



# MAT8001C

## Technical Mathematics for Computer Science

### Course Outline

2021-2022

Pre-requisite(s)	N/A
Co-requisite(s)	N/A
Prepared by	Michael Delgaty
Approved by	Adam Shane, Chair, ASET
Normative hours	56.00
Grading system	A+ Through F
Experiential Learning	No

Applicable Program(s)	Level	Core/Elective
Multiple Programs	Multiple Levels	Multiple Core/Elective

### Course Description

The study of algebraic and transcendental functions is an essential prerequisite to Calculus. Students manipulate algebraic expressions, solve algebraic equations and linear systems and learn the properties of and graph algebraic and transcendental functions. Students investigate computer number systems in addition to Boolean algebra and logic to help solve problems involving computer systems. Students also study the addition and subtraction of vectors using vector components. Delivered in a modular format, this course is equivalent to the completion of all of the following math modules MAT8100 - A, B, C, D, E, F, and L.

### Vocational Learning Outcomes

This course provides the opportunity for you to achieve the following outcomes:

#### 0006X01FWO - Computer Eng. Technology - Comp. Science

**VLO 14** Develop, test and maintain software applications for systems integration. (T)

#### 0006X03FWO - Computer Eng. Technology - Comp. Science

**VLO 14** Develop, test and maintain software applications for systems integration. (T)

#### 0336I01CKU - Computer Programming

**VLO 2** Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)

#### 0336X01FWO - Computer Programming

**VLO 2** Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)

#### 0336X03FWO - Computer Programming

**VLO 2** Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)

#### 0336X07PAO - Computer Programming

**VLO 2** Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)

#### 0336X09FAO - Computer Programming

**VLO 2** Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)

#### 3002X01FWO - Web Development & Internet Applications

**VLO 3** Design, implement and maintain databases to store and retrieve data according to requirements. (T, A)

**VLO 7** Develop internet applications reflective of business objectives and client needs. (T)

#### 3002X03FWO - Web Development & Internet Applications

**VLO 3** Design, implement and maintain databases to store and retrieve data according to requirements. (T, A)

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**Assessment Levels** —**T:** Taught **A:** Assessed **CP:** Culminating Performance

# Essential Employability Skills

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

- EES 3** Execute mathematical operations accurately. (T, A)
- EES 4** Apply a systematic approach to solve problems. (T, A)
- EES 5** Use a variety of thinking skills to anticipate and solve problems. (T, A)

**Assessment Levels** —**T:** Taught **A:** Assessed **CP:** Culminating Performance

# Course Learning Requirements / Embedded Knowledge and Skills

When you have earned credit for this course, you will have demonstrated the ability to:

**1. Evaluate numerical expressions and perform calculations with numbers in scientific notation; Simplify and perform algebraic operations on algebraic expressions using laws of exponents; Solve linear and literal equations.**

- Correctly round numbers.
- Apply the rule of order of operations on numeric expressions.
- Calculate roots, powers and absolute values of numbers using a calculator.
- Identify the terms and factors within a polynomial.
- Express and perform calculations with numbers in scientific notation.
- Add, subtract, and multiply polynomials.
- Apply the exponent rules to simplify monomials containing integer powers.
- Solve linear equations.

**2. Use basic algebraic operations to add, subtract, multiply, divide, and simplify algebraic expressions containing integer exponents and simple radicals.**

- Identify and distinguish the terms and factors within an algebraic expression.
- Combine Like Terms and simplify expressions containing integer powers and simply radicals.
- Expand algebraic expressions with the distributive property.
- Simplify and evaluate expressions by multiplying and dividing algebraic fractions.
- Add/Subtract factored algebraic fractions using a least common denominator.

**3. Factor algebraic expressions using common factors; Factor trinomials of the form  $ax^2 + bx + c$ ; Simplify, multiply and divide algebraic fractions; Solve quadratic equations and algebraic equations containing fractions.**

- Identify common factors and the difference of squares to factor simple expressions.
- Factor trinomials of the form:  $ax^2 + bx + c$ .
- Solve quadratic equations using the quadratic formula.
- Simplify algebraic fractions by factoring and using equivalent fractions.
- Use factoring and equivalent fractions to find the least common denominator of algebraic fractions.
- Correctly solve equations involving fractions.
- State the solutions to factored equations of the form  $(ax+b)(cx+d)(ex^2 +fx+g) = 0$ .

**4. Perform calculations within and convert between binary, octal, decimal and hexadecimal number systems.**

- Compare the historical representation of numbers.
- Transform one representation to another, and perform basic operations in different representations.
- Understand exponents in base 2 (Binary) , base 8 (Octal) , base 16 (Hexadecimal) and base 10 (Decimal) systems.
- Perform conversion between relevant number systems (hexadecimal, decimal, octal and binary).
- Elucidate real-world examples of number systems as used in technology.

**5. Design circuit diagrams using logic gates and prove Boolean Algebra equivalences using truth tables and Boolean algebra rules.**

- Describe and use Boolean logic in real world scenarios.
- Use truth tables and disjunctive normal forms.
- Understand the basic principles behind designing Boolean switching and gates circuits.
- Use the deductive approach to the scientific method (from axioms to theorems).
- Use symbolic logic and symbol manipulation.

**6. Express angles in degrees and radians; Solve right-angled triangles; Find the value of primary trigonometric functions given the angle and conversely find the angle given the trigonometric value for acute and obtuse angles; Graph the functions  $y = a\sin(x)$  and  $y = b\cos(x)$ .**

- Solve right triangles for any missing angles and/or sides.
- Identify angles and their measure.
- Define the trigonometric functions for acute angles.
- Define the reciprocal trigonometric functions for acute angles.
- Calculate values of trigonometric functions (acute angles): sin, cos, tan.
- Determine the signs of trigonometric functions.
- Calculate the values of the primary trigonometric functions (any angle): sin, cos, tan.
- Convert between radians measure and degrees measure.
- Perform addition, subtraction, multiplication and division of numeric fractions, in particular those involving Pi.
- Graph functions of the form  $y = \sin(x)$  or  $y = \cos(x)$  in both radians and degrees.

**7. Graph polynomial functions using tables of values; Write the equation and graph straight lines; Find the vertex and graph quadratic functions; Identify the Amplitude, period and phase shift and graph the functions  $y = a\sin(bx + c)$  and  $y = a\cos(b(x + c))$ .**

- Create a table of values using Function Notation
- Manipulate equations representing straight lines to identify the slope and intercepts of the line.
- Graph straight lines.
- Given a straight line, determine the equations of lines that are parallel and perpendicular to the given line.
- Identify and sketch horizontal and vertical lines

- Graph and write equations of straight lines in slope-intercept form, point-slope form, and standard form
- Identify quadratic equations
- Determine the vertex and sketch quadratic functions.
- Identify the period, amplitude and phase-shift of trigonometric functions
- Graph functions of the form  $y = a \sin(bx + c)$  or  $y = a \cos(b(x + c))$ .

8. Apply Vectors to solve problems.

- Determine the components of a vector.
- Solve vector problems analytically using vector components.
- Utilize vectors appropriately to solve application problems such as flight vectors given current wind velocities.

9. Solve 2X2 and 3X3 systems of linear equations using the method of elimination by addition or subtraction.

- Interpret solutions of systems of two linear equations in two unknowns.
- Solve systems of two linear equations in two unknowns algebraically using elimination by addition and subtraction.
- Solve systems of three linear equations in three unknowns algebraically using elimination by addition and subtraction.

## Learning Resources

**Required Software:** MyLab Math Access

**Recommended E-Text:** "Basic Technical Mathematics with Calculus (SI Version), 11th ed.", Washington, Evans, Boué and Martin, Pearson Publications, 2020

**Other Required Resources:**

**Scientific Calculator** – many programs require specific calculators for other courses, please consult with your program professors before choosing a calculator, but also note that graphing calculators are **NOT** permitted for use in this course.

## Learning Activities

- class discussions
- lecture notes
- review package
- MyMathLab on-line homework
- videos
- modular tests

## Pre-defined Evaluation / Earning Credit

The following list provides evidence of this course's learning achievements and the outcomes they validate:

**Quiz(zes)/Test(s) (80%)**

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, CLR 8, CLR 9, EES 3, EES 4, EES 5

**Online Activity(ies)/Assignment(s) (20%)**

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, CLR 9, EES 3, EES 4, EES 5

## Prior Learning Assessment and Recognition

Students who wish to apply for Prior Learning Assessment and Recognition (PLAR) need to demonstrate competency at a post-secondary level in all outlined course learning requirements. Evidence of learning achievement for PLAR candidates includes:

- Challenge Exam

## Other Information

### Grade Scheme

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
A+	90% - 100%	4.0	A	85% - 89%	3.8
A-	80% - 84%	3.6	B+	77% - 79%	3.3
B	73% - 76%	3.0	B-	70% - 72%	2.7
C+	67% - 69%	2.3	C	63% - 66%	2.0
C-	60% - 62%	1.7	D+	57% - 59%	1.4
D	53% - 56%	1.2	D-	50% - 52%	1.0
F	0% - 49%	0	FSP	0	0

## Course Related Information

In order to pass this course, **students must pass every module**. In order to pass a module, students must attain a grade of **AT LEAST 65% on a module test**. Students may attempt a module test a maximum of three times per semester. One module test for every module will be held during regular class time. Students may write up to two alternate versions of the module test. These re-writes are completed in the Math Test Centre on students' own time. Re-writes must be completed before the end of the semester. The highest passing module test grade will be used to calculate the final grade.

**Many programs require math as a prerequisite for other courses. Please note that failing one module could leave a student unable to take other core program courses.** For this reason it is strongly suggested that students re-write failed module tests as soon as possible after getting feedback on the previous attempt.

Students who receive a failing grade may reclaim their course credit by completing the failed modules online. Students may register for individual modules through the Centre for Continuing and Online Learning (CCOL). Once an online module is passed, the online module grade is used to replace a failed in class module test grade.

Once a student passes all the modules in a course, their final grade will be recalculated and a grade change submitted. Note: all modules must be passed within 24 months of students' first registration in the course.

In all cases, the final grade will be calculated based on both the module test marks (80% of the final grade) and the online assignment marks (20% of the final grade).

## College Related Information

**Algonquin College's policies have been developed to ensure the health, safety and security of all students, faculty and staff, and the proper and fair operation of the College as an academic institution and employer. Please refer to the Algonquin College Policies website for the most current policy information available at <http://www.algonquincollege.com/policies/>.**

**Students are especially encouraged to be aware of the following College expectations**

### Academic Integrity

Algonquin College is committed to the highest standards of academic integrity, and students are expected to uphold these standards as part of the learning process. Any academic work submitted by a student is expected to be their own work, unless designated otherwise and all sources must be attributed. All students should be familiar with the Algonquin College policy [AA48: Academic Integrity](#). In some courses, online proctoring may be used to discourage cheating. Additional information can be found at <https://www.algonquincollege.com/studentsupportservices/student-learning-kit/preparing-to-learn-online/>. Students with any questions about the course expectations for academic dishonesty and plagiarism are encouraged to speak to their professor.

### Centre for Accessible Learning

Students with visible and/or non-visible disabilities are encouraged to register with the Centre for Accessible Learning (CAL) in order to be eligible for appropriate learning supports and/or accommodations. Students are strongly encouraged to make an appointment at the Centre for Accessible Learning as early as possible when starting a program. Once your needs are identified, a Letter of Accommodation (LOA) will be issued which you can share with your professors. If you are a returning student, please ensure that professors are given a copy of your LOA each semester.

### College Email

Students at Algonquin College are provided with a college email 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 activities. Your network credentials can be found in the [ACSIS portal](#) and you are expected to check your Algonquin email regularly and to use it to send and receive college-related email. Support is available through the college Information Technology Service (ITS) at: <https://www.algonquincollege.com/its/>

### Retroactive Accommodations

Students are expected to meet evaluation and completion deadlines as stated in course outline and course section information documents. In circumstances where evaluation and/or completion deadlines are missed or student performance has been affected by a temporary or permanent disability (including mental health), interim or retroactive accommodations may be considered. In such instances, please consult your course faculty member. For other situations where deferral of evaluations may be warranted, please consult Algonquin College Policy [AA21: Deferred Evaluation](#).

### Student Course Feedback

Algonquin College's invites students to share their course experience by completing a student course feedback survey for each course they take. For further details consult Algonquin College Policy [AA25: Student Course Feedback](#).

### Use of Mobile Devices in Class

With the proliferation of small, personal mobile 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 can be disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College [Policy AA32: Use of Mobile Devices in Class](#)

### Technology Requirements

As Algonquin College continues to respond to public health guidelines, many courses will be offered through remote delivery. As such, students will be required to have access to a computer and to the internet. There may also be additional technology-related resources required to participate in a course that are not included in the course materials fee, such as headphones, webcams, specialized software, etc. Details on these requirements can be found in the Course Section Information of the course outline for each course available on Brightspace.

### Transfer of Credit

It is the student's responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.