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| **SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**  **SAULT STE. MARIE, ONTARIO** COURSE OUTLINE | | | | | |
| **COURSE TITLE:** | Technical Mathematics I | | | | |
| **CODE NO. :** | MTH142-5 | | **SEMESTER:** | | One |
| **PROGRAM:** | Engineering Technician and Technology Programs | | | | |
| **AUTHOR:** | Mathematics Department | | | | |
| **DATE:** | June 2012 | **PREVIOUS OUTLINE DATED:** | | May 2011 | |
| **APPROVED:** | “Brian Punch” | | | Aug/2012 | |
|  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_CHAIR | | | **\_\_\_\_\_\_\_**  **DATE** | |
| **TOTAL CREDITS:** | 5 | | | | |
| **PREREQUISITE(S):** | None | | | | |
| **HOURS/WEEK:** | 4 | | | | |
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| *For additional information, please contact Brian Punch, Chair, School of Environment, Technology and Business.* | | | | | |
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| *705- 759-2554, Ext. 2610* | | | | | |

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| **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. |

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| **II.** | | **LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:** | | | | |
|  | | Upon successful completion of this course, the student will demonstrate the ability to solve problems in the following topic areas: | | | | |
|  | | 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.   1. Add, subtract, multiply, and divide algebraic expressions. 2. 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** | | | |
|  | |  | 1. 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. | | | |
|  | | 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.  : | | | |
|  | | 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.  : | | | |
|  | | 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 | | | 8 hours | |
|  | 4. Systems of Linear Equations | | | 7 hours | |
|  | 5. Factoring and Fractions | | | 10 hours | |
|  | 6. Quadratic Equations (excluding completing the square) | | | 6 hours | |
|  | 7. Trigonometric Functions of any Angle | | | 6 hours | |

8. Vectors and Oblique Triangles 7 hours

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| **TOPIC NUMBER** | TOPIC DESCRIPTION | **REFERENCE CHAPTER ASSIGNMENTS** |
| **1.0** | **BASIC ALGEBRAIC OPERATIONS** | Chapter 1 |
| 1.1 | Numbers and literal symbols | Questions 1-44, p. 5 |
| 1.2 | Fundamental laws of algebra and order of operations | Questions 1-64, 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 1-56, p. 23 |
| 1.6 | Roots and radicals | Questions 1-56, p. 25 |
| 1.7 | Addition and subtraction of algebraic expressions | Questions 1-56, p. 29 |
| 1.8 | Multiplication of algebraic expressions | Questions 1-64, p. 31 |
| 1.9 | Division of algebraic expressions | Questions 1-52, p. 34 |
| 1.10 | Equations | Questions 1-52, p. 38 |
| 1.11 | Formulae and literal equations | Questions 1-48, p. 40 |
| 1.12 | Review exercise | Questions 1-106, p. 46 |
| **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: 1-56, Page 111 |
| 3.2 | Defining the trig. functions | Questions: 1-36, Page 115 |
| 3.3 | Values of the trig. functions | Questions: 1-58, Page 118 |
| 3.4 | The right triangle | Questions: 1-44, Page 123 |
| 3.5 | Applications of right triangles | Questions: 1-40, Page 126 |
| 3.6 | Review exercise | Questions: 1-95, Page 130 |

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| **4.0** | **SYSTEMS OF LINEAR EQUATIONS** | Chapter 5 |
| 4.1 | Linear equations | Questions: 1-30, Page 137 |
| 4.2 | Graphs of linear equations | Questions: 1-42, Page 141 |
| 4.3 | Solving systems of two linear equations in two unknowns graphically | Questions: 1-38, Page 145 |
| 4.4 | Solving systems of two linear equations in two unknowns algebraically | Questions: 1-60, Page 151 |
| 4.5 | Solving systems of two linear equations in two unknowns by determinants | Questions: 1-52, Page 157 |
| 4.6 | Solving systems of three linear equations in three unknowns algebraically | Questions: 1-32, Page 161 |
| 4.7 | Solving systems of three linear equations in three unknowns by determinants | Questions: 1-44, Page 167 |
| 4.8 | Review exercise | Questions: 1-95, Page 169 |
| **5.0** | **FACTORING AND FRACTIONS** | **Chapter 6** |
| 5.1 | Special products | Questions: 1-80, Page 176 |
| 5.2 | Common factor and difference of squares | Questions: 1-76, Page 181 |
| 5.3 | Factoring trinomials | Questions: 1-74, Page 187 |
| 5.4 | Sum and difference of cubes | Questions: 1-38, Page 189 |
| 5.6 | Multiplication and division of fractions | Questions: 1-48, Page 197 |
| 5.7 | Addition and subtraction of fractions | Questions: 1-68, Page 202 |
| 5.8 | Equations involving fractions | Questions: 1-60, Page 207 |
| 5.9 | Review exercise | Questions: 1-132, Page 209 |
| **6.0** | **QUADRATIC EQUATIONS** | Chapter 7 |
| 6.1 | Solution by factoring | Questions: 1-54, Page 216 |
| 6.2 | The Quadratic Formula | Questions: 1-58, Page 222 |

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| **7.0** | **TRIGONOMETRIC FUNCTIONS OF ANY ANGLE** | **Chapter 8** |
| 7.1 | Signs of trigonometric functions | Questions 1-42, p. 234 |
| 7.2 | Trigonometric functions of any angle | Questions 1-56, p. 239 |
| 7.3 | Radians | Questions 1-74, p. 243 |
| 7.4 | Applications of the use of radians | Questions 1-62, p. 248 |
| 7.5 | Review exercise | Questions 1-92, p. 251 |
| **8.0** | **VECTORS AND OBLIQUE TRIANGLES** | **Chapter 9** |
| 8.1 | Introduction to vectors | Questions 1-48, p. 258 |
| 8.2 | Components of vectors | Questions 1-34, p. 261 |
| 8.3 | Vector addition by components | Questions 1-34, p. 267 |
| 8.4 | Application of vectors | Questions 1-36, p. 270 |
| 8.5 | Oblique triangles, the Law of Sines | Questions 1-40, p. 278 |
| 8.6 | The Law of Cosines | Questions 1-40, p. 283 |
| 8.7 | Review exercise | Questions 1-70, p. 285 |

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| **IV.** | **REQUIRED RESOURCES/TEXTS/MATERIALS:**   1. Basic Technical Mathematics with Calculus (9th Edition) Washington, SI Version, Addison-Wesley, Pearson, 2010   **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.*** |

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| **V.** | **EVALUATION PROCESS/GRADING SYSTEM:**  Evaluation will consist of four in class term tests worth 25% each.   |  |  |  |  | | --- | --- | --- | --- | | **Course: MTH 142-5** | |  | | | **Evaluation Device** | **Topics Covered**  (reference topic numbers from the course outline) | | **% weight of Final Average** | | Test 1 | 1-2 | | 25% | | Test 2 | 3-4 | | 25% | | Test 3 | 5-6 | | 25% | | Test 4 | 7-8 | | 25% | |
|  | The following semester grades will be assigned to students: |

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|  | 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 |
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|  | 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. |  |

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| **VI.** | |  |  |  | | --- | --- | --- | | **VI.** | **SPECIAL NOTES:** | | | Attendance:  Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session. | | |
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| **VII.** | **COURSE OUTLINE ADDENDUM:** |
|  | The provisions contained in the addendum located on the portal, form part of this course outline. |
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