SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE: Technical Mathematics I

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

PROGRAM: Engineering Technician and Technology Programs

AUTHOR: Mathematics Department

DATE: Sept 2008   **PREVIOUS OUTLINE DATED:** June 2007

APPROVED:

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                 CHAIR   DATE

TOTAL CREDITS: 5

PREREQUISITE(S): None

HOURS/WEEK: 4

Technical Mathematics   **MTH142-5**

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 AND ELEMENTS OF THE PERFORMANCE:

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

1. **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.
2. **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.

3. **Topic 3: Trigonometric Functions**
    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.

Technical Mathematics   **MTH142-5**

4.   **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.
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5.   **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.

6.   **Topic 6: Quadratic Equations**
        1.   Solve by factoring
        2.   Solve using the Quadratic Formula
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7.   **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 Convert angles between radians, degrees and revolutions
8.   **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:
   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 completing   6 hours
   the square)
   7. Trigonometric Functions of any Angle   5 hours

Technical Mathematics   **MTH142-5**

III a. LEARNING ACTIVITIES:

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
1.0	**BASIC ALGEBRAIC OPERATIONS**	**Chapter 1**
1.1	Numbers and literal symbols	Questions 1-52, p. 5
1.2	Fundamental laws of algebra and order of operations	Questions 1-60, p. 10
1.3	Calculators and approximate numbers	Questions 1-60, p. 15
1.4	Exponents	Questions 1-68, p. 20
1.5	Scientific notation	Questions 1-52, p. 23
1.6	Roots and radicals	Questions 1-44, p. 26
1.7	Addition and subtraction of algebraic expressions	Questions 1-46, p. 29
1.8	Multiplication of algebraic expressions	Questions 1-58, p. 32
1.9	Division of algebraic expressions	Questions 1-42, p. 35
1.10	Equations	Questions 1-40, p. 39
1.11	Formulae and literal equations	Questions 1-38, p. 41
1.12	Review exercise	Questions 1-106, 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: 1-52, Page 113
3.2	Defining the trig. functions	Questions: 1-32, Page 117
3.3	Values of the trig. 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
3.6	Review exercise	Questions: 1-84, Page 132

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
4.0	**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
4.8	Review exercise	Questions: 1-68, Page 172
5.0	**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

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
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
5.9	Review exercise	Questions: 1-124, Page 213
6.0	**QUADRATIC EQUATIONS**	**Chapter 7**
6.1	Solution by factoring	Questions: 1-38, Page 220
6.2	The Quadratic Formula	Questions: 1-36, Page 226

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
7.0	**TRIGONOMETRIC FUNCTIONS OF ANY ANGLE**	**Chapter 8**
7.1	Signs of trigonometric functions	Questions 1-40, p. 238
7.2	Trigonometric functions of any angle	Questions 1-48, p. 243
7.3	Radians	Questions 1-60, p. 248
7.4	Applications of the use of radians	Questions 1-40, p. 252
7.5	Review exercise	Questions 1-76, p. 255
8.0	**VECTORS AND OBLIQUE TRIANGLES**	**Chapter 9**
8.1	Introduction to vectors	Questions 1-36, p. 262
8.2	Components of vectors	Questions 1-28, p. 265
8.3	Vector addition by components	Questions 1-28, p. 271
8.4	Application of vectors	Questions 1-32, p. 275
8.5	Oblique triangles, the Law of Sines	Questions 1-36, p. 282
8.6	The Law of Cosines	Questions 1-34, p. 287
8.7	Review exercise	Questions 1-64, p. 289

IV.   REQUIRED RESOURCES/TEXTS/MATERIALS:

1. Basic Technical Mathematics with Calculus (8th Edition) Washington, SI Version, Addison-Wesley, Pearson, 2005

    Calculator: (Recommended)

    a) Electrical, Electronics, Computer Engineering – **SHARP Scientific Calculator EL-520 (has complex numbers capability);**

    b) All other Engineering – **SHARP Scientific Calculator EL-531**

    Note: The use of some kinds of calculators and other electronic devises may be restricted during tests.

Technical Mathematics   **MTH142-5**

V.   EVALUATION PROCESS/GRADING SYSTEM:
There will be four tests of equal value averaged over the semester after each two topics.
Test 1 : topics 1 and 2
Test 2 : topics 3 and 4
Test 3 : topics 5 and 6
Test 4 : topics 7 and 8
Absence from a test will result in a zero grade for that test unless a verifiable excuse is available.

The following semester grades will be assigned to students:

Grade	Definition	Grade Point Equivalent
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VI.   SPECIAL NOTES:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

Technical Mathematics   **MTH142-5**

Retention of Course Outlines:
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Communication:
The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

The professor reserves the right to use other tools and / or techniques that may be more applicable. These other tools and / or techniques for effective communication will be discussed, identified and presented throughout the delivery of the course content.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Code of Conduct.* Students who engage in academic dishonesty will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

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.

Substitute course information is available in the Registrar's office.

VII.   PRIOR LEARNING ASSESSMENT:

Technical Mathematics   **MTH142-5**

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio.