

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



COURSE OUTLINE

Course Title: Technical Mathematics II

Code No.: MTH143-5

Semester: Winter

Program: Engineering Technician and  
Technology Programs

Author: Mathematics Department

Date: August 2001 Previous Outline Dated: August 2000

Approved: \_\_\_\_\_  
Dean Date

Total Credits: 5

Prerequisite(s): Mth 142

Substitutes: Mth 220, Mth 221, Mth 426, Mth 251, Mth 612

Total Credit Hours: 64

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## **I. COURSE DESCRIPTION:**

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:**

### **A. Learning Outcomes and Elements of the Performance:**

Upon successful completion of this course, students 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/Pulp & Paper/Water Resources*)

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

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE (Continued):**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 or parabola 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)

**III. TOPICS:**

	<b>Topic</b>	<b>Approximate Time Frame (no. of hours)</b>
1A or 1B	Complex numbers or Geometry	9
2	Exponents and Radicals	4
3	Graphs of Trigonometric Functions	5
4	Exponential and Logarithmic Functions	11
5	Variation	4
6	Additional Topics in Trigonometry	10
7	Plane Analytic Geometry	11
8	Basic Statistics	10

#### IV. LEARNING ACTIVITIES:

##### 1.0A Complex Numbers

- 1.1A Basic definitions
- 1.2A Basic operations with complex numbers
- 1.3A Graphical representation of complex numbers
- 1.4A Polar form of complex numbers
- 1.5A Exponential form of a complex numbers
- 1.6A Division of radicals
- 1.7A Products, quotients, powers and roots of complex numbers
- 1.8A Review exercise

##### 1.0B Geometry

- 1.1B Lines and angles
- 1.2B Triangles
- 1.3B Quadrilaterals
- 1.4B Circles
- 1.5B Solid Geometric figures
- 1.6B Review exercises

##### 2.0 Exponents and Radicals

- 2.1 Integral exponents
- 2.2 Fractional exponents
- 2.3 Simplest radical form
- 2.4 Addition and subtraction of radicals
- 2.5 Multiplication and division of radicals
- 2.6 Review exercise

##### 3.0 Graphs of Trigonometric Functions

- 3.1 Graphs of  $y = A\sin x$  and  $y = A\cos x$
- 3.2 Graphs of  $y = A\sin bx$  and  $y = A\cos bx$
- 3.3 Graphs of  $y = A\sin(bx+c)$  and  $y = A\cos(bx+c)$
- 3.4 Review exercise

##### 4.0 Exponential and Logarithmic Functions

- 4.1 The exponential and logarithmic functions
- 4.2 Graphs of exponential and logarithmic functions
- 4.3 Properties of logarithms
- 4.4 Logarithms to the base of 10
- 4.5 Natural logarithms
- 4.6 Exponential and logarithmic equations

##### 5.0 Variation

- 5.1 Ratio and proportion
- 5.2 Variation
- 5.3 Review exercise

##### Chapter 12

- Questions 1-53, p. 324
- Questions 1-46, p. 327
- Questions 1-32, p. 329
- Questions 1-40, p. 332
- Questions 1-32, p. 335
- Chapt. 11**, p.315
- Questions 1-44, p. 341

- Questions 1-68, p. 349

##### Chapter 2

- Questions 1-24, p. 51
- Questions 1-36, p. 57
- Questions 1-28, p. 61
- Questions 1-30, p. 64
- Questions 1-24, p. 71
- Questions 1-56, p. 74

##### Chapter 11

- Questions 1-60, p. 304
- Questions 1-60, p. 308
- Questions 1-60, p. 312
- Questions 1-30, p. 310
- Questions 1-52, p. 314
- Questions 1-70, p. 318

##### Chapter 10

- Questions 1-20, p. 279
- Questions 1-20, p. 282
- Questions 1-24, p. 286
- Questions 1-24, p. 298

##### Chapter 13

- Questions 1-56, p. 354
- Questions 1-24, p.357
- Questions 1-48, p. 361
- Questions 1-24, p. 364
- Questions 1-44, p. 367
- Questions 1-60, p. 376

##### Chapter 18

- Questions 1-40, p. 478
- Questions 1-48, p. 484
- Questions 1-52, p. 486

#### IV. LEARNING ACTIVITIES (cont'd):

##### 6.0 Additional Topics in Trigonometry

- 6.1 Fundamental trigonometric identities
- 6.2 Sine and cosine of the sum and difference of two angles
- 6.3 Double angle formulae
- 6.4 Trigonometric equations
- 6.5 Inverse trigonometric functions
- 6.6 Review exercise

##### 7.0 Plane Analytic Geometry

- 7.1 Basic definitions
- 7.2 The straight line
- 7.3 The circle
- 7.4 The parabola
- 7.5 The ellipse
- 7.6 The hyperbola
- 7.7 Translation of axes
- 7.8 The second-degree equation

##### 8.0 Introduction to Statistics

- 8.1 Frequency distribution
- 8.2 Measures of central tendency
- 8.3 Standard deviation
- 8.4 Normal distributions
- 8.5 Linear regression and coefficient of correlation ( $r$ )  
- calculation of ( $r$ ) from class notes

##### Chapter 20

- Questions 1-38, p. 516
- Questions 1-36, p. 521
- Questions 1-32, p. 524
- Questions 1-16, p. 533
- Questions 1-32, p.538
- Questions 1-76, p. 541

##### Chapter 21

- Questions 1-36, p. 547
- Questions 1-40, p. 553
- Questions 1-32, p. 557
- Questions 1-29, p. 562
- Questions 1-31, p. 567
- Questions 1-36, p. 573
- Questions 1-36, p. 576
- Questions 1-40, p. 579

##### Chapter 22

- Questions 1-28, p. 595
- Questions 1-32, p. 599
- Questions 1-20, p. 604
- Questions 5-20, p. 608
- Questions 1-16, p. 618

#### V. REQUIRED RESOURCES / TEXTS / MATERIALS:

1. Basic Technical Mathematics with Calculus, Washington A.J., 7<sup>th</sup> Edition (metric version), Addison Wesley, 2000
2. Calculator: (Recommended) a) SHARP Scientific calculator EL-506L – Electrical, Computer and Electronics; b) All other programs – EL531R. *The use of some kinds of calculators may be restricted during tests.*

#### VI. EVALUATION PROCESS / GRADING SYSTEM:

##### MAJOR ASSIGNMENTS AND TESTING

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.

**VI. EVALUATION PROCESS / GRADING SYSTEM (cont'd):**

The instructor will provide you with evaluation information for your class section. 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.

**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)**

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
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
CR	Credit exemption	
X	A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements	

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.

**V. EVALUATION PROCESS / GRADING SYSTEM (cont'd):****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 tests 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 you 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**

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

**VI. SPECIAL NOTES:**Special Needs

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.

**VII. PRIOR LEARNING ASSESSMENT**

Students who have related employment-centered experience should see the Prior Learning Assessment (PLA) Coordinator.

