

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:** Technical Mathematics II

**CODE NO. :** MTH143-5                      **SEMESTER:** Two

**PROGRAM:** Engineering Technician and  
Technology Programs

**AUTHOR:** Mathematics Department

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

**APPROVED:**

	CHAIR	DATE
<b>TOTAL CREDITS:</b>	<b>5</b>	
<b>PREREQUISITE(S):</b>	<b>MTH 142</b>	
<b>HOURS/WEEK:</b>	<b>4</b>	

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**COURSE DESCRIPTION:****I.**

This course is a continuation of MTH 142-5 (from Semester One) for engineering technology students. Topics of study include a more detailed view of exponents and radicals, plane analytic geometry, geometry, complex numbers, and functions including trigonometric, exponential and logarithmic functions. This course also includes an introduction to statistics.

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:

**Topic 1A: Complex Numbers (*Electrical/Electronics/Computer*)**

1. Write complex numbers in rectangular, polar, trigonometric and exponential forms
2. Graph complex numbers in both rectangular and polar form
3. Find the sum, differences, products, quotients, powers and roots of complex numbers

**Topic 1B: Geometry (*Civil/Environmental/Construction*)**

1. Solve practical problems to find the sides and angles of right triangles
2. Solve practical problems to find the areas of a triangle or quadrilateral
3. Solve problems involving the circumference, diameter, area or tangent to a circle
4. Compute surface areas and volumes of spheres, cylinders, cones and other solid figures

**Topic 2: 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

**Topic 3: Graphs of Trigonometric Functions**

1. Find the amplitude, period, frequency and phase angle for a sine wave or cosine wave

2. Write the sine function or cosine function, given the amplitude, period and phase
3. Graph the sine function, cosine function or tangent function

Topic 4: Exponential and Logarithmic Functions

1. Define the logarithmic and exponential function
2. Graph logarithmic and exponential functions
3. Convert expressions between exponential and logarithmic form
4. Evaluate, manipulate and simplify logarithmic expressions
5. Solve exponential and logarithmic equations

Topic 5: Variation

1. Review ratio and proportion
2. Study direct, inverse and joint variation

Topic 6: Additional Topics in Trigonometry

1. Simplify a trigonometric expression using the fundamental identities
2. Prove trigonometric identities using the fundamental identities
3. Simplify expressions or prove identities using the sum or difference formulae or double-angle formulae
4. Solve trigonometric equations
5. Evaluate inverse trigonometric functions

Topic 7: Plane Analytic Geometry

1. Write the equation of a line using the slope-intercept form, the point-slope form or the two-point form
2. Write the equation of a circle, ellipse, parabola or hyperbola from given information
3. Make a graph of any of the above conic sections

Topic 8: Basic Statistics

1. Organize data into frequency distributions, frequency histograms or frequency polygons
2. Calculate the mean, median and mode
3. Calculate the range and standard of deviation
4. Calculate the best fit curve (linear regression)
5. Coefficient of correlation ( $r$ ) – from class notes

**III. TOPICS:**

- 1a, Complex numbers  
 Or  
 1b or Geometry
2. Exponents and Radicals
  3. Graphs of Trigonometric Functions
  4. Exponential and Logarithmic Functions
  5. Variation
  6. Additional Topics in Trigonometry
  7. Plane Analytic Geometry
  8. Basic Statistics

**III a. LEARNING ACTIVITIES:**

<b>TOPIC NUMBER</b>	<b><u>TOPIC DESCRIPTION</u></b>	<b>REFERENCE CHAPTER ASSIGNMENTS</b>
<b>1.0A</b>	<b>Complex numbers</b>	<b><u>Chapter 12</u></b>
1.1 A	Basic definitions	Questions 1-54, p. 343
1.2 A	Basic operations with complex numbers	Questions 1-36, p. 346
1.3 A	Graphical representation of complex numbers	Questions 1-28, p. 348
1.4 A	Polar form of complex numbers	Questions 1-36, p. 351
1.5 A	Exponential form of complex numbers	Questions 1-36, p. 354
1.6 A	Products, quotients, powers, and roots of complex numbers	Questions 1-48, p. 360
1.7 A	Review exercises	Questions 1-72, p. 368
<b>1.0B</b>	<b>Geometry</b>	<b><u>Chapter 2</u></b>
1.1 B	Lines and angles	Questions 1-28, p. 53
1.2 B	<b>Triangles</b>	Questions 1-32, p. 59
1.3 B	<b>Quadrilaterals</b>	Questions 1-20, p. 63
1.4 B	<b>Circles</b>	Questions 1-41, p. 67
1.5 B	<b>Measurement of irregular areas</b>	Questions 1-16, p. 69
1.6 B	<b>Solid geometric Figures</b>	Questions 1-36, p. 74
1.7 B	Review Exercises	Questions 1- 68, p. 77
<b>2.0</b>	<b>Exponents and Radicals</b>	<b><u>Chapter 11</u></b>
2.1	Simplifying expressions with integral exponents	Questions 1-52, p. 321
2.2	Fractional exponents	Questions 1-56, p. 325
2.3	Simplest radical form	Questions 1-62, p. 330
2.4	Addition and subtraction of radicals	Questions 1-42, p. 332
2.5	Multiplication and division of radicals	Questions 1-58, p. 335
2.6	Review Exercises	Questions 1-374 p. 337

<b>3.0</b>	<b>Graphs of Trigonometric Functions</b>	<b>Chapter 10</b>
3.1	Graphs of $y = a \sin x$ and $y = a \cos x$	Questions 1-26, p. 295
3.2	Graphs of $y = a \sin bx$ and $y = a \cos bx$	Questions 1-42, p. 299
3.3	Graphs of $y = a \sin (bx + c)$ and $y = a \cos (bx + c)$	Questions 1-26, p. 303
3.4	Graphs of $y = \tan x$ , $y = \cot x$ , $y = \sec x$ and $y = \csc x$	Questions 1-24, p. 306
3.5	Review exercise	Questions 1-28, p. 314

<b>4.0</b>	<b>Exponential and Logarithmic Functions</b>	<b>Chapter 13</b>
4.1	Exponential functions	Questions 1-24, p. 72
4.2	Logarithmic functions	Questions 1-44, p. 377
4.3	Properties of logarithms	Questions 1-56, p. 381
4.4	Logarithms to Base 10	Questions 1-28, p. 384
4.5	Natural logarithms	Questions 1-34, p. 387
4.6	Exponential and logarithmic equations	Questions 1-30, p. 390
4.7	Review exercise	Questions 1-60, p. 396

<b>5.0</b>	<b>Variation</b>	<b>Chapter 18</b>
5.1	Ratio and proportion	Questions 1-44, p. 491
5.2	Variation	Questions 1-56, p. 497
5.3	Review exercise	Questions 1-68, p. 499

<b>6.0</b>	<b>Additional Topics in Trigonometry</b>	<b>Chapter 20</b>
6.1	Fundamental trigonometric identities	Questions 1-46, p. 531
6.2	The sum and difference formulas	Questions 1-18, p. 535
6.3	Double-angle formulas	Questions 1-18, p. 539
6.4	Half-angle formulas	Questions 1-18, p. 543
6.5	Solving trigonometric equations	Questions 1-36, p. 548

<b>7.0</b>	<b>Plane Analytic Geometry</b>	<b>Chapter 21</b>
7.1	Basic definitions	Questions 1-43, p. 563
7.2	The straight line	Questions 1-36, p. 568
7.3	The circle	Questions 1-40, p. 573
7.4	The parabola	Questions 1-28, p. 578
7.5	The ellipse	Questions 1-28, p. 583
7.6	The hyperbola	Questions 1-28, p. 588
7.7	Review exercises	Questions 1-32, p. 605

<b>8.0</b>	<b>Basic Statistics</b>	<b>Chapter 22</b>
8.1	Frequency distributions	Questions 1-30, p. 612
8.2	Measures of central tendency	Questions 1-40, p. 616
8.3	Standard deviation	Questions 1-14, p. 621
8.4	Normal distribution	Questions 1-24, p. 626
8.5	Linear Regression including coefficient of correlation	Questions 1-12, p. 636 and hand out
8.6	Review exercise	Questions 1-46, p. 641

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

1. Basic Technical Mathematics with Calculus (8<sup>th</sup> Edition) Washington, SI Version, Addison-Wesley, Pearson, 2005
2. **Calculator: (Recommended)**
  - a) Electrical, Electronics, Computer Engineering – **SHARP Scientific Calculator EL-520L or equivalent, (has complex numbers capability).**
  - b) All other Engineering – **SHARP Scientific Calculator EL-531**

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

**V. EVALUATION PROCESS/GRADING SYSTEM:**

*There will be four tests. Each test will be 25% of the final grade. Each test will occur after two topics are completed.*

The following semester grades will be assigned to students in postsecondary courses:

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

**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.

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.

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:**

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.