SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	**Technical Mathematics II**
CODE NO. :	**OEL840** **SEMESTER:**
PROGRAM:	**Engineering Technician and Technology Programs**
AUTHOR:	**Mathematics Department**
DATE:	**Dec 2007** **PREVIOUS OUTLINE DATED:** **June 2007**
APPROVED:	
	DEAN **DATE**
TOTAL CREDITS:	**4**
PREREQUISITE(S):	**MTH 142, OEL806**
HOURS/WEEK:	**4**

I. COURSE DESCRIPTION:

This course is a continuation of MTH 142/OEL806 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 ***(Students in Electrical/Electronics/Computer programs should complete this topic)***

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 ***(Students in Civil/Environmental/Construction programs should complete this topic)***

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: Variation

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

Topic 3: 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 4: 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 5: 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 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)

III. TOPICS (may not be in the order covered:

1a, 0r 1b Complex numbers or Geometry
2. Exponents and Radicals
3. Graphs of Trigonometric Functions
4. Exponential and Logarithmic Functions
6. Additional Topics in Trigonometry
7. Plane Analytic Geometry
8. Basic Statistics

III a. LEARNING ACTIVITIES:

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS (odd questions unless otherwise stated)
1.0A	**Complex numbers**	**Chapter 12**
1.1 **A**	Basic definitions	Questions 5-57, p. 343
1.2 **A**	Basic operations with complex numbers	Questions 5-47, p. 346
1.3 **A**	Graphical representation of complex numbers	Questions 3-35, p. 348
1.4 **A**	Polar form of complex numbers	Questions 3-39, p. 351
1.5 **A**	Exponential form of complex numbers	Questions 5-37, p. 354
1.6 **A**	Products, quotients, powers, and roots of complex numbers	Questions 5-41, p. 360
1.7 **A**	Review exercises	Questions 1-63, p. 368
	Practice test	Questions 1-7, 9, 10, p.369
1.0B	**Geometry**	**Chapter 2**
1.1 **B**	Lines and angles	Questions 5-31, p. 53
1.2 **B**	**Triangles**	Questions 1-27, 31, 35-45, p. 59
1.3 **B**	**Quadrilaterals**	Questions 1-23, 29,31, 33, p. 63
1.4 **B**	**Circles**	Questions 1-41, p. 66
1.5 **B**	**Measurement of irregular areas**	Questions 5-15, p. 71
1.6 **B**	**Solid geometric Figures**	Questions 1-35, p. 74
1.7 **B**	Review Exercises	Questions 1- 67, p. 77
	Practice Test	Questions 1-14, p. 80
2.0	**Variation**	**Chapter 18**
2.1	Ratio and proportion	Questions 1-43, p. 491
2.2	Variation	Questions 1-35, 39-47, p. 497
2.3	Review exercise	Questions 1-67, p. 499
	Practice Test	Questions 1-7, p. 502
3.0	**Exponents and Radicals**	**Chapter 11**

3.1	Simplifying expressions with integral exponents	Questions 1-51, p. 321
3.2	Fractional exponents	Questions 1-55, p. 325
3.3	Simplest radical form	Questions 1-61, p. 330
3.4	Addition and subtraction of radicals	Questions 1-35, p. 332
3.5	Multiplication and division of radicals	Questions 1-49, p. 335
3.6	Review Exercises	Questions 1-77 p. 337
	Practice Test	Questions 1-12 p. 338

4.0	**Exponential and Logarithmic Functions**	**Chapter 13**
4.1	Exponential functions	Questions 3-15, p. 372
4.2	Logarithmic functions	Questions 5-45, p. 376
4.3	Properties of logarithms	Questions 1-55, p. 381
4.4	Logarithms to Base 10	Questions 3-27, p. 384
4.5	Natural logarithms	Questions 3-33, p. 387
4.6	Exponential and logarithmic equations	Questions 3-37, p. 390
4.7	Review exercise	Questions 1-67, p. 396
	Practice Test	Questions 1-12 p. 398
5.0	**Graphs of Trigonometric Functions**	**Chapter 10**
5.1	Graphs of $y = a \sin x$ and $y = a \cos x$	Questions 3-21, p. 295
5.2	Graphs of $y = a \sin bx$ and $y = a \cos bx$	Questions 3-37, p 299
5.3	Graphs of $y = a \sin (bx + c)$ and $y = a \cos (bx + c)$	Questions 3-29, p. 303
5.4	Graphs of $y = \tan x$, $y = \cot x$, $y = \sec x$ and $y = \csc x$	Questions 3,4,5,6,7-13 , p. 306
5.5	Review exercise	Questions 1-31, p. 316
6.0	**Additional Topics in Trigonometry**	**Chapter 20**
6.1	Fundamental trigonometric identities	Questions 7-31, p. 530
6.2	The sum and difference formulas	Questions 3-29, p. 535
6.3	Double-angle formulas	Questions 5-37, p. 539
6.4	Half-angle formulas	Questions 3-21, p. 543
6.5	Solving trigonometric equations	Questions 3-19, p. 548
6.6	Inverse trigonometric function	Questions 1-31, p. 553
6.7	Review exercise	Questions 1-75, p. 556
	Practice Test	Questions 1-8,10 p. 558

7.0	**Plane Analytic Geometry**	**Chapter 21**
7.1	Basic definitions	Questions 1-51, p. 563
7.2	The straight line	Questions 5-37, p. 568
7.3	The circle	Questions 1-35, p. 573
7.4	The parabola	Questions 1-29, p. 578
7.5	The ellipse	Questions 1-29, p. 583
7.6	The hyperbola	Questions 3-31, p. 588
7.7	Review exercises	Questions 1-23, 55,57,77,79,85, p. 605
	Practice Test	Questions 1-8, 10, p. 607

8.0	**Basic Statistics**	**Chapter 22**
8.1	Frequency distributions	Questions 5-12,13-16,17-20,21-24,25,26, p. 612
8.2	Measures of central tendency	Questions 5-17,18,19,33, p. 616
8.3	Standard deviation	Questions 3-9,15, p. 621
8.4	Linear Regression	Questions 2,3,4,5,7, p. 636
8.5	Review exercise	Questions 1-28, 41,42, p. 641
	Practice Test	Questions 1-7, 11, pg.644

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

1. Basic Technical Mathematics with Calculus (8th 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 devises may be restricted during tests.

V. EVALUATION PROCESS/GRADING SYSTEM:

There will be four tests (12.5%) and a final exam. The four tests will be averaged to become 50% of the final grade. The final paper-based exam is worth 50% of your final grade.

Your college will convert your number grade to a letter grade. See your registering college's grading scheme.

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. Please ensure that you or your registering college submits a plan to the professor.

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.

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.