

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE, MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: MATHEMATICS

CODE NO, : MTH 143-5 SEMESTER: II

PROGRAM: MECHANICAL/ELECTRICAL/ELECTRONICS/COMPUTER/  
ARCHITECTURAL/CIVIL TECHNICIAN

AUTHOR: J- MCGAULEY

DATE: SEPTEMBER 1993 PREVIOUS OUTLINE DATED: NEW

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MATHEMATICS

MTH 143-5

**COURSE NAME**

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**TOTAL CREDIT HOURS: 80**

**PREREQUISITE(S): MTH 142**

**I. PHILOSOPHY/GOALS:**

This course is a continuation of MTH142-5 (from Sem. 1) for engineering technology students. Topics of study include exponents and radicals, plane analytic geometry, solid mensuration<sup>^</sup> and functions including trigonometric, exponential and logarithmic functions. This course concludes with 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, TERMINAL PERFORMANCE OBJECTIVES:**

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

Topic 1: 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 2: Mensuration

1. Solve practical problems to find the sides and angles of right triangles.
2. Solve practical problems to find the area of a triangle or quadrilaterai.
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 3: 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, or parabola from given information.
3. Make a graph of any of the above conic sections.

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**COURSE NAME****COURSE NUMBER****II, TERMINAL PERFORMANCE OBJECTIVES: (continued)**Topic 4: 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 5: 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 6: Complex Numbers

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 7: 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 shifts.
3. Graph the sine function, cosine function or tangent function.

Topic a: 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 formulas, or the double-angle formulas.
4. Solve trigonometric equations.
5. Evaluate inverse trigonometric functions.

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**COURSE NAME****COURSE NUMBER****II. TERMINAL PERFORMANCE OBJECTIVES: (continued)**Topic 9: 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 10: Statistics

Organize data into frequency distributions, frequency histograms, or frequency polygons.

Calculate the mean, median and mode.

Calculate the range and standard deviation.

Fit a straight line to a set of points using the method of least squares.

**III TOPICS TO BE COVERED**

**Approximate Time Frames**  
(no. hours)

(1) Units of Measurement and Approximate Numbers	5
(2) Mensuration	9
(3) Plane Analytic Geometry	11
(4) Trigonometric Functions of any Angle	3
(5) Vectors and Oblique Triangles	5
(6) Complex Numbers	7
(7) Graphs of Trigonometric Functions	5
(8) Additional Topics in Trigonometry	8
(9) Exponential and Logarithmic Functions	11
(10) Statistics	15

**IV, LEARNING ACTIVITIES:****REQUIRED RESOURCES:**

<u>1.0 Units of Measurement and Approximate Numbers</u>	Appendix B
1.1 The metric system (SI)	Question 1-39, p.A-9
1.2 Approximate numbers and significant digits	Questions 1-39, p.A-12
1.3 Arithmetic operations with approximate numbers	Questions 1-44, p.A-16

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**IV. LEARNING ACTIVITIES: (continued)**

2.0	<u>Mensuration</u>	Appendix C
2.1	Review of Geometry	Questions 1-84, p.A-22
2.2	Composite distances, areas and volumes	Teacher provided handout sheets
2.3	Weights, cost estimates	
3.0	<u>Plane Analytic Geometry</u>	Chapter 2 0
3.1	The Straight Line (review)	Questions 1-43^ pg. 569
3.2	The circle	Questions 1-35, pg. 574
3.3	The parabola	Questions 1-29, pg. 579
3.4	The ellipse	Questions 1-31, pg. 585
3.5	Translation of axes	Questions 1-28, pg. 596 (OMIT hyperbolic questions)
4.0	<u>Trigonometric Functions of Any Angle</u>	Chapter 7
4.1	Signs of trigonometric functions	Questions 1-24, p. 207
4.2	Trigonometric functions of any angle	Questions 1-56, p. 214
4.3	Radians	Questions 1-60, p. 219
4.4	Applications of the use of radians	Questions 1-40, p. 225
4.5	Review exercise	Questions 1-76, p. 227
5.0	<u>Vectors and Oblique Triangles</u>	Chapter 8
5.1	Introduction to vectors	Questions 1-36, p. 234
5.2	Components of vectors	Questions 1-24, p. 237
5.3	Vector addition by components	Questions 1-24, p. 242
5.4	Application of vectors	Questions 1-24, p. 245
5.5	Oblique triangles, the sine law	Questions 1-32, p. 252
5.6	The law of cosines	Questions 1-32, p. 257
5.7	Review exercise	Questions 1-56, p. 259

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**IV. LEARNING ACTIVITIES: (continued)**

<u>6.Q</u> <u>Complex Numbers</u>	Chapter 11
6.1 Basic definitions	Questions 1-52, p- 319
6.2 Basic operations with complex numbers	<b>Questions 1-60</b> , p- 322
6.3 Graphical representation of complex numbers	Questions 1-32, p- 324
6.4 Polar form of complex numbers	Questions 1-40, p- 329
6.5 Exponential form of a complex number	Questions 1-32, p- 332
6.6 Products, quotients, powers and roots of complex numbers	Questions 1-40, p- 338
6.7 Review exercise	Questions 1-68, p- 346
<u>7.Q</u> <u>Graphs of Trigonometric Functions</u>	Chapter 9
7.1 Graphs of $y = A\sin x$ and $y = A\cos x$	Questions 1-20, p- 264
7.2 Graphs of $y = A\sin bx$ and $y = A\cos bx$	Questions 1-20, p- 268
7.3 Graphs of $y = A\sin(bx+c)$ and $y = A\cos(bx+c)$	Questions 1-24, p- 271
7.4 Review exercise	Questions 1-24, p- 286
<u>8.0</u> <u>Additional Topics in Trigonometry</u>	Chapter 19
8.1 Fundamental trigonometric identities	Questions 1-56, p- 528
8.2 Sine and cosine of the sum and difference of two angles	Questions 1-36, p- 533
8.3 Double angle formulas	Questions 1-33, p- 538
8.4 Trigonometric equations	Questions 1-32, p- 546
8.5 Inverse trigonometric functions	Questions 1-72, p- 552
8.6 Review exercise	Questions 1-84, p- 555

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**COURSE NAME****COURSE NUMBER****IV, LEARNING ACTIVITIES: (continued)**

<u>9.0</u>	<u>Exponential and Logarithmic Functions</u>	Chapter 12	
9.1	The exponential and logarithmic functions	Questions 1-56, p.	352
9.2	Graphs of exponential and logarithmic functions	Questions 1-24	355
9.3	Properties of logarithms	Questions 1-60	350
9.4	Logarithms to base 10	Questions 1-44	364
9.5	Natural logarithms	Questions 1-44	368
9.6	Exponential and logarithmic	Questions 1-52	372
9.7	Review exercise	Questions 1-56 61-78	379
<u>10.0</u>	<u>Statistics and Empirical Curve Fitting</u>	Chapter 21	
10.1	Frequency distributions	Questions 1-23, p.	617
10.2	Measures of central tendency	Questions 1-32, p.	622
10.3	Standard deviation (OMIT Formula 21-5)	Questions 1-24, p,	628
10.4	Fitting a straight line to a set of points	Questions 1-11, p.	632
10.5	Non-linear empirical equations	Teacher provided handout sheets	

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**EVALUATION METHODS:**

Four - five tests per seinester. Test questions will be of near equal difficulty to questions assigned in the exercises.

b. Final grade is a weighted average of these tests

$$90 - 100 = A+$$

$$80 - 89 = A$$

$$65 - 79 = B$$

$$55 - 64 = C$$

$$0 - 54 = R \text{ (or x)}$$

A credit for this course may be allowed upon presentation of proof of standing in the appropriate grade 13 mathematics courses (MAGGA and MCAGA).

All tests are scheduled in advance. Hence, attendance is mandatory. Unexcused absence from a test will result in a mark of zero for that test. If a student is prevented from writing a test by illness, the instructor should be notified before the time of the test. Upon return to class, the student should see the instructor immediately to arrange a time for a make-up test. The student should have a note from the college nurse or a doctor.

**VI. REQUIRED STUDENT RESOURCES:**

1. Text

Washington, Basic Technical Mathematics with Calculus  
Fifth edition, metric version. Benjamin/Cummings Pub. Co. 1990

2. Calculator: Recommended; SHARP Scientific calculator EL531G

**VII. SPECIAL NOTES:**

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor,

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.