Course Outline

Course Title: Precalculus Algebra And Trigonometry
Common Course Title: MAC1147
Effective Term: Fall 2021 (Aug 9, 2021)   Next Review : Aug 8, 2026
Credit Hours: 5 Units   Contact Hour Breakdown: *(Per 16 week Term)*

Total: 80
Lecture: Lab:
Clinic: Other:

Requirements

Prerequisite with minimum grade required

MAC1105 (B) **OR** MAC1105C (B)

Course Description:

This course is designed to satisfy the dual requirements of MAC1114 and MAC1140, thus preparing the student for the study of calculus. In this course, the student will study various function families (e.g. polynomial, exponential, logarithmic, trigonometric) from both analytic and graphical viewpoints, and will use them to model real-life situations. The student will be exposed to additional topics that will deepen their mathematical understanding, including systems, matrices and determinates, sequences and series, parametric equations, and polar coordinates and equations. A graphing calculator may be required. Recommendation of the Mathematics Department or at least a grade of "B" in the prerequisite course is required.

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Alignment of General Education Competencies with General Outcomes of this Course (for general education assessment purposes)

1. Critical Thinking
- 7.0

2. Effective Communication
- 8.0, 11.0
3. Ethical Reasoning

4. Global Awareness

5. Information Literacy

6. Mathematical and Scientific Reasoning
- 3.0

UNITS

Unit 1: Properties and Graphs of Polynomial, Rational, and Other Algebraic Functions

General Outcome
1.0 Recognize and graph polynomial, rational, and other algebraic functions, and write functions that satisfy specific characteristics.

Specific Learning Outcomes
1.1 Recognize and construct graphs of polynomial functions.
1.2 Recognize and construct graphs of rational functions.
1.3 Define, graph, and write the equations of vertical, horizontal, and slant asymptotes.
1.4 Create appropriate polynomial or rational functions that satisfy specific given conditions.
1.5 Recognize and construct graphs of piecewise functions.

Unit 2: Polynomial, Absolute Value, and Rational Functions, Equations, and Inequalities

General Outcome
2.0 Identify the zeros of polynomial functions, determine solutions to polynomial, absolute value, and rational inequalities, and find the partial fraction decomposition of rational expressions

Specific Learning Outcomes
2.1 Determine the number of zeros of a polynomial and the multiplicity of each zero.
2.2 Read and apply the Remainder Theorem and the Factor Theorem.
2.3 Use the Rational Root (Zeros) Theorem to find zeros of polynomials
2.4 Perform synthetic division to find zeros of polynomials.
2.5 Determine the solution sets of polynomial, rational, and absolute value inequalities.
2.6 Find the partial fraction decomposition of a rational expression.

Unit 3: Exponential and Logarithmic Functions

General Outcome
3.0 Recognize and graph exponential and logarithmic functions, and solve exponential and logarithmic equations.

Specific Learning Outcomes
3.1 Read and apply the definitions and properties of exponents and logarithms.
3.2 Recognize and graph exponential and logarithmic functions.
3.3 Use the change-of-base formula.
3.4 Evaluate logarithmic and exponential expressions using a calculator.
3.5 Recognize and solve exponential and logarithmic equations, and provide these solutions both exactly and accurate to an indicated number of decimal places.
3.6 Read and solve applications of exponential and logarithmic functions involving topics such as population growth, compound interest, Carbon-14 dating, etc., and interpret the results in context, giving the solutions both exactly and accurate to an indicated number of decimal places.

Unit 4: Matrices, Determinants, and Systems of Equations

General Outcome
4.0 Perform matrix operations, and apply the theories and techniques used in solving systems of equations.

Specific Learning Outcomes
4.1 Recognize and solve systems of linear equations in two or more variables using matrix reduction techniques and Cramer's Rule.
4.2 Find the sum, difference, and product of two matrices, if they exist.
4.3 Demonstrate how to multiply a matrix by a scalar.

Unit 5: Trigonometric Functions and Their Graphs

General Outcome
5.0 Define, apply, and graph the trigonometric functions.

Specific Learning Outcomes
5.1 Solve problems involving degree and radian measure of angles as they relate to circular models in the physical world.
5.2 Define the sine, cosine, tangent, cotangent, secant, and cosecant functions of angles and of real numbers.
5.3 Know and apply the fundamental identities relating the six basic trigonometric functions.
5.4 Sketch the graphs of the six basic trigonometric functions and specify the intervals over which they increase or decrease.
5.5 Identify and use the domain, range, amplitude, period and phase shift to graph trigonometric functions.

Unit 6: Inverse Trigonometric Functions and Their Graphs

General Outcome
6.0 Define, apply, and graph the inverse trigonometric functions.

Specific Learning Outcomes
6.1 Define and graph the inverse trigonometric functions.
6.2 Apply the definitions to evaluate inverse trigonometric functions.

Unit 7: Trigonometric Identities and Equations

General Outcome
7.0 Verify trigonometric identities and solve trigonometric equations.

Specific Learning Outcomes
7.1 Write the proofs of trigonometric identities using fundamental identities, addition-subtraction formulas, co-function formulas, half-angle formulas, double-angle formulas, and power-reducing formulas.
7.2 Solve trigonometric equations, both with and without an specified interval.

Unit 8: Solutions of Triangles

General Outcome
8.0 Solve right and oblique triangles.

Specific Learning Outcomes
8.1 Solve a right triangle using the definitions of sine, cosine, tangent, cosecant, secant and cotangent.
8.2 Solve an oblique triangle using the Law of Sines and/or the Law of Cosines.
8.3 Use right and/or oblique triangles to read, interpret, and solve problems involving real-world applications such as navigation, angles of elevation and depression, temperature, air flow, and tides.

Unit 9: Conic Sections

General Outcome
9.0 The student shall be able to graph conic sections.

Specific Learning Outcomes

Aug 18, 2021 2:28 PM

9.1 Recognize, write the equations of, analyze, and graph conic sections such as parabolas, hyperbolas, ellipses.

Unit 10: Polar Coordinates, Equations, and Their Graphs

General Outcome
10.0 Manipulate and graph polar coordinates and equations.

Specific Learning Outcomes
10.1 Plot points in polar coordinates on a polar plane.
10.2 Convert ordered pairs from rectangular to polar coordinates and vice-versa.
10.3 Convert equations from rectangular form to polar form and vice-versa.
10.4 Plot graphs of simple polar equations.

Unit 11: Vectors and Parametric Equations

General Outcome
11.0 Manipulate 2-dimensional vectors, use vectors to solve applied problems, and work with parametric equations.

Specific Learning Outcomes
11.1 Interpret the various forms of vectors both geometrically and analytically as used in physics.
11.2 Perform operations of addition, subtraction, and scalar multiplication of vectors both geometrically and analytically.
11.3 Calculate the dot product of vectors, the scalar projection of a vector onto another vector, and the cosine of the angle between vectors.
11.4 Express vectors in trigonometric form.
11.5 Read, interpret, and solve applied problems using vectors as used in physics.
11.6 Plot and show the orientation of graphs represented by parametric equations.
11.7 Eliminate the parameter in a set of parametric equations.

Unit 12: Sequences, Series, and the Binomial Theorem

General Outcome
12.0 Apply properties of sequences and series, and demonstrate the use of the binomial theorem.

Specific Learning Outcomes
12.1 Perform operations on summations, determine sequences defined recursively, and determine the nth term of an arithmetic or geometric sequence.
12.2 Recognize and identify arithmetic and geometric sequences.
12.3 Determine the sum of the first n terms of an arithmetic or geometric sequence and also the sum of an infinite geometric series, if it exists.
12.4 Apply the binomial theorem to expand powers of binomials, and write the kth term of an indicated binomial expansion.