ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster University

Course Outline

1. COURSE INFORMATION

Session Offered	Summer 2022	
Course Name	Mathematics I	
Course Code	ENG TECH 1MC3	
Date(s) and Time(s) of lectures	Tue 2:30 pm - 5:20 pm Thu 2:30 pm - 5:20 pm	
Program Name	Automotive and Vehicle Engineering Technology/ Biotechnology/ Automation Engineering Technology	
Calendar Description	Introductory mathematics course covering pre-calculus concepts including algebra, trigonometry, complex numbers, exponential and logarithmic functions, systems of equations, matrices and vectors.	
Instructor(s)	Dr. Yotka Rickard	E-Mail: yotka@mcmaster.ca Office Hours: Tue, Thu 5:30 pm - 6:30 pm

2. COURSE SPECIFICS

Course Description

Review of algebraic basics and operations, trigonometric functions and identities, logarithmic, exponential, and advanced functions; complex numbers including operations; systems of linear and non-linear equations; linear algebra; coordinate systems in 2-D and 3-D, differential calculus with engineering and technology applications, vectors and vector algebra, sequences and series.

Instruction Type

Code	Type	Hours per term
C	Classroom instruction	25
L	Laboratory, workshop or fieldwork	
T	Tutorial	14
DE	Distance education	
	Total Hours	39

Resources

ISBN	Textbook Title & Edition	Author & Publisher
ISBN-10: 1-285-74155-2 ISBN-13: 978-1-285-74155-0	**Calculus:** Early Transcendentals, 8th Edition	Stewart, Nelson Co

Other Supplies	Source
Problem Sets/ Assignments	**Avenue to Learn,** http://avenue.mcmaster.ca

Prerequisite(s)	Registration in Automotive and Vehicle Engineering Technology I, Biotechnology I, or Automation Engineering Technology I, or Automotive and Vehicle Engineering Technology, Biotechnology, or Automation Engineering Technology
Corequisite(s)	*N/A*
Antirequisite(s)	*N/A*
Course Specific Policies	• No calculators will be allowed during Tests and Final Exam. • **Passing the course:** In order to pass this course, you are required to obtain overall average of at least 50% including all evaluation components. • **Attendance and Participation:** regular attendance and active participation in all class sessions are essential for success in this course.

- **Missed Work Policy:**
- **Quizzes.** All quizzes must be written online during the scheduled time for the class. There are no re-writes. If you miss a quiz because of an emergency, you must contact the professor no later than the next business day and send an MSAF, otherwise you will be assigned a grade of zero for the quiz. If an MSAF has been submitted, the weight of the quiz will be added to the final exam.
- **Tests.** All tests are to be written in person at the times announced unless alternative arrangements have been made previously between the student and the professor to cover exceptional circumstances. Students with special needs must inform the professor through McMaster Student Accessibility Services (SAS) office of their requirements at least five days prior to the test date so that alternative arrangements can be made.
- If you miss a test because of an emergency, you must contact the professor no later than the next business day and you are required to submit MSAF for missing test(s); otherwise, ZERO will be assigned to the grade. After receiving your MSAF, the weight of the missing test will be added to the final examination. Students who fail to send MSAF will be considered "absentees" and will be assigned a grade of zero for the test.
- Make-up test will be provided for the 2nd missed (MSAF-ed) test before the examination ban week.
- Students who fail a test will not be permitted to rewrite the test under any circumstances.
- **Assignments.** Assignments will be submitted through Avenue as per posted due dates. A submission after the deadline or by e-mail will not be considered for marking or review.
- All test/assignment/quiz marks will be posted on Avenue. It is your responsibility to report any discrepancies to your instructor **before the last day of classes**. No errors will be corrected unless reported by this time.

Reviewing a test mark

- Tests may be resubmitted to the instructor for re-mark up to one week after the test grade has been uploaded. Students must submit a detailed written description of the marking problem regarding their submission. However, the instructor has the right to remark the test in its entirety.

The educational materials developed for this course, including, but not limited to, lecture notes and slides, handout materials, examinations and assignments, and any materials posted to Avenue, are the intellectual property of the course instructor. These materials have been developed for student use only and they are not intended for wider dissemination and/or communication outside of a given course. Posting or providing unauthorized audio, video, or textual material of lecture content to third-party websites violates the instructor's intellectual property rights, and the Canadian Copyright Act. Failure to follow these instructions may be in contravention of the university's Code of Student Conduct and/or Code of Academic Conduct, and will result in appropriate penalties. Participation in this course constitutes an agreement by all parties to abide by the relevant University Policies, and to respect the intellectual property of others during and after their association with McMaster University and Mohawk College.

Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of "out-of-class" work for every scheduled hour in class. "Out-of-class" work includes reading, research, assignments and preparation for tests and examinations. The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception. Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class. Instructor has the right to submit work to software to identify plagiarism.
3. SUB TOPIC(S)	
Week 1 May 2-6	**Introduction** • Critical importance of mathematics in engineering and technology, the structure, meaning, and application of this course and the mathematics courses that build on this one (i.e., 1MT3, 2MA3, & 2MT3) • The importance of doing a lot of work on your own **MODULE 01** • Real numbers, Intervals, and Absolute Value • Exponents and Radicals • Round-off errors and significant figures • Simplifying Algebraic Fractions • Factoring algebraic expressions (common factors, difference of squares, grouping, sum or difference of two cubes) • Solving linear equations in one variable • Solving inequalities in one variable • Solving equations and inequalities involving absolute value • Solving quadratic equations by factoring, completing the square and quadratic formula • Systems of two equations in two unknowns **MODULE 02** • Cartesian coordinate system details, and distance between points in 2-D • Equations of a line • Definition of functions, domain and range • Graphs and Sketches of polynomial and linear functions • Graphing and Sketching 2nd degree equations: circle, ellipse, parabola, hyperbola
Week 2 May 9-13	**MODULE 03** • Trigonometric ratios and trigonometric functions • Trigonometric identities and trigonometric equations • Exponential and Logarithmic functions • Exponential and Logarithmic equations **MODULE 04** • Arrays and systems of linear equations • Determinants, matrices and matrix operations

	• Matrix inversion and multiplication • Cramer's Rule • Vectors and Vector algebra (dot product and cross product) • Unit vectors $\hat{i}$, $\hat{j}$, and $\hat{k}$
Week 3 May16-20	**MODULE 05** • Complex numbers and arithmetic operations • Cartesian, polar and exponential form • Euler's formula **MODULE 06** • The limit of a function; one sided and two sided limits • Limits at infinity • Continuity of a function • Types of discontinuities **MODULE 07:** Differential Calculus • Derivatives and Rates of Change • Rules of differentiation • Derivatives of Algebraic functions • The Chain Rule **Term Test 1: Test covers all the topics listed in Weeks 1 -2**
Week 4 May 23-27	• Derivatives of exponential and logarithmic functions • Derivatives of trigonometric and inverse trigonometric functions • Derivatives of hyperbolic functions • Implicit differentiation • Higher-order derivatives **MODULE 08:** Some applications of differential calculus • Rates of change problems • Related Rates problems • Critical Points and the 1st and 2nd derivative tests • Optimization problems
Week 5 May 30 - Jun 3	**MODULE 09** • Indeterminate forms of the types $\frac{0}{0}$, $\frac{\infty}{\infty}$, $0\cdot\infty$, $\infty-\infty$, 0^0, ∞^0, and 1^∞ • L'Hospital's Rule **MODULE 10** • Partial derivatives • Higher-order partial derivatives • The Chain Rule • Implicit differentiation using partial derivatives • Total differentials **Term Test 2: Test covers all the topics listed in Weeks 3-4**
Week 6 Jun 6 - 10	**MODULE 11** • Infinite sequences and infinite series • Geometric series • Series' convergence and divergence

	• Taylor's series • MacLaurin's series
Week 7 Jun 13 - 17	• Taylor's series (cont'd) • MacLaurin's series (cont'd) • Review, if time permits

Classes end: Friday, June 17

Final examination: Thursday, June 16, 2:30 pm - 5:00 pm

All examinations MUST be written during the scheduled examination time.

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments	10%
Quizzes	10%
2 Mid-term tests (each 20%)	40%
Final examination (tests cumulative knowledge)	40%
TOTAL	**100%**

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Explain linear and non-linear equations, systems of equations, functions, trigonometric functions, exponential and logarithmic functions.
2. Use Cramer's rule to solve a system of linear equations.
3. Describe and apply the concepts of limits, continuity, and derivatives to solve real world problems.
4. Express complex numbers in Cartesian/polar/exponential form, solve problems using complex algebra.
5. Perform vector operations such as dot product and cross product.
6. Perfom differentiations of functions of one and more variables using Chain Rule, Implicit and Logarithmic differentiation.
7. Determine the region of convergence of a series. Determine the Taylor and MacLaurin series of a function.

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.
http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"),

and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in

the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.