**Salem Community College NET 111 Course Syllabus**

NET 111 Mathematics for Energy Technicians: Credits 4:0:4

**Prerequisite:**  Completion of ENG098 and MAT095, if required. All developmental level courses must be completed before enrolling in NET core courses.

Contact John Steiner: (856) 351-2638, [jsteiner@salemcc.edu](mailto:jsteiner@salemcc.edu)

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**Course Description:**

This course reviews fundamental mathematics concepts, algebra, manipulations of equations and scientific notation as a prerequisite to the upcoming science courses where these calculation methods are used.

**Course Performance Objectives:**

Course Performance Objective #1:

The students will learn to add, subtract, multiply and divide whole numbers.

1. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE whole numbers.

2. With an approved calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE whole numbers.

3. Without a calculator: CONVERT between decimal and binary numbers.

Course Performance Objective #1:

The students will learn to perform mathematical calculations involving fractions.

1. DEFINE and GIVE EXAMPLES of:

a. proper fractions

b. improper fractions

c. mixed numbers.

2. CONVERT between proper fractions, improper fractions and mixed numbers.

3. SOLVE mathematical problems involving fractions by:

a. reducing the fraction

b. solving for the Lowest Common Denominator

c. changing the form of the fraction

4. Without a calculator; ADD, SUBTRACT, MULTIPLY and DIVIDE fractions (proper fractions, improper fractions, and mixed numbers).

5. With an approved calculator; ADD, SUBTRACT, MULTIPLY and DIVIDE fractions (proper fractions, improper fractions, and mixed numbers).

Course Performance Objective #3:

The students will learn to complete mathematical calculations involving decimals, averages and significant digits.

1. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE decimal fractions.

2. With an approved calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE decimal fractions.

3. CONVERT between decimal numbers, fractions, and percentages.

4. Without a calculator: CALCULATE the average of a series of numbers.

5. With an approved calculator: CALCULATE the average of a series of numbers.

6. Without a calculator: EXPRESS the solution of addition, subtraction, multiplication, and division operations using the appropriate number of significant digits.

Course Performance Objective #4:

The students will learn to perform mathematical calculations involving radicals and exponents.

1. USE the rules for multiplication and division of numbers and algebraic expressions raised to a power.

2. USE the rules for multiplication and division of radicals.

3. Without a calculator: CONVERT between radical and exponential form.

4. With an approved calculator: CONVERT between radicals and decimals.

5. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE numbers and algebraic expressions with exponents and radicals.

6. With an approved calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE numbers with exponents and radicals.

Course Performance Objective #5:

The students will become familiar with the concept of algebraic expressions and signed numbers.

1. IDENTIFY and DEFINE terms necessary for dealing with algebraic expressions, such as

a. factors

b. prime numbers

c. coefficients

d. monomials

e. binomials

f. polynomials

2. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE signed numbers.

3. With an approved calculator: ADD, SUBTRACT, MULTIPLY and DIVIDE signed numbers.

4. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE algebraic expressions.

Course Performance Objective #6:

The students will learn to perform basic algebraic calculations.

1. CHANGE the sign of an algebraic term or expression.

2. FACTOR and/or REDUCE algebraic term or expressions.

3. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE algebraic terms and expressions.

Course Performance Objective #7:

The students will learn to perform calculations involving the four algebraic axioms.

1. EXPLAIN the concept of an equation and be able to DISTINGUISH between identities and conditional equations.

2. STATE the four axioms for solving algebraic expressions and the methods by which they are used.

3. SOLVE fractional algebraic equations using the four axioms.

4. SOLVE problems using ratios and proportions.

Course Performance Objective #8:

The students will learn to successfully solve algebraic work problems.

1. Given a word problem, WRITE an equation that describes the situation in the word problem.

2. SOLVE algebraic word problems USING a step-by-step method.

Course Performance Objective #9:

Students will learn to perform algebraic calculations that involve multiple unknowns.

1. EXPLAIN the three methods by which a system of equations can be solved:

a. addition and/or subtraction

b. substitution, and

c. comparison

2. SOLVE system of equations involving two unknowns.

3. SOLVE system of equations involving three unknowns.

Course Performance Objective #10:

The students will learn to solve quadratic equations.

1. From memory, STATE the general form of the quadratic equation.

2. Without a calculator: SOLVE quadratic equations.

3. With an approved calculator: SOLVE quadratic equations.

4. APPLY the methods for solving quadratic equations to word problems.

Course Performance Objective #11:

The students will learn to perform calculations involving scientific notation and logarithms.

1. DESCRIBE the use of scientific notation in facilitating calculations involving very large or very small numbers.

2. Without a calculator, CONVERT:

a. Numbers and decimals to scientific notation.

b. Numbers with scientific notation to numbers and decimals.

3. With an approved calculator, CONVERT:

a. Numbers and decimals to scientific notation.

b. Numbers with scientific notation to numbers and decimals.

4. Without a calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE numbers with scientific notation.

5. With an approved calculator: ADD, SUBTRACT, MULTIPLY, and DIVIDE numbers with scientific notation.

6. STATE the purpose and use of common logarithms, natural logarithms, and antilogarithms.

7. Convert between decimal numbers and logarithms.

8. RECOGNIZE and USE the characteristic and mantissa of a logarithm.

9. MULTIPLY and DIVIDE numbers and numbers raised to powers by using both common logarithms and natural logarithms.

Course Performance Objective #12:

The students will learn the basic mathematical implications of graphing.

1. Given data, an equation, or word problem, PLOT the data points on a Cartesian coordinate graph.

2. Given data, an equation, or word problem, PLOT the data points on a semi-logarithmic coordinate graph.

3. Given a graph, INTERPRET data that is plotted.

4. Given a graph, SOLVE for an unplotted value using extrapolation of the data contained on the graph.

5. Given a graph, SOLVE for an unplotted value using interpolation of the data contained on the graph.

6. Given a graph, DETERMINE:

a. x-intercept,

b. y-intercept, and

c. the slope

7. Given an equation, CALCULATE:

d. x-intercept,

e. y-intercept, and

f. the slope

Course Performance Objective #13:

The students will learn to complete basic geometric calculations.

1. RECOGNIZE by form and shape the various types of polygons, triangles, quadrilaterals, and circles.

2. IDENTIFY the nomenclature dealing with the elements and parts of plane geometric figures and circles.

3. With an approved calculator and without a formula sheet, CALCULATE the angles, area, lengths, and the perimeter (circumference) of each of the following basic geometric shapes:

a. Triangle

b. Quadrilaterals (squares, rectangles, rhombus, and parallelograms)

c. Circle

4. Given a right triangle and the length of any two sides, SOLVE for the length of the third side using the Pythagorean Theorem.

5. Given more than one geometric figure and the appropriate dimensions in a word problem, CALCULATE the combined area of the figure.

Course Performance Objective #14:

The students will become familiar with the geometric properties of solid shapes.

1. RECOGNIZE by form and shape the various types of solid figures, solid rectangles, cubes, cylinders, spheres, and hemispheres.

2. IDENTIFY the nomenclature dealing with the elements and parts of solid geometric figures.

3. With an approved calculator and without a formula sheet, CALCULATE the surface area and volume of each of the following basic solid geometric shapes:

a. Rectangular solids and cubes

b. Cylinders

c. Spheres and Hemispheres

4. Given more than one solid geometric figure and the appropriate dimensions in a word problem, CALCULATE the combined surface area or volume of the figure.

Course Performance Objective #15:

The students will become familiar with the concepts of sine, cosine, tangent and the related applications.

1. Given a right triangle and a reference angle, IDENTIFY the following triangle sides:

a. Adjacent

b. Opposite

c. Hypotenuse

2. From memory, STATE the formulas for the following trigonometric functions:

a. Sine

b. Cosine

c. Tangent

d. Cosecant

e. Secant

f. Cotangent

3. Given a right triangle and a reference angle, the length of any side, and with an approved calculator; SOLVE for the unknown angles of the triangle.

4. DEFINE the unit of measure of a radian.

5. SOLVE problems using radians.

Course Performance Objective #16:

The students will be able to determine unknown sides and angles of a triangle.

1. Given a right triangle and a reference angle, the length of any side, and with an approved calculator, SOLVE for the unknown angles and sides of the triangle.

2. Given a triangle other than a right angle triangle, a reference angle, the length of any side, and with an approved calculator, SOLVE for the unknown angles and sides of the triangle.

Course Performance Objective #17:

Students will learn how to perform basic calculations involving scalar and vector quantities.

1. STATE the qualities of scalar and vector quantities.

2. REPLACE a single vector by its x and y component vectors.

3. ADD and SUBTRACT vectors analytically and graphically.

Course Performance Objective #18:

The student will be capable of applying the appropriate mathematical solutions to solve for various unknowns.

1. Apply basic mathematical theory involving graphs, formulas, and unknowns to solve problems.

2. Identify the proper application of the various formulae to solve problems.

**Required Text(s):** See http://salemcc.bncollege.com.

**Course Requirements and Means of Evaluation:** Please refer to the instructor’s syllabus addendum (to be distributed in class) for specific information regarding the course requirements and means of evaluation.

**Course Activities:**

Lecture and class discussions are the major means of instruction. Other activities may include demonstrations, presentations, field trips, and guest speakers.

**Grading Scale:** 93 – 100 = A, 90 – 92 = A-, 88 – 89 = B+, 83 – 87 = B, 80 – 82 = B-, 78 – 79 = C+,

73 – 77 = C, 70 – 72 = C-, 68 – 69 = D+, 60 – 67 = D, 59 – below = F, Failure due to attendance = FA

**Course Content Outline:**

1. Whole Numbers
2. Fractions
3. Decimals and Percentages
4. Exponents and Powers
5. Algebraic Operations I
6. Algebraic Operations II
7. Algebraic Equations
8. Algebraic Word Problems
9. Systems of Equations
10. Quadratic Equations
11. Scientific Notation and Logarithms
12. Graphing
13. Plane Geometry
14. Solid Geometry
15. Trigonometry I
16. Trigonometry II
17. Scalar and Vector Quantities