THE SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ON

COURSE OUTLINE

Course Title: Technical Mathematics I

Code No.: MTH142-5   **Semester**: One

Program: Engineering Technician and Technology Programs

Author: Mathematics Department

Date: August 2001   **Previous Outline Dated**: August 2000

Approved: _____   _____
                        Dean   Date

Total Credits: 4   **Prerequisite(s): None**
Substitutes: Mth119, Mth120, Mth612
Length of Course: 4 hrs./wk.   Total Credit Hours: 64

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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.   STUDENT PERFORMANCE OBJECTIVES:

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

II.   STUDENT PERFORMANCE OBJECTIVES (Continued):

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.

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

IV. LEARNING ACTIVITIES:

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
1.0	**BASIC ALGEBRAIC OPERATIONS**	**Chapter 1**
1.1	Numbers and literal symbols	Questions 1-40, p. 5
1.2	Fundamental laws of algebra and order of operations	Questions 1-52, p. 10
1.3	Calculators and approximate numbers	Questions 1-56, p. 15
1.4	Exponents	Questions 1-60, p. 21
1.5	Scientific notation	Questions 1-44, p. 23
1.6	Roots and radicals	Questions 1-36, p. 25
1.7	Addition and subtraction of algebraic expressions	Questions 1-44, p. 29
1.8	Multiplication of algebraic expressions	Questions 1-56, p. 31
1.9	Division of algebraic expressions	Questions 1-36, p. 34
1.10	Equations	Questions 1-36, p. 37
1.11	Formulae and literal equations	Questions 1-36, p. 40
1.12	Review exercise	Questions 1-105, p. 45
2.0	**UNITS OF MEASURE AND APPROXIMATE NUMBERS**	
2.1	The metric system	Questions - Appendix B p. A-9
3.0	**THE TRIGONOMETRIC FUNCTIONS**	**Chapter 4**
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: 1-44 Page 115
3.4	The right triangle	Questions: 1-28 Page 120
3.5	Applications of right triangles	Questions: 1-27 Page 122
3.6	Review exercise	Questions: 1-76 Page 125

IV.   LEARNING ACTIVITIES (Continued):

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
4.0	**SYSTEMS OF LINEAR EQUATIONS**	**Chapter 5**
4.1	Linear equations	Questions: 1-20 Page 132
4.2	Graphs of linear equations	Questions: 1-32 Page 136
4.3	Solving systems of two linear equations in two unknowns graphically	Questions: 1-28 Page 140
4.4	Solving systems of two linear equations in two unknowns algebraically	Questions: 1-32 Page 145
4.5	Solving systems of two linear equations in two unknowns by determinants	Questions: 1-32 Page 151
4.6	Solving systems of three linear equations in three unknowns algebraically	Questions: 1-14 Page 155
4.7	Solving systems of three linear equations in three unknowns by determinants	Questions: 1-28 Page 161
4.8	Review exercise	Questions: 1-64 Page 163
5.0	**FACTORING AND FRACTIONS**	**Chapter 6**
5.1	Special products	Questions: 1-68 Page 169
5.2	Common factor and difference of squares	Questions: 1-60 Page 173
5.3	Factoring trinomials	Questions: 1-48 Page 179
5.4	Sum and difference of cubes	Questions: 1-20 Page 181
5.5	Equivalent fractions	Questions 1-60 Page 185
5.6	Multiplication and division of fractions	Questions: 1-40 Page 188
5.7	Addition and subtraction of fractions	Questions: 1-44 Page 193
5.8	Equations involving fractions	Questions: 1-44 Page 198
5.9	Review exercise	Questions: 1-112 Page 199
6.0	**QUADRATIC EQUATIONS**	**Chapter 7**
6.1	Solution by factoring	Questions: 1-47 Page 206
6.2	The Quadratic Formula	Questions: 1-32 Page 213

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IV. LEARNING ACTIVITIES (Continued):

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
7.0	**TRIGONOMETRIC FUNCTIONS OF ANY ANGLE**	**Chapter 8**
7.1	Signs of trigonometric functions	Questions 1-32, p. 223
7.2	Trigonometric functions of any angle	Questions 1-48, p. 229
7.3	Radians	Questions 1-60, p. 234
7.4	Applications of the use of radians	Questions 1-40, p. 238
7.5	Review exercise	Questions 1-72, p. 240
8.0	**VECTORS AND OBLIQUE TRIANGLES**	**Chapter 9**
8.1	Introduction to vectors	Questions 1-36, p. 247
8.2	Components of vectors	Questions 1-24, p. 251
8.3	Vector addition by components	Questions 1-28, p. 256
8.4	Application of vectors	Questions 1-24, p. 259
8.5	Oblique triangles, the Law of Sines	Questions 1-32, p. 266
8.6	The Law of Cosines	Questions 1-32, p. 271
8.7	Review exercise	Questions 1-60, p. 273

V.   REQUIRED RESOURCES / TEXTS / MATERIALS:

1. Basic Technical Mathematics with Calculus (7th Edition) Washington, Metric Version. Addison-Wesley, 2000
2. Calculator: (Recommended)
   a) Electrical, Electronics, Computer Engineering – SHARP Scientific Calculator EL-506L; b) Civil, Architectural Engineering – SHARP Scientific Calculator EL-531R
   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 evaluation information for your class section. Tests may be scheduled out of regular class time.

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VI. EVALUATION PROCESS/GRADING SYSTEM (continued):

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.

METHOD OF ASSESSMENT (GRADING METHOD)

Grade		Definition	Grade Point Equivalent
A+	Consistently outstanding	(90% - 100%)	4.00
A	Outstanding achievement	(80% - 89%)	3.75
B	Consistently above average achievement	(70% - 79%)	3.00
C	Satisfactory or acceptable achievement in all areas subject to assessment	(60% - 69%)	2.00
R	Repeat - The student has not achieved the objectives of the course, and the course must be repeated.	(less than 60%)	0.00
X	A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements		
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.

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VI. EVALUATION PROCESS/GRADING SYSTEM (continued):

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 50% and 59% was achieved
- at least 50% of the tests were passed
- at least 80% of the scheduled classes were attended
- at least 80% of quizzes and assignments were submitted
- 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 60% or
greater, a "C" grade will be assigned. If the re-calculated average is 59% or less, an "R"
grade will be assigned.

"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.

VII. SPECIAL NOTES (continued):

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).