

**Columbus State Community College**  
**Math Department**

**Course and Number:** Mathematics for Construction Sciences and Applied Technologies  
MATH 1101

**CREDITS: 3      CLASS HOURS PER WEEK: 4 (2 lecture, 2 lab)**

**PREREQUISITES:** MATH 1024 or MATH 1025 with a C or better, or placement equivalent.

**DESCRIPTION OF COURSE (AS IT APPEARS IN THE COLLEGE CATALOG):**

This college level mathematics course is designed for students seeking degrees in Automotive Technology, Construction Science, Heating Ventilating and Air Conditioning Technology, Skilled Trades, and Landscape Design and Management. Topics include: mathematics of measurement, function concepts and representations, basic elementary functions, right angle trigonometry, systems of linear equations, quadratic equations, and mathematical modeling.

All topics are delivered in the construction context of Automotive Technology(AUTO), Construction Science(CMGT), Heating Ventilating and Air Conditioning Technology(HVAC), Skilled Trades Technology(SKTR), and Landscape Design and Management(LAND). This course focuses on building problem solving and critical thinking skills and the supporting algebraic and analytical skills. Excel labs are included to support and extend the course topics. This course fulfills the mathematics requirement for designated AAS degree programs at CSCC. Transfer credit is not guaranteed.

**LEARNING OUTCOMES:**

**Unit 1: Measurement**

1.1: What is Measurement?

- Students will learn about measurements including units of rates and quantities.

1.2: Precision and Accuracy

- Students will learn about precision and accuracy and how these are applied.

1.3: Unit Conversions/Dimensional Analysis

- Students will learn how to apply the concepts and skills of dimensional analysis.

**Unit 2: Geometry of Shapes**

2.1: Angles

- Students will learn various measurement systems for angles.

2.2: Geometry of Triangles

- Students will learn about the geometric structure of triangles.

**Unit 3: Functions**

3.1: Introduction to Functions

- Students will learn the basic concepts and definition of functions.

### 3.2: Interpreting Graphs and Tables

- Students will learn how to use functional representations to analyze properties of functions.

### 3.3: Creating Graphs and Tables

- Students will learn how to create graphs of functions by hand and with technology.

### 3.4: Using Formulas

- Students will learn how functional values are modeled with formulas.

## **Unit 4: Relationships**

### 4.1: Types of Relationships

- Students will learn about independent and dependent relationships and how these are modeled with graphs, tables, and formulas.

### 4.2: Equations of Relationships

- Students will learn how functional values are modeled with equations.

### 4.3: Modeling

- Students will learn how to model real situations with equations and functions.

## **Unit 5: Right Triangle Trigonometry**

### 5.1: Properties of Triangles

- Students will learn basic trigonometry questions leading the way to functional relationships.

### 5.2: Pythagorean Theorem

- Students will learn how to apply the Pythagorean Theorem to deconstruct a triangle.

### 5.3: Trigonometric Functions

- Students will learn the basic trigonometric functions.

### 5.4: Approximating Trigonometric Functions

- Students will learn how to use technology to approximate trigonometric values.

### 5.5: Solving Triangles

- Students will learn to completely describe triangle measurements.

### 5.6: Applications

- Students will learn to apply trigonometric reasoning to real situations.

## **Unit 6: Systems of Linear Equations**

### 6.1: Solve system graphically

- Students will learn solution represented by intersection.

### 6.2: Solve via the Substitution Method

- Students will learn the substitution method.

### 6.3: Solve via the Elimination Method

- Students will learn the elimination method.

### 6.4: Applications

- Students will apply systems of equations to situations.

## **Unit 7: Quadratic Equations**

### 7.1: Quadratic Formula

- Students will learn the quadratic formula.

### 7.2: Applications

- Students will apply quadratic equations to situations.

## **GENERAL EDUCATION GOALS:**

Columbus State Community College has defined a series of general education outcomes that all students are expected to acquire before they graduate which include:

- Critical Thinking
- Effective Communication
- Quantitative Literacy

## **EQUIPMENT AND MATERIAL REQUIRED:**

- Scientific Calculator
- On-line Homework System

## **TEXTBOOK, MANUALS, REFERENCES, AND OTHER READINGS:**

- All materials provided in the Blackboard course

## **GENERAL INSTRUCTIONAL METHODS:**

This course utilizes a variety of instructional methods including, but not limited or restricted to on-line lessons, videos, notes, interactive applications, discussion boards, unit reviews, exercises, and Excel Labs.

## **ASSESSMENT:**

Columbus State Community College is committed to assessment (measurement) of student achievement of academic outcomes. This process addresses the issues of what you need to learn in your program of study and if you are learning what you need to learn. The assessment program at Columbus State has four specific and interrelated purposes: (1) to improve student academic achievements; (2) to improve teaching strategies; (3) to document successes and identify opportunities for program improvement; (4) to provide evidence for institutional effectiveness. In class you are assessed and graded on your achievement of the outcomes for this course. You may also be required to participate in broader assessment activities.

## **STANDARDS AND METHODS FOR EVALUATION**

This course utilizes a variety of assessment methods including, but not limited or restricted to: exercises, labs, quizzes, tests, exams, and projects.

## **GRADING SCALE:**

90% - 100% = A

80% - 89% = B

70% - 79% = C

60% - 69% = D

0% - 59% = E

## **UNITS OF INSTRUCTION**

Please provide a weekly course schedule indicating the Units of Instruction, learning objectives/goals, assigned readings, assignments, and exams.

### **Week 1**

**- Unit of Instruction: Measurement**

**- Student Learning Outcomes:**

#### 1.1 What is Measurement?

- Choose appropriate units for quantities or rates being measured using “measurement sense”.
- Distinguish between numbers that are measurements and numbers that are not measurements.
- Distinguish between measurements that are rates and measurements that are quantities or scalars.
- Estimate and interpolate to correctly take measurements from a given meter or scale.

#### 1.2 Precision and Accuracy

- Distinguish between precision and accuracy.
- Apply rules of precision for appropriate rounding when adding or subtracting measured quantities.
- Apply rules of significant digits for appropriate rounding when multiplying or dividing measured quantities.
- Identify which digits in a measurement are significant digits.
- Choose the appropriate level of precision for a measurement based on given tolerances.
- Accurately measure objects using a variety of tools/meters.
- Describe the difficulties that using various tools can cause.

**- Assigned Reading:** Sections 1.1-1.2

**- Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

### **Week 2**

**- Unit of Instruction: Measurement**

**- Student Learning Outcomes:**

#### 1.3 Unit Conversion/Dimensional Analysis

- Approximate a measurement given in one system of measure in another system.
- Convert from one unit of length to an equivalent unit of length.
- Convert from one unit of area to another unit of area.
- Convert from one unit of volume to another unit of volume.
- Convert rates from one unit to another.
- Perform multi-step unit conversions on measurements of using an algebraic unit conversion method.

- Perform unit conversions within the Metric System.
- Perform unit conversions within the English System.

- **Assigned Reading:** Sections 1.3

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 3

- **Unit of Instruction:** Geometry of Shapes

### 2.1 Angles

- Identify different types of angles.
- Use a protractor to draw an angle having a specified measure.
- Use a protractor to accurately measure an angle using degrees.
- Measure a given angle using degree-minute-second measure, to a stated level of accuracy.
- Measure a given angle using radian measure, to a stated level of accuracy.
- Convert between degree-minute-second and decimal-degree measures of angles.
- Convert between degree and radian measures.
- Make size comparisons for angles measured using different units of measure.
- State that 180 degrees and  $\pi$  radians are equivalent measures.

### 2.2 Geometry of Triangles

- Calculate the area of a triangle.
- Calculate the perimeter of a triangle.
- Determine whether triangles are congruent.
- Determine whether triangles are similar.
- Describe different types of triangles: scalene, isosceles, equilateral, acute, right, and obtuse.
- Identify different types of triangles as scalene, isosceles, or equilateral, and as acute, right, or obtuse.
- For a right triangle, identify which sides are the legs, and which side is the hypotenuse.
- Determine whether changes in dimensions of a triangle affect the area of a triangle.  
(e.g., perimeter is the same, but area is different)

- **Assigned Reading:** Sections 2.1 and 2.2

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 4

- **Unit of Instruction:** Functions

- **Student Learning Outcomes:**

### 3.1 Introduction to Functions

- Distinguish between a dependent variable and independent variable when presented with a practical situation.
- Use function notation to represent range values.
- Interpret the meaning of the domain of a function within the context of a given application problem.
- Interpret the meaning of the range of a function within the context of a given application problem.
- Calculate expressions involving function notation.

### 3.2 Interpretation of Graphs and Tables

- Use existing graphs and tables and functions to understand the connection between mathematical models and real world situations.
- Determine and interpret the maximum and minimum values for an existing function.
- Determine and interpret the intercepts of an existing function.
- Analyze the behavior of an existing function.
- Interpret what it means in the context of a problem for an existing function to be constant, increasing, and decreasing.
- Interpret the meaning of slope for an existing linear relationship.
- Identify functional relationships between quantities in applications.  
(Pos/Neg correlations and strength of correlations, median, mean, mode of measurements)

- **Assigned Reading:** Sections 3.1 and 3.2

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Weeks 5

- **Unit of Instruction:** Functions

- **Student Learning Outcomes:**

### 3.3 Creating Graphs and Tables

- Create various graphs (by hand and using technology) to convey important and useful information about a real world situation.
- Create a table of data in Excel to be used in a graph.
- Compare functions via tables and graphs.
- Graph a function that is based on a practical situation.
- Apply the analytical skills from section 6.2 to the student created graphs and tables.

- **Assigned Reading:** Section 3.3

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Weeks 6

- **Unit of Instruction:** Functions

- **Student Learning Outcomes:**

### 3.4 Using Formulas

- Using a formula to model data given in a graph or table.
- Identify the effects of changing variable values on functions via formulas, graphs, and tables.
- Use technology to evaluate functions via formulas. (calculator and Excel)
- Compare functions via tables, graphs, and formulas.

- **Assigned Reading:** Section 3.4

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## **Weeks 7**

- **Unit of Instruction:** Relationships (Library)

- **Student Learning Outcomes:**

### 4.1 Type of Relationships

- Discuss real life examples of all types of relationships between variables including linear, exponential, reciprocal, square root, quadratic, and piecewise.
- Look at graphs of these relationships.
- Look at equations of these relationships.

- **Assigned Reading:** Section 4.1

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## **Week 8**

- **Unit of Instruction:** Relationships (Library)

- **Student Learning Outcomes:**

### 4.2 Equations of Relationships

- Evaluate functional values.
- Solve equations.
- Manipulate a formula to isolate a specified variable.
- Find and interpret important points from an equation.

- **Assigned Reading:** Section 4.2

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## **Week 9**

- **Unit of Instruction:** Relationships (Library)

- **Student Learning Outcomes:**

### 4.3 Modeling

- Create and solve ratios and proportions
- Identify relationships within real life situations.
- Identify the appropriate relationship to model a data set.
- Observe the behavior of a graph when we adjust a parameter in the equation of a relationship.
- Use technology to create a function to model an existing data set.

- **Assigned Reading:** Section 4.3

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 10

- **Unit of Instruction:** Right Triangle Trigonometry

- **Student Learning Outcomes:**

### 5.1 Properties of Triangles

- Use the conventions for accuracy and precision when working with lengths and angles in their respective units.
- Use universal notation for angles and triangles to represent information about triangles.
- Determine unknown measures by relating the sides and angles of similar triangles.
- Use properties of congruent and similar triangles to model and solve problems involving triangles.
- State what will happen to the angles of a triangle when the length of one side of the triangle is changed.

### 5.2 Pythagorean Theorem

- Illustrate the Pythagorean Theorem.
- Deconstruct a non-right triangle so that it is comprised of two right triangles.
- Use the Pythagorean Theorem to model and solve problems involving right triangles.

- **Assigned Reading:** Section 5.1 and 5.2

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 11

- **Unit of Instruction:** Right Triangle Trigonometry

- **Student Learning Outcomes:**

### 5.3 Trigonometric Functions

- State the right triangle definitions of the sine, cosine, and tangent, in terms of ratios of side lengths of a right triangle.
- State the tangent definition in terms of sine and cosine.

### 5.4 Approximating Trigonometric Functions

- Use technology to accurately approximate the value of the sine of a given angle.
- Use technology to accurately approximate the value of the cosine of a given angle.
- Use technology to accurately approximate the value of the tangent of a given angle.
- Use a table of trigonometric values to accurately approximate the value of the sine of a given angle.
- Use a table of trigonometric values to accurately approximate the value of the cosine of a given angle.
- Use a table of trigonometric values to accurately approximate the value of the tangent of a given angle.
- Use technology appropriate inverse trigonometric function to accurately approximate the measure of an angle in degrees.
- Use technology inverse trigonometric functions to accurately approximate the measure of an angle in radians.

- **Assigned Reading:** Section 5.3 and 5.4

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project



## Week 12

- **Unit of Instruction:** Right Triangle Trigonometry

- **Student Learning Outcomes:**

### 5.5 Solving Triangles

- Determine the measures of sides of a triangle when the measures of two of its angles and one of its sides are known.
- Apply the Law of Cosines to determine triangle measurements.
- Apply the Law of Sines to determine triangle measurements.
- Determine accurate measures of the angles in a right triangle when the measures of two of its sides are known.

- **Assigned Reading:** Section 5.5

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 13

- **Unit of Instruction:** Right Triangle Trigonometry

- **Student Learning Outcomes:**

### 5.6 Applications

- Solve engineering related word problems by doing the following:
  - Define a variable(s) to represent the unknown quantity(s) for the given situation.
  - Draw and label a triangle(s) that models the situation and uses the above-defined variable(s).
  - Write an equation(s) that represents the situation and that will lead to determining the unknown quantity(s).
  - Solve the equation(s) for the unknown quantity(s).
  - Interpret the solution(s) in the context of the problem situation.
  - State the answer to the problem.
  - Defend the reasonableness of their answer to the problem.

- **Assigned Reading:** Section 5.6

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## Week 14

- **Unit of Instruction:** Systems of Linear Equations

- **Student Learning Outcomes:**

### 6.1 Solve system graphically

- Draw lines and identify intersection point.
- Interpret coordinates as solutions.

### 6.2 Solve system via the substitution method

- Apply method and identify solutions.

### 6.3 Solve system via the elimination method

- Apply method and identify solutions.

### 6.4 Applications

- Solve problems describe with systems of linear equations.

- **Assigned Reading:** Section 6.1, 6.2, 6.3, and 6.4
- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

## **Week 15**

- **Unit of Instruction:** Quadratic Equations

- **Student Learning Outcomes:**

### 7.1 Quadratic Formula

- Apply quadratic formula and identify solutions to quadratic equations.

### 7.2 Applications

- Solve problems described with quadratic equations.

- **Assigned Reading:** Section 7.1 and 7.2

- **Assessment Methods:** Exercises, Labs, Quizzes, Tests, Comprehensive Project

**ATTENDANCE POLICY:** Refer to instructor's addendum

## **STUDENT CODE OF CONDUCT:**

As an enrolled student at Columbus State Community College, you have agreed to abide by the Student Code of Conduct as outlined in the Student Handbook. You should familiarize yourself with the student code. The Columbus State Community College expects you to exhibit high standards of academic integrity, respect and responsibility. Any confirmed incidence of misconduct, including plagiarism and other forms of cheating, will be treated seriously and in accordance with College Policy and Procedure 7-10.

## **ADA POLICY:**

It is Columbus State policy to provide reasonable accommodations to students with disabilities as stated in the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act. If you would like to request such accommodations for access, please contact Disability Services: 101 Eibling Hall, (614) 287-2570. Email or give your Instructor a copy of your accommodations letter from Disability Services as soon as possible. Accommodations do not start until the letter is received, and accommodations are not retroactive.

Delaware Campus students may contact an Advisor in the Student Services Center on the first floor of Moeller Hall, (740) 203-8000.

## **AUDIO RECORDING**

Audio-and video-recording of class content, transmission, and distribution of class content (eg. lectures, discussions, demonstrations, etc.) is strictly prohibited unless written permission has been provided by the course instructor via the syllabus, or a signed form. Authorization to record extends solely to students in that particular course. Transmitting, sharing, or distributing course content onto public sites, commercial sites, or social media sites is strictly prohibited (effective SU 2015).

## **TITLE IX STATEMENT**

Columbus State Community College is committed to creating a learning and working environment that is free of bias, discrimination, and harassment by providing open communication and mutual respect. If you have encountered sexual harassment, sexual misconduct, sexual assault, or discrimination based on race, color, religion, age, national origin, ancestry, sex, sexual orientation, gender identity and expression, genetic information (GINA), military status or disability, please contact one of the following people:

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For additional information about your options at Columbus State Community College or to file a complaint online, please visit our webpage at: <http://www.csc.edu/services/title-ix/>

## **WEATHER CONDITIONS**

In the event of severe weather or other emergencies which could force the college to close or to cancel classes, such information will be broadcast on radio stations and television stations. Students who reside in areas which fall under a Level III emergency should not attempt to drive to the college even if the college remains open.

## **FINANCIAL AID ATTENDANCE REPORTING**

Columbus State is required by federal law to verify the enrollment of students who participate in Federal Title IV student aid programs and/or who receive educational benefits through the Department of Veteran's Affairs. It is the responsibility of the College to identify students who do not commence attendance or who stop attendance in any course for which they are registered and paid. Non-attendance is reported each term by each instructor, and results in a student being administratively withdrawn from the class section. Please contact the Financial Aid Office for information regarding the impact of course withdrawals on financial aid eligibility.