

## Course Outline

| 1. COURSE INFORMATION                  |   |  |                               |
|--|---|--|-------------------------------|
| <b>Session Offered</b>                 | Fall 2017   |  |                               |
| <b>Course Name</b>                     | Mathematics 1   |  |                               |
| <b>Course Code</b>                     | ENG TECH 1MC3   |  |                               |
| <b>Date(s) and Time(s) of lectures</b> | C01-M,Th- 9.30-11.20am. Room ABB 163<br>C02-M,Th- 12.30-2.20pm. Room T13 106<br>C03-M,Th- 2.30-4.20pm. Room T13-105<br>C04-M,Th- 4.30-6.20pm. Room T13 106  |  |                               |
| <b>Program Name</b>                    | Automation Engineering Technology/ Automotive and Vehicle Technology/ Biotechnology   |  |                               |
| <b>Calendar Description</b>            | Introductory mathematics course covering pre-calculus concepts including algebra, trigonometry, complex numbers, exponential and logarithmic functions, systems of equations, matrices and vectors.   |  |                               |
| <b>Instructor(s)</b>                   | Dr. Yotka Rickard   | E-mail: yotka@mcmaster.ca<br>Office Hours & Location: Tu, Th-1.30-2.30pm ETB 209   |                               |
|  | John Prince   | E-mail: princejf@mcmaster.ca<br>Office Hours & Location: M, Th 3.30 - 4.30pm ETB 209   |                               |
| 2. COURSE SPECIFICS                    |   |  |                               |
| <b>Course Description</b>              | 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. |  |                               |
| <b>Instruction Type</b>                | <b>Code</b>   | <b>Type</b>  | <b>Hours per term</b>         |
|  | C   | Classroom instruction  | 48                            |
|  | L   | Laboratory, workshop or fieldwork  | 0                             |
|  | T   | Tutorial   | 0                             |
|  | DE  | Distance education   | 0                             |
|  | <b>Total Hours</b>  |  | 48                            |
| <b>Resources</b>                       | <b>ISBN</b>   | <b>Textbook Title &amp; Edition</b>  | <b>Author &amp; Publisher</b> |
|  | ISBN-10:1-285-74155-2<br>ISBN-13: 978-1-285-74155-0   | Calculus Early<br>Transcendentals, 8 Ed.   | Stewart, Nelson Co.           |
|  | <b>Other Supplies</b>   | <b>All course materials, resources, and assignments/problem-sets will be posted on<br/><a href="http://avenue.mcmaster.ca">http://avenue.mcmaster.ca</a></b> |                               |
| <b>Prerequisite(s)</b>                 | Registration in Automation Engineering Technology I, or Automotive and Vehicle Engineering Technology I, or Biotechnology I, or Automation Engineering Technology, or Automotive and Vehicle Engineering Technology, or Biotechnology   |  |                               |
| <b>Corequisite(s)</b>                  | None  |  |                               |
| <b>Antirequisite(s)</b>                | None  |  |                               |
| <b>Course Specific Policies</b>        | <ul style="list-style-type: none"> <li>Absolutely <b>NO electronic devices</b> will be permitted in tests and</li> </ul>  |  |                               |

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|                              | <p>examinations.</p> <ul style="list-style-type: none"> <li>• In order to pass this course, you are required to obtain <ul style="list-style-type: none"> <li>(1) combined average of at least 50% in tests and final exam, i.e. 40/80;</li> <li>(2) and overall average of at least 50% including all evaluation components</li> </ul> </li> <li>• Missed Work Policy: <ul style="list-style-type: none"> <li>– You are required to submit MSAF for missing test(s); otherwise ZERO will be assigned to the grade.</li> <li>– The weight of the first missed test will be added to the final examination.</li> <li>– Make-up test will be provided for the 2<sup>nd</sup> missed (MSAF-ed) test before the examination ban week.</li> </ul> </li> <li>• All tests/assignments 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.</li> <li>• 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 an instructor’s intellectual property rights, and the Canadian Copyright Act. Recording lectures in any way is prohibited in this course unless specific permission has been granted by the instructor. 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.</li> </ul> |
| <b>Departmental Policies</b> | <p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>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.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>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.</p> <p>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.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>   |
| <b>3. SUB TOPIC(S)</b>       |   |
| Week 1                       | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• 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, &amp; 2MT3)</li> </ul>  |

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|  | <ul style="list-style-type: none"> <li>The importance of doing <u>a lot</u> of work on your own</li> </ul> <p><b>MODULE 01</b></p> <ul style="list-style-type: none"> <li>Real numbers, Intervals, and Absolute Value</li> <li>Exponents and Radicals</li> <li>Round-off errors and significant figures</li> <li>Simplifying Algebraic Fractions</li> <li>Factoring algebraic expressions (common factors, difference of squares, grouping, sum or difference of two cubes)</li> <li>Solving linear equations in one variable</li> <li>Solving inequalities in one variable</li> <li>Solving equations and inequalities involving absolute value</li> </ul> |  |
| Week 2   | <ul style="list-style-type: none"> <li>Solving quadratic equations by factoring, completing the square and quadratic formula</li> <li>Systems of two equations in two unknowns</li> </ul> <p><b>MODULE 02</b></p> <ul style="list-style-type: none"> <li>Cartesian coordinate system details, and distance between points in 2-D</li> <li>Equations of a line</li> <li>Definition of functions, domain and range</li> <li>Graphs and Sketches of polynomial and linear functions</li> <li>Graphing and Sketching 2<sup>nd</sup> degree equations: circle, ellipse, parabola, hyperbola</li> </ul>   |  |
| Week 3   | <p><b>MODULE 03</b></p> <ul style="list-style-type: none"> <li>Trigonometric ratios and trigonometric functions</li> <li>Trigonometric identities and trigonometric equations</li> <li>Exponential and Logarithmic functions</li> <li>Exponential and Logarithmic equations</li> </ul>  |  |
| Week 4   | <p><b>MODULE 04</b></p> <ul style="list-style-type: none"> <li>Arrays and systems of linear equations</li> <li>Determinants, matrices and matrix operations</li> <li>Matrix inversion and multiplication</li> <li>Cramer's Rule</li> <li>Vectors and Vector algebra (dot product and cross products).</li> <li>Unit vectors <math>\vec{i}</math>, <math>\vec{j}</math>, and <math>\vec{k}</math></li> </ul>   |  |
| Week 5   | <p><b>MODULE 05</b></p> <ul style="list-style-type: none"> <li>Complex numbers and arithmetic operations</li> <li>Cartesian, polar and exponential form</li> <li>Euler's formula</li> </ul> <p><b>Term Test 1: Test covers all the topics listed in Weeks 1 -4</b></p>  |  |
| Mid-term Recess: Monday, October 9 to Sunday, October 15, 2017 |   |  |
| Week 6   | <p><b>MODULE 06</b></p> <ul style="list-style-type: none"> <li>The limit of a function; one sided and two sided limits</li> <li>Limits at infinity</li> <li>Continuity of a function</li> <li>Types of discontinuities</li> </ul> <p><b>MODULE 07: Differential Calculus</b></p>  |  |

|         |   |  |
|---------|---|--|
|         | <ul style="list-style-type: none"> <li>• Derivatives and Rates of Change</li> <li>• Rules of differentiation</li> <li>• Derivatives of Algebraic functions</li> </ul>   |  |
| Week 7  | <ul style="list-style-type: none"> <li>• The Chain Rule</li> <li>• Derivatives of exponential and logarithmic functions</li> <li>• Derivatives of trigonometric and inverse trigonometric functions</li> <li>• Derivatives of hyperbolic functions</li> <li>• Implicit differentiation</li> <li>• Higher-order derivatives</li> </ul>   |  |
| Week 8  | <p><b>MODULE 08:</b> Some applications of differential calculus</p> <ul style="list-style-type: none"> <li>• Rates of change problems</li> <li>• Related Rates problems</li> <li>• Critical Points and the 1<sup>st</sup> and 2<sup>nd</sup> derivative tests</li> <li>• Optimization problems</li> </ul>   |  |
| Week 9  | <p><b>MODULE 09</b></p> <ul style="list-style-type: none"> <li>• Indeterminate forms of the types <math>\frac{0}{0}</math>, <math>\frac{\infty}{\infty}</math>, <math>0 \cdot \infty</math>, <math>\infty - \infty</math>, <math>0^0</math>, <math>\infty^0</math>, and <math>1^\infty</math></li> <li>• L'Hospital's Rule</li> </ul> <p><b>Term Test 2: Test covers all the topics listed in Weeks 5 - 9</b></p> |  |
| Week 10 | <p><b>MODULE 10</b></p> <ul style="list-style-type: none"> <li>• Partial derivatives</li> <li>• Higher-order partial derivatives</li> <li>• The Chain Rule</li> <li>• Implicit differentiation using partial derivatives</li> <li>• Total differentials</li> </ul>  |  |
| Week 11 | <p><b>MODULE 11</b></p> <ul style="list-style-type: none"> <li>• Infinite sequences and infinite series</li> <li>• Geometric series</li> <li>• Series' convergence and divergence</li> </ul>  |  |
| Week 12 | <ul style="list-style-type: none"> <li>• Taylor's series</li> <li>• Maclaurin's series</li> </ul>   |  |
| Week 13 | <ul style="list-style-type: none"> <li>• Review</li> </ul>  |  |

Classes end: Wednesday, December 6, 2017

Final examination period: Friday, December 8 to Thursday, December 21, 2017

All examinations MUST be written during the scheduled examination period.

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/quizzes/worksheets                 | 20%         |
| 2 Term tests (20% each)                        | 40%         |
| Final examination (tests cumulative knowledge) | 40%         |
| <b>TOTAL</b>                                   | <b>100%</b> |

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, system of equations, functions, trigonometric functions, exponential and logarithmic functions.
2. Use Cramer's rule to solve system of linear equations
3. Describe and apply the concepts of limits, continuity, and the derivatives to solve real world problems.
4. Express complex numbers in Cartesian/polar/exponential form, solve complex algebra
5. Perform vector operations such as dot product and cross product.
6. Determine the region of convergence of a series. Determine the Taylor and Maclaurin series of a function.

## 6. POLICIES

### 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](http://www.mcmaster.ca/policy/General/HR/Discrimination%20Harassment%20Sexual%20Harassment-Prevention&Response.pdf)

### Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

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.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

### Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences **DUE TO MINOR MEDICAL SITUATIONS** that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately (**NORMALLY WITHIN TWO WORKING DAYS**) regarding the nature of the accommodation.

If you are absent **for reasons other than medical reasons**, for more than 3 days or exceed 1 request per term you **MUST** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. <http://www.mcmaster.ca/msaf/>

### E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access

Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

### **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.

### **Turnitin (Optional)**

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

### **Protection of Privacy Act (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

### **Academic Accommodation of Students with Disabilities Policy**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

## Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>