# ALGONQUIN COLLEGE

## *Essential Mathematics*

### SCHOOL OF ADVANCED TECHNOLOGY

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| **Course Number:**<br>MAT8100 | **Contribution to Program:**<br>Vocational<br>Core | **Normative Hours:**<br>45 |
| **Applicable Program(s):**<br><br>Multiple Programs | **AAL:**<br><br>Multiple Levels | **Approval Date:**<br>04/09/2009 |
| **Prepared by:**<br>E. Hobbs<br>Clerk Academic | | **Approved by:**<br>Claude Brulé<br>Executive Dean, FCTT |
| **Co-Requisites**<br>N/A | | **Approved for Academic Year:**<br>2009-2010 |
| **Pre-Requisites**<br>N/A | | |

### COURSE DESCRIPTION

This course covers the following topics: angles and their measure, trigonometric functions, solving right triangles, graphs of the sine and cosine functions; vectors; the straight line; factoring polynomial expressions; rational expressions; algebraic expressions with fractional exponents; radicals; exponential and logarithmic functions; equations of various types; complex numbers.

### ESSENTIAL EMPLOYABILITY SKILLS

**The course contributes to your program by helping you achieve the following Essential Employability Skills:**

3        Execute mathematical operations accurately.(T,A)

4        Apply a systematic approach to solve problems.(T,A)

5        Use a variety of thinking skills to anticipate and solve problems.(T,A)

### COURSE LEARNING REQUIREMENTS/EMBEDDED KNOWLEDGE AND SKILLS

| COURSE LEARNING REQUIREMENTS<br>When you have earned credit for this course, you will have demonstrated the ability to: | EMBEDDED KNOWLEDGE AND SKILLS |
|---|---|
| 1. **Define and use Trigonometric Functions of Acute Angles** | • Angles and their measure<br>• Defining the primary trigonometric functions for acute angles<br>• Defining the reciprocal trigonometric functions for acute angles<br>• Values for the trigonometric functions (acute angles): sin, cos, tan<br>• Values of the trigonometric functions (acute angles): sec, csc, cot<br>• The right triangle |
| 2.<br><br>**Define and use Trigonometric Functions of Any Angle** | • Signs of the trigonometric functions<br>• Values of the primary trigonometric functions (any angle): sin, cos, tan<br>• Radians |
| 3. **Apply Vectors to solve problems** | • Vectors<br>• Components of vectors<br>• Vector addition by components given angle and direction of the vectors<br>• Applications of vectors |
| 4. **Graph Trigonometric Functions** | • Review of numerical fractions in simplest form, addition, subtraction, multiplication and division of numerical fractions (with particular emphasis on fractions involving $\pi$ )<br>• Graph of the functions $y = a\sin bx$ and $y = a\cos bx$ |

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| | - Graph of the functions y = asinbx and y = acosbx |
| | - Graph of the functions y = asin(bx + c) and y = acos(bx + c) |
| 5. **Apply straight line theory to develop equations of a staight line and sketch graphs of a line.** | - The slope of a line |
| | - Parallel lines |
| | - Perpendicular lines |
| | - Equation of a vertical line |
| | - Equation of a horizontal line |
| | - Equation of a line in slope-intercept form |
| | - Equation of a line in slope-point form |
| | - Equation of a line in the general form |
| | - Sketching the graph of a line |
| 6. **Solve Systems of Linear Equations** | - Linear equations, linear systems |
| | - Graphical interpretation of the solutions of systems of two linear equations in two unknowns |
| | - Solving systems of two linear equations in two unknowns algebraically using elimination by addition and subtraction |
| | - Solving systems of three linear equations in three unknowns algebraically using elimination by addition and subtraction |
| 7. **Solve problems involving factoring and fractions** | - Special products: <br><br> $a(x + y) = ax + ay$ <br><br> $(x + y)(x - y) = x^2 - y^2$ <br><br> foil |
| | - Common factors and difference of squares |
| | - Factoring trinomials of the form: <br><br> $x^2 + bx + c$ <br><br> $ax^2 + bx + c$ |
| | - Equivalent fractions |
| | - Multiplication and division of fractions |
| | - Addition and subtraction of fractions |
| | - Equations involving fractions |
| 8. **Solve Quadratic Equations** | - The quadratic equation, the quadratic function |
| | - Solving quadratic equations by factoring |
| | - Solving quadratic equations using the quadratic formula |
| | - Sketching the quadratic function |
| 9. **Perform operations on Exponents and Radicals** | - The laws of exponents for integral exponents (algebraic expressions) |
| | - The laws of exponents for fractional exponents (algebraic expressions) |
| | - Radicals in simplest form up to cubic roots |
| | - Addition and subtraction of radicals (square roots) |
| | - Multiplication of radicals (square roots) |
| | - Division of radicals (square roots) |
| 10. **Apply the properties of Exponential and Logarithmic Functions to solve problems.** | - Definition of the exponential and logarithmic functions |
| | - Conversion between exponential and logarithmic forms |

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|  | • Properties of logarithms |
|  | • Logarithm to the base 10 |
|  | • Natural Logarithm |
|  | • Finding the logarithm to any base of a number using change of base |
|  | • Solving exponential equations:<br>  - Using same base<br>  - Using logarithms |
|  | • Logarithmic equations |
| 11. **Define and use Complex Numbers** | • Basic definitions, complex numbers in rectangular form |
|  | • Basic operations with complex numbers in rectangular form |
|  | • Graphical representation of complex numbers |
|  | • Polar form of a complex number |
|  | • Exponential form of a complex number |
|  | • Products, quotients, powers, and roots of complex numbers in polar form |

## LEARNING RESOURCES

Pearson Education Custom Package for AlgonquinCollege: ISBN 0132446944 consisting of:

· <u>Basic Technical Mathematics with Calculus</u> (Author: Washington), Metric Version, 9th edition (ISBN 0321306899)
· Students Solutions Manual (ISBN 0321307542)
· Technical mathematics Study Card (ISBN 0131287397)
· MyMathLab Access Kit (ISBN 0321307542)

Required Resources:

Scientific Calculator.  Sharp WBK531 is recommended.

**<u>Note</u>: Graphing Calculators are not permitted for use in this course.**

## LEARNING ACTIVITIES

**During this course, you are likely to experience the following learning activities:**
Samples of learning activities include:

- class lectures
- discussions
- problem solving activities
- electronic demonstrations
- homework execises

## EVALUATION/EARNING CREDIT

| The following will provide evidence of your learning achievements: | This activity validates the following Course Learning Requirements and/or Essential Employability Skills: |
|---|---|
| MyMathLab Quizzes      10% | • **Define and use Trigonometric Functions of Acute Angles** - [CLR 1]<br><br>• **Define and use Trigonometric Functions of Any Angle**<br><br>  - [CLR 2]<br><br>• **Apply Vectors to solve problems**  - [CLR 3]<br><br>• **Graph Trigonometric Functions** - [CLR 4]<br><br>• **Apply straight line theory to develop equations of a staight line and sketch graphs of a line.**  - [CLR 5]<br><br>• **Solve Systems of Linear Equations** - [CLR 6]<br><br>• **Solve problems involving factoring and fractions** - [CLR 7]<br><br>• **Solve Quadratic Equations** - [CLR 8] |

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- **Perform operations on Exponents and Radicals** - [CLR 9]
- **Apply the properties of Exponential and Logarithmic Functions to solve problems.** - [CLR 10]
- **Define and use Complex Numbers** - [CLR 11]
- Execute mathematical operations accurately. - [EES 3]
- Apply a systematic approach to solve problems. - [EES 4]
- Use a variety of thinking skills to anticipate and solve problems. - [EES 5]

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| 4 In Class Quizzes (20 minutes maximum)   20% | - **Define and use Trigonometric Functions of Acute Angles** - [CLR 1]<br>- **Define and use Trigonometric Functions of Any Angle** - [CLR 2]<br>- **Apply Vectors to solve problems** - [CLR 3]<br>- **Graph Trigonometric Functions** - [CLR 4]<br>- **Apply straight line theory to develop equations of a staight line and sketch graphs of a line.** - [CLR 5] |
| 2 Tests   40% | - **Solve Systems of Linear Equations** - [CLR 6]<br>- **Solve problems involving factoring and fractions** - [CLR 7]<br>- **Solve Quadratic Equations** - [CLR 8]<br>- **Perform operations on Exponents and Radicals** - [CLR 9] |
| 1 Final Assessment        30% | - **Define and use Trigonometric Functions of Acute Angles** - [CLR 1]<br>- **Define and use Trigonometric Functions of Any Angle** - [CLR 2]<br>- **Apply Vectors to solve problems** - [CLR 3]<br>- **Graph Trigonometric Functions** - [CLR 4]<br>- **Apply straight line theory to develop equations of a staight line and sketch graphs of a line.** - [CLR 5]<br>- **Solve Systems of Linear Equations** - [CLR 6]<br>- **Solve problems involving factoring and fractions** - [CLR 7]<br>- **Solve Quadratic Equations** - [CLR 8]<br>- **Perform operations on Exponents and Radicals** - [CLR 9]<br>- **Apply the properties of Exponential and Logarithmic Functions to solve problems.** - [CLR 10]<br>- **Define and use Complex Numbers** - [CLR 11]<br>- Execute mathematical operations accurately. - [EES 3]<br>- Apply a systematic approach to solve problems. - [EES 4]<br>- Use a variety of thinking skills to anticipate and solve problems. - [EES 5] |

**COLLEGE GRADING NUMERICAL EQUIVALENT TABLE**

| Final Grade | Mark Equivalent | Numeric Value | Final Grade | Mark Equivalent | Numeric Value |
|---|---|---|---|---|---|
| A+ | 90-100% | 4.0 | C+ | 67-69% | 2.3 |
| A | 85-89% | 3.8 | C | 63-66% | 2.0 |
| A- | 80-84% | 3.6 | C- | 60-62% | 1.7 |
| B+ | 77-79% | 3.3 | D+ | 57-59% | 1.4 |

| B | 73-76% | 3.0 | D | 53-56% | 1.2 |
|---|---|---|---|---|---|
| B- | 70-72% | 2.6 | D- | 50-52% | 1.0 |
| | | | F | 0-49% | 0 |
| | | | FSP | 0 | 0 |

## PRIOR LEARNING ASSESSMENT AND RECOGNITION

See College Directive E35 for details on eligibility and process.

For this course, evidence of learning achievement for PLA candidates will include the successful completion of:

- A challenge exam with a breadth of coverage and level of difficulty equivalent to the final examination in the course;

## RELATED INFORMATION

**The following information is course-specific:**

The course consists of 3 hours of lectures per week. It is anticipated that you will need to spend an additional 3 hours per week, on average, of your own time for homework exercises and study. The students' ability to successfully complete the homework exercises will directly correlate with their level of success on quizzes, tests and the final assessment. Failure to do homework exercises mean you don't have enough time to complete similar questions found on tests and exams.

P.S. Students registered in MAT8100P take an additional 2 hours per week to support their learning. MAT8100 and MAT8100P have a common final assessment.

During this course you are likely to experience:

Lectures:

Lectures will present the theoretical material of the course.

·   Students are expected to attend all of the lectures.

·   Course material will be presented, aided by use of overhead projections, demonstrations and brief lecture notes during lectures. Students are expected to prepare their own personal notes and are responsible for all the material presented. If you miss a class, make sure you get the relevant notes from another student before the next class.

·   Students are expected to read and understand specific sections of the textbook as indicated in the course syllabus, which will be provided by the course professor.
 Students will be expected to ask for clarification and explanations as required.

·   Students are encouraged to ask questions during lectures and to consult with the professor on topics that they do not clearly understand. The course material is cumulative and does not lend itself well to "cramming" at the last minute. Ask your questions early and often.

·   The professor will inform students, at the beginning of the course, of suitable times for consultation.

In order to pass the course, the student must have a grade of at least 50% or **"D-"** on quizzes, tests and the final exam combined. For a complete breakdown of the grading system, please refer to college directive E-11.

The final assessment is designed to be a comprehensive, summative evaluation instrument. If, as a result of being off-track in your program or some unforeseen circumstance, you note that there is a scheduling conflict in your final assessment schedule, it is your responsibility to alert your course professor no later than one week before final assessments start, to allow for any special arrangements.

 In the case of a documented emergency that causes a student to miss a quiz, class test or final assessment, the professor in consultation with the Chair, as required, will determine how the marks will be made up and/or final grade adjusted.

**The following information is program-specific:**

**The following information is school/department-specific:**

**The following information is College-wide:**

**Email**
Algonquin College provides all full-time students with an e-mail account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive e-mail using your Algonquin account and to check it regularly.

**Centre for Students with Disabilities (CSD)**
If you are a student with a disability, it is strongly recommended that you identify your needs to the professor and the Centre for Students with Disabilities (CSD) by the end of the first month of the semester in order that any necessary support services can be arranged for you.

**Academic Integrity**
Adherence to acceptable standards of academic honesty is an important aspect of the learning process at Algonquin College. Academic work submitted by a student is evaluated on the assumption that the work presented by the student is his or her own, unless designated otherwise.  For further details consult Algonquin College Directives
E16 (http://www.algonquincollege.com/directives/sectionE/E16.pdf)
and E43 (http://www.algonquincollege.com/directives/sectionE/E43.pdf).

**Course Assessments**
It is Algonquin College's policy to give students the opportunity to complete a course assessment survey in each course that they take which solicits their views regarding the curriculum, the professor and the facilities.  For further details consult Algonquin College Directive E38 (http://www.algonquincollege.com/directives/sectionE/E38.pdf).

**Use of Electronic Devices**
With the proliferation of small, personal electronic devices used for communications and data storage, Algonquin College believes there is a need to address their use during classes and examinations. During classes, the use of such devices is disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College Directive E39 (http://www.algonquincollege.com/directives/sectionE/E39.pdf).

**Transfer of Credit**
Students, it is your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.