Students will be able to find algebraic expressions of composite inverse trigonometric expressions.

7. Students will be able to demonstrate knowledge of analytic trigonometry.
7.1. Students will be able to use the basic trigonometric identities to verify identities.
7.2. Students will be able to evaluate trigonometric functions using the sum and difference formulas.
7.3. Students will be able to evaluate trigonometric functions using the double-angle and half-angle formulas.
7.4. Students will be able to evaluate trigonometric functions using product-to-sum and sum-to-product formulas.
7.5. Students will be able to solve trigonometric equations.

8. Students will be able to demonstrate knowledge of additional topics in trigonometry.
8.1. Students will be able to use the Law of Sines to solve triangles.
8.2. Students will be able to use the Law of Cosines to solve triangles.
8.3. Students will be able to convert a point from polar coordinates to rectangular coordinates and vice-versa.
8.4. Students will be able to graph polar equations.

8.5. Students will be able to sketch vectors.
8.6. Students will be able to find the magnitude of a vector.
8.7. Students will be able to represent vectors between any two points.
8.8. Students will be able to carry out vector operations such as vector addition, vector subtraction, and scalar multiplication.
8.9. Students will be able to find a unit vector.
8.10. Students will be able to find a resultant force using vectors.

9. Students will be able to demonstrate knowledge of systems of equations and inequalities.
9.1. Students will be able to identify and solve systems of linear equations by substitution and graphing.
9.2. Students will be able to solve systems of linear equations by elimination.
9.3. Students will be able to solve systems of linear equations by Gauss-Jordan elimination.
9.4. Students will be able to solve non-linear systems by any method.
9.5. Students will be able to solve applied problems using systems of equations.
9.6. Students will be able to solve systems of inequalities by graphing methods.

10. Students will be able to demonstrate knowledge of further topics. (As time permits.)