Columbus State Community College
Division: Arts & Sciences
Department: Mathematics

COLUMBUS STATE
COMMUNITY COLLEGE

COURSE NUMBER: MATH 1121

COURSE TITLE: Precalculus II

INSTRUCTOR:

CONTACT:

CREDITS: 5

CLASS/CONTACT HOURS PER WEEK: 6

PREREQUISITES: Completion of Math 1120 with a C or better

DESCRIPTION OF COURSE: MATH 1121 is the second course in a Precalculus sequence. The concepts, skills, reasoning, and rigor expected of successful Calculus students is developed in this sequence. MATH 1121 concludes outlining the analytical structure of the Elementary Functions (linear, quadratic, absolute value, root, polynomial, rational, exponential, logarithmic, trigonometric, and piecewise.) with considerable emphasis on the Trigonometric functions, structure, and relationships. Calculus situations and descriptions will be used to motivate and inspire analysis, which includes function behavior and characteristics, function arithmetic, and modeling. Supporting algebraic concepts and skills are included in the curriculum as necessary. This course, along with MATH 1120, is specifically designed as preparation for Calculus.

COURSE STUDENT LEARNING OUTCOMES: Following student outcomes from TMM002, the successful Precalculus II student can:

- analyze functions.
- convert between different representations of a function.
- perform operations with functions.
- analyze angles and triangles
- combine geometric and arithmetic reasoning with regards to $\mathbb{R}^2$ and $\mathbb{C}$.
- recognize function families as they appear in equations.
- choose an appropriate solution methodology for a particular equation.
- communicate reasons for choices.
- use correct, consistent, and coherent notation throughout the solution process.
- distinguish between exact and approximate solutions.
- demonstrate an understanding of the algebraic, functional, and geometric viewpoints.
- solve for one variable in terms of another.
- cite domain restrictions resulting from solution decisions.
- purposefully create equivalences and indicate where they are valid.
- recognize opportunities to create equivalencies in order to simplify workflow.
- become fluent with conversions using traditional equivalency families.
- interpret the function correspondence and behavior of a given model in terms of the context.
- create linear models from data and interpret slope as a rate of change.
- determine parameters of a model given the form of the model and data.
- determine a reasonable applied domain for the model.

- anticipate the output from a graphing utility and make adjustments.
- use technology to verify solutions to equations and inequalities obtained algebraically.
- use technology to obtain solutions to equations and inequalities which are difficult to obtain algebraically.
- use technology and algebra in concert to locate and identify exact solutions.
- recognize when a result (theorem) is applicable and use the result to make sound logical conclusions and provide counter-examples to conjectures.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING:
For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:

ILG 1 – Critical Thinking
ILG 3 – Quantitative Skills

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Ximera textbook: https://ximera.osu.edu/csccmathematics/precalculus2
- Precalculus II Notes (from CSCC Bookstore), 5th edition
- Wacom One Drawing Tablet (or equivalent device w digital pen) – [For online sections]

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS
- Graphing Technology
  - The Texas Instruments' TI-84 (regular, Plus, Silver, etc.) graphing calculator is allowed.
  - Some students may prefer to use a CASIO-FX-9750GII, TI- Nspire (non-CAS version), or a TI-83. These options are similar to the TI-84.
  - Some students may prefer online options.
  - The TI-89, TI-92, TI-Nspire CAS, or other Computer Algebra System (CAS) calculators, are never allowed during proctored assessments.
  - Check with your instructor to see if your calculator will be allowed during their proctored assessments.

GENERAL INSTRUCTIONAL METHODS: Instructional methods may include face-to-face or video lectures or demonstration, face-to-face or virtual discussion, individual or group activities including the use of visual aids, graphing calculators, computers and/or other technologies. Students may be expected to participate in these activities during class and/or outside of class. Instructors may require class participation, collaborative learning, and peer review.

STANDARDS AND METHODS FOR EVALUATION:

Ximera Notebook Pages	10%
iMath On-Line Homework	10%
Written Homework	35%
Project	5%
Tests	40%
	100%

GRADING SCALE: Letter grades for the course will be awarded using a 90% - 80% - 70% - 60% scale. Grades will not be curved, skewed, or otherwise inflated.

SPECIAL COURSE REQUIREMENTS: None

ATTENDANCE POLICY: To be determined by the instructor.

COLLEGE SYLLABUS STATEMENTS: Columbus State Community College required College Syllabus Statements on College Policies and Student Support Services can be found at www.cscc.edu/syllabus or on the College website Quick Links "Syllabus Statements".

WEATHER RELATED DEPARTMENT SPECIFIC POLICY: None

UNITS OF INSTRUCTION:

Week 1
- Unit of Instruction: Exponential & Logarithmic Functions
- Learning Objectives/Goals:
- X01 Exponential Functions
  - o Describe the full picture of all exponential functions and their graphs
- X02 Logarithmic Functions
  - o Paint a full picture of logarithmic functions
- Assignment: X01 Exponential Functions, X02 Logarithmic Functions, Assessment(s)
- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 2

- Unit of Instruction: Polynomial & Rational Functions

- Learning Objectives/Goals:

- X03 Polynomial Functions
  - o Paint a full picture of polynomials
  - o Use the Rational Roots Theorem
  - o Complete the picture of polynomials with the Fundamental Theorem of Algebra
- X04 Rational Functions
  - o Analyze rational functions

- Assignment: X03 Polynomial Functions, X04 Rational Functions, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 3

- Unit of Instruction: Composition Behavior

- Learning Objectives/Goals:

- X05 Function Forms
  - o Identify function forms
- X06 Composition
  - o View functions as composition
  - o Deduce behavior of compositions
- X07 The Derivative
  - o Analyze functions using the derivative

- Assignment: X05 Function Forms, X06 Composition, X07 The Derivative, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 4

- Unit of Instruction: Function Analysis

- Learning Objectives/Goals:

- X08 Analyzing Functions
  - o Analyze functions algebraically from their formula
- X09 Analyzing More Functions
  - o Analyze functions from their formula

- Assignment: X08 Analyzing Functions, X09 Analyzing More Functions, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 5

- Unit of Instruction: Function Behavior & Linear Functions

- Learning Objectives/Goals:

- X10 Quadratic Functions
    - Review the real number story about quadratics
- X11 2D Numbers
    - Extend the real numbers
- X12 Complex Numbers
    - Explore the arithmetic of complex numbers

- Assignment: X10 Quadratic Functions, X11 2D Numbers, X12 Complex Numbers, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 6

- Unit of Instruction: Complex Numbers

- Learning Objectives/Goals:

- X13 Complex Arithmetic
    - Explore the arithmetic of complex numbers
- X14 Complex Fractions
    - Explore the arithmetic of complex numbers
- X15 Algebraic Geometry
    - Represent real numbers on the 2D number line in polar form

- Assignment: X13 Complex Arithmetic, X14 Complex Fractions, X15 Algebraic Geometry, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 7

- Unit of Instruction: The Unit Circle; Right Triangles

- Learning Objectives/Goals:

- X16 The Unit Circle
    - Examine the unit circle via right triangles
    - Decompose vectors into perpendicular components
    - Describe components with sine and cosine
    - Describe complex numbers with this information
- X17 Right Triangles
    - Study right triangles
    - Study general triangles

- Assignment: X16 The Unit Circle, X17 Right Triangles, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 8

- Unit of Instruction: General Triangles

- Learning Objectives/Goals:

- X18 General Triangles
  - o Apply the Law of Sines
  - o Apply the Law of Cosines
- X19 Trigonometric Functions
  - o Study sine
  - o Study cosine
  - o Study tangent
- X20 Around the Circle
  - o Explore the reference angles $\frac{\pi}{6}, \frac{\pi}{4}, and \frac{\pi}{3}$ in the four quadrants

- Assignment: X18 General Triangles, X19 Trigonometric Functions, X20 Around the Circle, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 9

- Unit of Instruction: Graphical Transformations

- Learning Objectives/Goals:

- X21 Cartesian Graphs
  - o Study sine
  - o Study cosine
  - o Study tangent

- Assignment: X21 Cartesian Graphs, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 10
- Unit of Instruction: Trigonometric Functions
- Learning Objectives/Goals:
- X22 Polar Graphs
    - Use polar coordinates to describe curves
    - Convert between polar and Cartesian coordinates
    - Convert between the Cartesian and polar representation of a curve
    - Determine whether different polar representations represent the same point in the (x, y)-plane
    - Use the Cartesian to polar method to plot polar graphs
    - Understand the difference between a curve and the choice of coordinates used to describe the curve
- X23 Rate of Change
    - Compare rates of change of sine and cosine
- X24 More Trigonometric Functions
    - Investigate secant as the reciprocal of cosine
    - Investigate cosecant as the reciprocal of sine
    - Investigate cotangent as the reciprocal of tangent

- Assignment: X22 Polar Graphs, X23 Rate of Change, X24 More Trigonometric Functions, Assessment(s)
- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 11
- Unit of Instruction: Inverse Trigonometric Functions
- Learning Objectives/Goals:
- X25 Inverse Trigonometric Functions
    - Review Inverse functions
    - Investigate inverse trigonometric functions

- Assignment: X25 Inverse Trigonometric Functions, Assessment(s)
- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 12
- Unit of Instruction: Euler's Formula
- Learning Objectives/Goals:
- X26 Complex Bridge
    - Explore the arithmetic of complex numbers
- X27 Function Analysis
    - Analyze functions from their formula

- Assignment: X26 Complex Bridge, X27 Function Analysis, Assessment(s)
- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 13

- Unit of Instruction: Function Analysis

- Learning Objectives/Goals:

- X28 More Zeros
    - Examine the relationships between complex zeros
    - Examine zeros and factoring
- X29 More Function Analysis
    - Analyze functions from their formula

- Assignment: X28 More Zeros, X29 More Function Analysis, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 14

- Unit of Instruction: Modeling

- Learning Objectives/Goals:

- X30 Implicit Functions
    - Analyze functions via equations
- X31 Modeling
    - Find relationships in situations

- Assignment: X30 Implicit Functions, X31 Modeling, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.

Week 15

- Unit of Instruction: Model Analysis

- Learning Objectives/Goals:

- X32 Model Analysis
    - Encoding and decoding information

- Assignment: X32 Model Analysis, Assessment(s)

- Assessment Methods: Final exam, tests, quizzes, graded homework, discussion boards, individual or group projects, oral assessments, presentations, portfolios, etc.