SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: Technical Mathematics I

Code No.: OEL806

Semester:

Program: Engineering Technician & Technology Programs

Author: Mathematics Department

Date: Aug 2005 **Previous Outline Dated:** Jan 2001

Approved:

Total Credits: 4

Prerequisite(s): None

Length of Course: 4 hours/week **Total Credit Hours:** 64

I. COURSE DESCRIPTION:

This first level mathematics course for engineering technology programs begins with a review of fundamental concepts including arithmetic operations and concepts in measurement. This is followed by

several algebra topics including linear equations, factoring, fractions and quadratic equations. A treatment of trigonometry of right triangles, the trigonometric functions of any angle and of oblique 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 thinking skills necessary to analyze and solve engineering technology problems.

II. LEARNING OUTCOMES & ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

Topic 1: Basic Algebraic Operations

1. Perform basic arithmetic operations 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 like terms.
5. Add, subtract, multiply, and divide algebraic expressions.
6. Solve simple linear equations, and solve literal equations for the indicated letter.

Topic 2: Units of Measurement and Approximate Numbers

1. Convert units of measurement from one system to another.
2. Perform basic arithmetic operations on approximate numbers.

Topic 3: The Trigonometric Functions

1. Convert angles between decimal degrees, radians, and degrees, minutes and seconds.
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 equations in two unknowns or three equations in three unknowns using addition/subtraction, or determinants.

Topic 5: Factoring and Fractions

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

Topic 6: Quadratic Equations

1. Solve by factoring.
2. Solve by using the Quadratic Formula.

Topic 7: Trigonometric Functions of any Angle

1. Identify the algebraic sign of a given trigonometric function for an angle in any quadrant.
2. Find a trigonometric function for any angle using a calculator.
3. Convert angles between radians, degrees and revolutions.

Topic 8: Vectors and Oblique Triangles

1. Determine the resultant of two or more vectors.
2. Resolve a vector into its components.
3. Solve applied problems requiring vectors.
4. Solve oblique triangles using the law of sines and the law of cosines.
5. Solve applied problems requiring oblique triangles.

III. TOPICS:

Topic numbers do not correspond with the module numbers in the web course.

	Approximate Time
Topic 1: Basic Algebraic Operations	10 hours
Topic 2: Units of Measurement	6 hours
Topic 3: The Trigonometric Functions	10 hours
Topic 4: Systems of Linear Equations	7 hours
Topic 5: Factoring and Fractions	11 hours
Topic 6: Quadratic Equations (excluding Completing the Square)	6 hours
Topic 7: Trigonometric Functions of any Angle	5 hours
Topic 8: Vectors and Oblique Triangles	9 hours

III a. LEARNING ACTIVITIES:

For testing purposes you are responsible for knowing how to do all of the following from your textbook:

TOPIC	DESCRIPTION	REFERENCE
Topic 1	***Basic Algebraic Operations***	***Chapter 1***
1-1	Numbers and literal symbols	Questions 1-52, Page 5
1-2	Fundamental laws of algebra and order of operations	Questions 1-60, Page 10
1-3	Calculators and approximate numbers	Questions 1-60, Page 15
1-4	Exponents	Questions 1-68, Page 20
1-5	Scientific notation	Questions 1-52, Page 23
1-6	Roots and radicals	Questions 1-44, Page 26
1-7	Addition and subtraction of algebraic expressions	Questions 1-46, Page 29
1-8	Multiplication of algebraic expressions	Questions 1-58, Page 32
1-9	Division of algebraic expressions	Questions 1-42, Page 35
1-10	Solving equations	Questions 1-40, Page 39
1-11	Formulae and literal equations	Questions 1-38, Page 41
	Review exercises	Questions 1-106, Page 47
Topic 2	***Units of Measurement and Approximate Numbers***	***Appendix B***
B-1	The metric system	Questions - Page A-9
Topic 3	***The Trigonometric Functions***	***Chapter 4***
3-1	Angles	Questions 1-52, Page 113
3-2	Defining the trigonometric functions	Questions 1-32, Page 117
3-3	Values of the trigonometric functions	Questions 1-52, Page 121
3-4	The right triangle	Questions 1-28, Page 126
3-5	Applications of right triangles	Questions 1-27, Page 129
	Review exercises	Questions 1-84, Page 132

Topic 4	***Systems of Linear Equations***	***Chapter 5***
4-1	Linear equations	Questions 1-24, Page 140
4-2	Graphs of linear equations	Questions 1-36, Page 144
4-3	Solving systems of two linear equations in two unknowns graphically	Questions 1-32, Page 148
4-4	Solving systems of two linear equations in two unknowns algebraically	Questions 1-40, Page 154
4-5	Solving systems of two linear equations in two unknowns by determinants	Questions 1-36, Page 160
4-6	Solving systems of three linear equations in three unknowns algebraically	Questions 1-16, Page 164
4-7	Solving systems of three linear equations in three unknowns by determinants	Questions 1-30, Page 170
	Review exercises	Questions 1-68, Page 172
Topic 5	***Factoring and Fractions***	***Chapter 6***
5-1	Special products	Questions 1-72, Page 179
5-2	Common factor and difference of squares	Questions 1-64, Page 184
5-3	Factoring trinomials	Questions 1-56, Page 191
5-4	Sum and difference of cubes	Questions 1-26, Page 193
5-5	Equivalent fractions	Questions 1-72, Page 197
5-6	Multiplication and division of fractions	Questions 1-40, Page 201
5-7	Addition and subtraction of fractions	Questions 1-46, Page 206
5-8	Equations involving fractions	Questions 1-48, Page 211
	Review exercises	Questions 1-124, Page 213
Topic 6	***Quadratic Equations***	***Chapter 7***
6-1	Solutions by factoring	Questions 1-38, Page 220
6-2	The Quadratic Formula	Questions 1-36, Page 226

Topic 7	***Trigonometric Functions of Any Angle***	***Chapter 8***
7-1	Signs of trigonometric functions	Questions 1-40, Page 238
7-2	Trigonometric functions of any angle	Questions 1-48, Page 243
7-3	Radians	Questions 1-60, Page 248
7-4	Applications of the use of radians	Questions 1-40, Page 252
	Review exercises	Questions 1-76, Page 255
Topic 8	***Vectors and Oblique Triangles***	***Chapter 9***
8-1	Introduction to vectors	Questions 1-36, Page 262
8-2	Components of vectors	Questions 1-28, Page 265
8-3	Vector addition by components	Questions 1-28, Page 271
8-4	Applications of vectors	Questions 1-32, Page 275
8-5	Oblique triangles, the Law of Sines	Questions 1-36, Page 282
8-6	The Law of Cosines	Questions 1-34, Page 287
	Review exercises	Questions 1-64, Page 289

IV. REQUIRED RESOURCES/TEXTS/MATERIALS/SOFTWARE/TECHNOLOGY:

1. *Basic Technical Mathematics with Calculus* (8th Edition), SI Version, Allyn J. Washington. Addison-Wesley, Pearson, 2005. ISBN: 0131888447
2. (Strongly Recommended): *Student Solutions Manual, Basic Technical Mathematics with Calculus* (8th Edition), SI Version, John R. Martin. Addison-Wesley, Pearson, 2005. ISBN: 0321307542
3. Calculator: (Recommended)
   a) Electrical, Electronics, Computer Engineering –SHARP Scientific Calculator EL-506L
   b) Civil, Architectural Engineering –SHARP Scientific Calculator EL-531

   Note: The use of programmable calculators is restricted during the final exam.

4. Speakers and a sound card are required in order to access the lectures.

V. EVALUATION PROCESS/GRADING SYSTEM:

There are four online tests, each of equal value and weight and will be averaged out to a total of 50%. There is one proctored written final exam, valued at 50%. The online tests and final exam are open book.

Passing grade at Sault College is 50%. Your registering college will convert the percentage grade to the

letter grade.

VII. SPECIAL NOTES:

1. If you are a student with a disability please identify your needs to the tutor and/or the Centre for Students with Disabilities at your registering college.
2. Students, it is your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.
3. Course outline amendments: The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.
