

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE MARIE, ON



COURSE OUTLINE

Course Title: Technical Mathematics

Code No.: Mth 142-5

Semester: One

Program; Electrical / Electronics / Computer /  
Civil Technician / Construction

Author: Mathematics Department

Date: August 1998    Previous Outline Dated: July 1997

Approved

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**sn.**  
Date

Total Credits: 4            Prerequisite(s): None

Substitutes: Mth 119, Mth 120, Mth 612

Length of Course: 4 hrs./week    Total Credit Hours: 64

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SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE. MARIE

## **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 course finishes with a more detailed view of exponents and radicals.

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**

### **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: 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 and two unknowns or three equations and three unknowns using determinants

## II. LEARNING OUTCOMES (confd):

### 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

### Topic 6: Quadratic Equations

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

### Topic 7: Trigonometric Functions of any Angle

1. Identify the algebraic sign of a given trig function for an angle in any quadrant
2. Find a trig 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

### Topic 9: Exponents and Radicals

1. Use the laws of exponents to simplify 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

## III. TOPICS:

## TIMEFRAME

• Basic Algebraic Operations	8 hrs
• Units of Measurement	5 hrs
• The Trigonometric Functions	10 hrs
• Systems of Linear Equations	6 hrs
• Factoring and Fractions	11 hrs
• Quadratic Equations (Excluding Completing the Square)	4 hrs
• Trigonometric Functions of Any Angle	3 hrs
• Vectors and Oblique Triangles	7 hrs
• Exponents and Radicals	10 hrs

IV. LEARNING ACTIVITIES

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHARTER ASSIGNMENTS
<b>1.0</b>	<b>BASIC ALGEBRAIC OPERATIONS</b>	<b>Chapter 1</b>
1.1	Numbers and literal symbols	Questions 1-36, Page 5
<b>1.2</b>	Fundamental laws of algebra and order of operations	Questions 1-52, Page 10
1.3	Calculators and approximate numbers	Questions 1-60, Page 15
1.4	Exponents	Questions 1-56, Page 21
1.5	Scientific notation	Questions 1-44, Page 23
1.6	Roots and radicals	Questions 1-36, Page 26
<b>1.7</b>	Addition and subtraction of algebraic expressions	Questions 1-44, Page 30
<b>1.8</b>	Multiplication of algebraic expressions	Questions 1-56, Page 32
<b>1.9</b>	Division of algebraic expressions	Questions 1-34, Page 35
1.10	Equations	Questions 1-36, Page 38
1.11	Formulae and literal equations	Questions 1-36, page 41
1.12	Review exercise	Questions 1-104, Page 46
<b>2.0</b>	<b>UNITS OF MEASURE AND APPROXIMATE NUMBERS</b>	
2.1	The metric system (SI)	Questions 1-40, Page A-9, Appendix B
<b>3.0</b>	<b>THE TRIGONOMETRIC FUNCTIONS</b>	<b>Chapter 4</b>
3.1	Angles	Questions 1-44, Page 107
3.2	Defining the trig. functions	Questions 1-32, Page 111
3.3	Values of the trig. functions	Questions 1-40, Page 115
3.4	The right triangle	Questions 1-28, page 119
3.5	Applications of right triangles	Questions 1-27, Page 122
3.6	Review exercise	Questions 1-76, Page 124
<b>4.0</b>	<b>SYSTEMS OF LINEAR EQUATIONS</b>	<b>Chapter 5</b>
4.1	Linear equations	Questions 1-20, page 130
4.2	Graphs of linear equations	Questions 1-32, Page 135
4.3	Solving systems of two linear equations in two unknowns graphically	Questions 1-28, Page 138
4.4	Solving systems of two linear equations in two unknowns algebraically	Questions 1-32, Page 143
4.5	Solving systems of two linear equations in two unknowns by determinants	Questions 1-32, Page 149
4.6	Solving systems of three linear equations in three unknowns algebraically	Questions 1-14, Page 153
<b>4.7</b>	Solving systems of three linear equations in three unknowns by determinants	Questions 1-28, Page 159
<b>4.8</b>	Review exercise	Questions 1-64, Page 160

## IV. LEARNING ACTIVITIES

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
5.0	FACTORING AND FRACTIONS	Chapter 6
5.1	Special products	Questions 1-68, Page 167
5.2	Common factor and difference of squares	Questions 1-60, Page 171
5.3	Factoring trinomials	Questions 1-48, Page 176
5.4	Sum and difference of cubes	Questions 1-20, Page 178
5.5	Equivalent fractions	Questions 1-60, Page 181
5.6	Multiplication and division of fractions	Questions 1-40, Page 184
5.7	Addition and subtraction of fractions	Questions 1-36, Page 189
5.8	Equations involving fractions	Questions 1-44, Page 194
5.9	Review exercise	Questions 1-104, Page 195
6.0	QUADRATIC EQUATIONS	Chapter 7
6.1	Solution by factoring	Questions 1-40, Page 203
6.2	The Quadratic Formula	Questions 1-32, Page 210
7.0	TRIGONOMETRIC FUNCTIONS OF ANY ANGLE	Chapter 8
7.1	Signs of trig functions	Questions 1-24, Page 220
7.2	Trig functions of any angle	Questions 1-56, Page 226
7.3	Radians	Questions 1-60, Page 231
7.4	Applications of the use of radians	Questions 1-40, Page 235
7.5	Review exercise	Questions 1-72, Page 238
8.0	VECTORS AND OBLIQUE TRIANGLES	Chapter 9
8.1	Introduction to vectors	Questions 1-36, page 244
8.2	Components of vectors	Questions 1-24, Page 247
8.3	Vector addition by components	Questions 1-24, Page 252
8.4	Application of vectors	Questions 1-24, Page 255
8.5	Oblique triangles, the Law of Sines	Questions 1-32, Page 262
8.6	The Law of Cosines	Questions 1-32, Page 267
8.7	Review exercise	Questions 1-56, Page 268
9.0	EXPONENTS AND RADICALS	Chapter 11
9.1	Integral exponents	Questions 1-56, Page 300
9.2	Fractional exponents	Questions 1-60, Page 304
9.3	Simplest radical form	Questions 1-60, Page 308
9.4	Addition and subtraction of radicals	Questions 1-30, Page 310
9.5	Multiplication and division of radicals	Questions 1-52, Page 314
9.6	Review exercise	Questions 1-70, Page 316

## V. REQUIRED RESOURCES / TEXTS / MATERIALS:

1. Basic Technical Mathematics with Calculus. Washington, 6<sup>th</sup> Edition, Metric Version, Benjamin/Cummings, 1995
2. Calculator: (Recommended) -
  - a) Electrical, Electronics, Computer Engineering - SHARP Scientific Calculator EL-506L
  - b) Civil, Architectural Engineering - SHARP Scientific Calculator EL-531L

*Note: The use of some kinds of calculators may be restricted during tests.*

## VI. EVALUATION PROCESS/GRADING SYSTEM:

### MAJOR ASSIGNMENTS AND TESTS

While regular tests will normally be scheduled and announced beforehand, there may be an unannounced test on current work at any time. Such tests, at the discretion of the instructor, may be used for up to 30% of the overall mark.

At the discretion of the instructor, there may be a mid-term exam and there may be a final exam, each of which can contribute up to 30% of the overall mark.

The instructor will provide you with a list of test dates. Tests may be scheduled out of regular class time.

### ATTENDANCE

It is your responsibility to attend all classes during the semester. Research indicates there is a high correlation between attendance and student success.

If you are absent from class, it is your responsibility to find out what work was covered and assigned and to complete this work before the next class. Your absence indicates your acceptance of this responsibility.

**Unexcused absence from a test may result in a mark of zero ("0").** Absence may be excused on compassionate grounds such as verified illness or bereavement. On return from an excused absence, you should ask your instructor to schedule the writing of a make-up test. Failure to do so will be considered as an unexcused absence..

## VI. EVALUATION PROCESS/GRADING SYSTEM (Continued):

### METHOD OF ASSESSMENT (GRADING METHOD)

A+	Consistently outstanding	(90% - 100%)
A	Outstanding Achievement	(80% - 89%)
B	Consistently above average achievement	(70% - 79%)
C	Satisfactory or acceptable achievement in all areas subject to assessment	(55% - 69%)
X or R	A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements (See <b>below</b> )	(45% - 54%)
R	Repeat - The student has not achieved the objectives of the course, and the course must be repeated	(0% - 44%)
CR	Credit exemption	

The method of calculating your weighted average will be defined by your instructor. Since grades are based upon averages, it follows that good marks in some tests can compensate for a failing mark in another test.

#### Make-Up Test (if applicable)

An "X" grade may be assigned at the end of the regular semester if you have met ALL of the following criteria:

- an overall average between 45% and 54% was achieved
- at least 50% of the tests were passed
- at least 80% of the scheduled classes were attended
- all of the topic tests were written

If you are assigned an "X" grade, you may convert it to a "C" grade by writing a make-up test on topics agreed to by the instructor. This test will be available at the time agreed to by your instructor.

At the end of the regular term, it is your responsibility to obtain your results from your instructor and, in the event of an "X" grade, to inquire when the make-up test will be available.

The score you receive on this make-up test will replace your original test score and be used to re-calculate your weighted average. If the re-calculated average is 55% or greater, a "C" grade will be assigned. If the re-calculated average is 54% or less, an "R" grade will be assigned.

## **VI. EVALUATION PROCESS/GRADING SYSTEM (Continued):**

### **"R" and "X" Grades at the end of the Semester**

If an "X" grade is not cleared by the specified date, it will become an "R" grade. Except for extenuating circumstances, an "X" grade in Math will not be carried into the next semester.

### **"R" Grades during the Semester**

A student With a failing grade and poor attendance (less than 80% attendance) may be given an "R" at any time during the semester.

## **VII. SPECIAL NOTES:**

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities), are encouraged to discuss required accommodations with the professor and/or contact the Special Needs Office.

### **Advanced Standing**

Students who have completed an equivalent post-secondary course must bring relevant documents to the Coordinator, Mathematics Department:

- ^ • a copy of course outline
- a copy of the transcript verifying successful completion of the equivalent course

Note: A copy of the transcript must be on file in the Registrar's Office.

## **VIII. PRIOR LEARNING ASSESSMENT:**

Students who wish to apply for advanced credit in the course should consult the instructor or the Prior Learning Assessment Office (E2203).