SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINR

COURSE TITLE: TECHNICAL MATHEMATICS

CODE NO.: MTH142-5   **SEMESTER:**

PROGRAM: MECHANICAL/ELECTRICAL/ELECTRONICS/COMPUTER ARCHITECTURAL/CIVIL TECHNICIAN

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PREVIOUS OUTLINE DATED:

APPROVED:
                    DEAN   DATE

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TOTAL CREDIT HOURS: 64

PREREQUISITE(S): NONE

SUBSTITUTE(S): MTH U9, MTH 120, MTH 612

I. **PHILOSOPHY/GOALS:**

This first level mathematics course for engineering technology programs begins with a review of fundamental concepts including arithmetic operations. This is followed by several algebra topics - functions and graphs, linear eguations, factoring, fractions and quadratic equations. A brief treatment of trigonometry of right triangles is also included.

The goals of this course are, first to show that mathematics does play a most important role in the development and understanding of the various fields of technology and, secondly to ensure that students acquire the mathematical and critical thinJcing skills necessary to analyze and solve engineering technology problems.

II. **TERMINAL PERFORMANCE OBJECTIVES**

After studying each of the following topics, the student should be able to:

Topic 1: Basic Algebraic Operations

1. Perform basic arithmetic ojierations on signed numbers.
2. Take powers, roots, and reciprocals of signed numbers and algebraic quantities.
3. Convert numbers between decimal and scientific notation.
4. Simplify expressions by removing grouping symbols and combining Uke terms.
5. Add, subtract, multiply, and divide algebraic expressions.
6. Solve simple linear equations, and solve literal equations for the indicated letter.

Topic 2: FimctJons and Graphs

1. Distinguish between relations and functions.
2. Graph points, relations and functions.
3. Solve equations graphically.

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IL TERMINAL PERFORMANCE OBJECTIVES (contd)

Topic 3: Trigonometric **Fundions**

    1   Convert angles between decimal degrees, radians, and degrees, minutes and seænds.
    2   Find the trigonometric functions of an angle.
    3   Find the missing sides and angles of a right triangle.
    4   Solve practical problems involving the right triangle.

Topic 4: **Systems of Linear Equations**

    1   Find an approximate graphical solution to a system of two equations.
    2   Solve a system of two equations and two unknowns by the addition-subtraction methods and by the substitution method.
    3   Solve a system of two ecjuations and two unknowns or three equations and three unknowns using determinants.

Topic 5: **Fa<^toring and Fr^tJQRg**

    1   Factor expressions by removing common f actors.
    2   Factor binomials that are the difference of the two squares.
    3   Factor trinomials.
    4   Reduce algebraic f ractions.
    5   Add, subtract, multiply and divide algebraic fractions.
    6   Solve fractional equations.

Topic 6: **Qiiadratic Equations**

    1   Solve quadratic equations by factoring, by completing the square, and the quadratic formula.
    2   Graph quadratic equations.

Topic 7: **F^xponents and Radicals**

    1   Use the laws of exponents to simplif y and combine expressions having integral exponents.
    2   Simplify radicals by removing perfect powers and by rationalizing the denominator.
    3   Add, subtract, multiply and divide radicals.

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IIL TOPICS TO BE COVERED: **TIMEFRAME:**

L	Basic Algebraic Operations	12 periods
2.	Functions and Graphs.	7 periods
3.	The Trigonometric Functions.	10 periods
4.	Systems of Linear Equations.	6 periods
5.	Factoring and Fractions.	12 periods
6.	Quadratic Equations	6 periods
7.	Exponents and Radicals	11 periods

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IV.   LEARNING ACTIVITIES: **REQUIRED RESOURCES:**

Ul   Basic Alegbraic Operations   Chapter 1

1.1   Numbers and literal symbols.   Questions 1 36, p.5
1.2   Fundamental laws of algebra and order of Questions 1 52, p.lO
        operations.
1.3   Calculators and approximate numbers   Questions 1 60, p.15
1.4   Exponents.   Questions 1 56, p.21
1.5   Scientific notation.   Questions 1 44, p.23
1.6   Roots and radicals.   Questions 1 36, p.26
1.7   Addition and subtraction of algebraic   Questions 1 44, p.30
        expressions.
1.8   Multiplication of algebraic expressions. Questions 1 *56*, p.32
1.9   Division of algebraic expressions.   Questions 1 34, p.35
1.10   Equations.   Questions 1 36, p.38
1.11   Formulas and literal equations.   Questions 1 36, p.41
1.12   Review exercise.   Questions 1 104, p.46

M   Functions and Graphs   Chapter 3

2.1   Introduction to functions.   Questions 1 36, p.78
2.2   Rectangular coordinates.   Questions 1 27, p.86
2.3   The graph of a function.   Questions 1 32, p.91
2.4   Solvmg equations graphically. (optional) Questions 1 28, p.96
2.5   Review exercise.   Questions 1 52, p.lOO

3X1   The Trigonometric Functions   Chapter 4

3.1   Angles.   Questions 1 - 44, p.l07
3.2   Defining the trig. functions.   Questions 1 - 32, p.lll
3.3   Values of the trig. functions.   Questions 1 - 40, p.l15
3.4   The right triangle.   Questions 1 - 28, p.l19
3.5   Applications of right triangles.   Questions 1 - 27, p.l22
3.6   Review exercise.   Questions 1 - 76, p.l24

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IV. LEARNING ACTIVITIES: (confd)	REQUIRED RESOURCES:

4^ Systems of Linear Equations	Chapter 5.
4.1 Linear equations.	Questions 1 - 20, p.130
4.2 Graphs of Linear Equations.	Questions 1 - 32, p.135
4.3 Solving systems of two linear equations in two unJoiowns graphically.	Questions 1 - 28, p.138
4.4 Solving systems of two linear equations in two unknowns algebraicaily.	Questions 1 - 32, p.143
4.5 Solving systems of two linear equations in two uaknowns by determinants.	Questions 1 - 32, p.149
4.6 Solving systems of three linear equations in three unknowns algebraicaily.	Questions 1 -14, p.153
4.7 Solving systems of three linear equations in three unknowns by determinants.	Questions 1 - 28, p.159
4.8 Review exercise.	Questions 1 - *64*, p.160

^ Factoring and Fractions	Chapter 6
5.1 Special products.	Questions 1 *es*, p.167
5.2 Common factor and difference of squares.	Questions 1 60, p.171
5.3 Factoring trinomials.	Questions 1 48, p.176
5.4 Sum and Difference of cubes.	Questions 1 20, p.178
5.5 Equivalent fractions.	Questions 1 60, p.181
5.6 Multiplication and division of fractions.	Questions 1 40, p.184
5.7 Addition and subtraction of fractions.	Questions 1 36, p.189
5.8 Equations involving fractions.	Questions 1 44, p.194
5.9 Review exercise.	Questions 1 104, p.195

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V.   METHOD OF EVALUATION:

1.   Four - five tests per semester. Test questions will be of near equal difficulty to questions assigned in the exercises.

2.   Final grade is a weighted average of these tests.

      90 -100 = A+
      80- 89 = A
      65- 79 = B
      55- 64 = C
       0 - 54 = R (or X)

A credit for this course may be allowed upon presentation of proof of standing in the appropriate grade 13 mathematics course (MAGOA). A score of 70% (or better) in the pre-test must be achieved as well.

All tests are scheduled in advance. Hence, attendance is mandatory. Unexcused absence from a test will result in a mark of zero for that test. If a student is prevented from writing a test by illness, the instructor should be notified before the time of the test. Upon return to class, the student should see the instructor immediately to arrange a time for a make-up test. The student should have a note from the college nurse or a doctor.

VI.   REQUIRED STUDENT RESOURCES:

1.   Text: Washington, Basic Technical Mathematics with Calculus. Sixth edition, metric version. Benjamin/Cummings Pub. Co. 1995.

2.   Calculator: (Recommended) SHARP Scientific calculator EL-531G. The use of some kinds of calculators may be restricted during tests.

VII.   SPECIAL NOTES:

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabihties) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.