Course Syllabus (Section A)
Department of Mathematics and Statistics
MATH 1280
Engineering Mathematics I
Winter 2024/25

Instructor: Jonathan Tot,   email: jonathan.tot@dal.ca
Chase Building 312, Studley Campus.
Office hours: Mondays and Wednesdays 3:40 – 5:00 pm or by appointment.

Lectures: MWF   1:35pm – 2:25pm, Sir James Dunn Building, r.135 (Studley Campus).

Tutorials: MWF 12:35pm – 1:25pm, Sir James Dunn Building, r.135 (Studley Campus).
Not every Monday, Wednesday, and Friday – there will be 24 tutorial sessions in all (plus two Quizzes, written in the tutorial time). The tutorial dates are given in the Course Schedule in this syllabus. The first tutorial will be Friday, January 10th.

MATH 1280 Engineering Math I ▶

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Course Delivery: I will be going over lecture slides provided by Prof. Edward Yao, as well as developing concepts, techniques, and problem solving on the board. The tutorial sessions are also in person, with our TA Hasan Mahmood (mh290120@dal.ca).

Student Support: There are many ways to seek help in this course. There are office hours with the instructor, our class discussion board on the course Brightspace page, support from Teaching Assistants in the MATH/STAT Learning Centre, and other classmates.

The MATH/STAT Learning Centre is located in Chase 119 and will be operating in-person and remotely. It opens on January 6th and support is available Monday through Friday from 11:30am - 4:30pm and Monday through Friday evenings from 6:30- 7:30pm, until Apr. 26. Register for the Brightspace "course" at www.dal.ca/faculty/science/math-stats/about/learning-centre.html to access the online support and see the latest schedule.

Course Description

This forms an introduction to differential and integral calculus for Engineering students. All topics of MATH 1000 are covered, but in greater depth. In addition, this course covers functions, differentiation of polynomial, trigonometric, exponential and logarithmic functions, product, quotient and chain rules, linear approximation, antiderivatives and definite integrals, Riemann sums, and numerical approximations of integrals.

Credit Hours: 3

Course Prerequisites

Nova Scotia Mathematics advanced 11 and 12 or pre-calculus. Pre-calculus is highly recommended.

Course Exclusion

MATH 1000.03, MATH 1215.03

Learning Objectives

- Develop students' conceptual understanding of single-variable functions in terms of the limit, continuity, derivative, and integration.
- Train students to efficiently perform fundamental calculations with these functions.
- Introduce engineering-related applications of this knowledge and skills.

Learning Outcomes

1. Use principles of calculus involving limits and differentiation of rational, algebraic, and transcendental functions.
2. Use calculus to graph functions.
3. Use calculus to solve practical engineering problems involving related rates and optimization.
4. Use integration to compute areas and moments.

Graduate Attributes

Performance Indicator (**01A**): Explain and apply mathematics for analysis and synthesis in engineering.

Course Materials

Textbook

I will be using an online [OpenStax](#) textbook, [*Calculus Volume 1*](#) by Gilbert Strang (MIT) and Edwin Herman (UW–Stevens Point). You can access this text and additional resources online, and it will also be available to download from our course Brightspace page.

Historically, MATH 1280 has used *Calculus - Early Transcendentals (3rd ed.),* Briggs and Cochran. This text covers single and multiple variable calculus topics, for which MATH 1280 covers Chapters 1- 5 and MATH 1290 covers Chapters 6 – 12. The text can be purchased at the Dal Bookstore: [https://bookstore.dal.ca/CourseSearch/?course[]=SUB,FALL21,MATH,MATH1280,&](https://bookstore.dal.ca/CourseSearch/?course[]=SUB,FALL21,MATH,MATH1280,&)
Please note: MyLab Math is not required for both courses.

Web Resources

See Brightspace for the course syllabus, announcements, assignments and solutions, tutorial problems, discussion board, lecture and tutorial notes[1], etc. Log in using your NetID. You should see a link to the course MATH 1280.

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[1] These will be posted after each session.

Course Assessment

In this course, we will have ten (10) Assignments which will count towards 45% of the final evaluation. We will also have two Quizzes, held in Tutorial time slots, that will be 10% each, and a Final Exam for 35%.

Assignment (10, 45% total weight)

We will discuss together, and in conjunction with the Marker, for the most preferred mode of Assignment submission. No late assignments will be accepted – the due dates are given in the

Schedule table below. Assignments must be completed independently. Copying the solutions from other classmates or various sources is strictly forbidden. Follow the **Student Absence Reporting** stated in Section B of the syllabus for any *legitimately* late or missed assignments up to a maximum of two times. Upon approval by the Associate Dean's Office, the missed work will be granted a waiver. There is no alternative work to replace any missing assignment. Assignments will be due weekly Friday (exact timing pending our discussion), starting January 24th, excepting Week 8 (the Winter Study Break) – Assignment 5 will simply be due Feb 28th – and I will make the last due by our last class time on April 7th.

Quizzes (20%)

We will have two Quizzes (10% each), written in the Tutorial timeslot (50 min) on **February 12th** and **March 19th**. Calculators will not be used, unless explicitly specified. Turn off all electronic devices that make noise. In case you cannot attend one of the Quizzes due to an illness (diagnosed by a physician, not a nurse), please follow the **Student Absence Reporting** stated in Section B of the syllabus to fill in a form and submit it together with a doctor's note to the Associate Dean's Office for approval.

Final Exam (35%)

The cumulative exam will be 3 hours. More information TBD.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100) B+ (77-79) C+ (65-69) D (50-54)

A (85-89) B (73-76) C (60-64) F (< 50)

A- (80-84) B- (70-72) C- (55-59)

Growth Mindset vs. Fixed Mindset

There is evidence[2] that shows that your frame of mind can greatly affect your success. In particular, if you have a growth mindset (you believe that with practice your abilities can improve) you are often more successful than if you have a fixed mindset (you believe that you can either do or not do something). We invite you to take a growth mindset to mathematics: with regular practice, you will improve your skills.

Short-term Missed Work and Absence Reporting

Any absence resulting in missed academic work must be reported using the Engineering Student Absence Reporting online system. This applies to both *Student Declaration of Absence* and *Request for Accommodation*. Visit forms.engineering.dal.ca for details and to submit a request.

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[2] Dweck, C. S. (2006). Mindset: The new psychology of success. Random House.

Course Content

There are four main modules of the course:

Course Outline

1. Review of Functions, Limits, Weeks 1 – 3
2. The Derivative and Differentiation, Weeks 4 – 8
   (note – Week 7 is a study break, February 17-21)
3. Applications of Differentiation: some physics topics, Economics, Related Rates and Optimization problem, Weeks 9 – 11
4. Integration, Weeks 12 – 13

Schedule   You should regard Lectures and Tutorials as mandatory – attendance will be taken, for which bonus marks will be awarded (TBD).

- Week 1

   - Jan 6   Lecture 1 – Review of Functions, the Difference Quotient (slope of Secant line)

   - Jan 8   Lecture 2 – Inverse Functions, Transformations

   - Jan 10   Lecture 3 – Trig, Exponential and Logarithmic functions
                    Tutorial 1

- Week 2

   - Jan 13   Lecture 4 – Intro to Limits
                    Tutorial 2

   - Jan 15   Lecture 5 – Limits Laws, Squeeze Theorem

   - Jan 17   Lecture 6 – Conventions for Infinity, Infinite Limits (Vertical Asymptotes)
                    Tutorial 3

- Week 3

   - Jan 20   Lecture 7 – Limits at Infinity (Horizontal and Slant Asymptotes)
                    Tutorial 4

   - Jan 22   Lecture 8 – Continuity and the Intermediate Value Theorem

   - Jan 24   Lecture 9 – Intro the Derivative: slope of the Tangent line, limit definition
                    Tutorial 5

- Week 4

   - Jan 27   Lecture 10 – The Derivative as a Function
                    Tutorial 6

   - Jan 29   Lecture 11 – Basic Differentiation Rules and Properties
                    Tutorial 7

   - Jan 31   Lecture 12 – Product, Quotient and Chain Rules
                    Tutorial 8

- Week 5
  - Feb 3   Lecture 13 – Special Limits, Trig and Exponential Derivatives
                     Tutorial 9
  - Feb 5   Lecture 14 – Implicit Differentiation
                     Tutorial 10
  - Feb 7   Munro Day,   University closed (no class or tutorial)
- Week 6
  - Feb 10   Lecture 15 – Logarithm and power derivatives
                     Tutorial 11
  - Feb 12   Lecture 16 – Inverse Trig derivatives
                     Quiz 1 – Functions, Limits, and Derivatives
                                    (up to Chain rule and Trig derivatives)
  - Feb 14   Lecture 17 – Local and Absolute Extrema
                     Tutorial 12
- Week 7   WINTER STUDY BREAK
- Week 8
  - Feb 24   Lecture 18 – Rolle's and Mean Value Theorems
  - Feb 26   Lecture 19 – Graphing Functions 1: 1st, 2nd Derivatives Tests, Inflection points
                     Tutorial 13
  - Feb 28   Lecture 20 – Graphing Functions 2: Bringing it all Together
                     Tutorial 14
- Week 9
  - Mar 3   Lecture 21 – Applications of Derivatives: physics topics, Economics
  - Mar 5   Lecture 22 – (TBD)
  - Mar 7   Lecture 23 – Vibrational Modes of a beam
                     Tutorial 15
- Week 10
  - Mar 10   Lecture 24 – Related Rates problems
  - Mar 12   Lecture 25 – Optimization Problems
                     Tutorial 16
  - Mar 14   Lecture 26 – More Applications
- Week 11
  - Mar 17   Lecture 27 – the Linear Approximation, concept of Differentials
                     Tutorial 17

- Mar 19   Lecture 28 – L'Hopital's Rule, Newton's Method
              Quiz 2 – Implicit Differentiation, Applications and Related Rates
  - Mar 21   Lecture 29 – Antiderivatives, Indefinite Integrals
              Tutorial 18

- Week 12

  - Mar 24   Lecture 30 – net Areas, uniform Riemann Sums
              Tutorial 19

  - Mar 26   Lecture 31 – more Riemann Sums, definition of the Definite Integral
              Tutorial 20

  - Mar 28   Lecture 32 – Basic Integration
              Tutorial 21

- Week 13

  - Mar 31   Lecture 33 –Fundamental Theorems of Calculus
              Tutorial 22

  - Apr 2   Lecture 34 – Symmetric Integrals, Mean Value Theorem for Integrals
              Tutorial 23

  - Apr 4   Lecture 35 – Integration by Substitution
              Tutorial 24

- Week 14

  - Apr 7   Lecture 36 – Final Exam Review

Course Syllabus (Section B)
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Associate-Dean's Office – Undergraduate Studies

Associate Dean:	Dr. Darrel Doman Darrel.Doman@Dal.Ca
Undergraduate Office Coordinator:	Jason Lecoure Jason.lecoure@dal.ca
Student Success Coordinator:	Karyn Hemsworth Karyn.hemsworth@dal.ca
General Inquires:	engineering@dal.ca or (902) 494-2963

Dalhousie Engineering Student Oath

I, as one who is preparing to enter the profession of engineering, promise to conduct myself in an honorable and ethical manner, and, as such, I will not cheat, plagiarize or be involved in any other academically dishonest activities. I shall uphold the values of truth, honesty and trustworthiness. I shall study diligently so that I will be able to safeguard human life, to protect the welfare of society and the environment, and to uphold the reputation of the profession. In all this I shall be concerned for the well-being of others, and not just myself.

Student Absence Reporting

Any absence resulting in missed academic work must be reported using the Engineering Student Absence Reporting online system. This applies to both Student Declaration of absence and Request for Accommodation. Visit Engineering Forms for details and to submit a request.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.
Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).
Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative

justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.
Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Originality Checking Software (Mandatory to include if being used)

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. (Read more: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

o **Student Use of Course Materials**

These course materials are designed for use as part of the **MATH1280** course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness
Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).
Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False

University Grading Practices
https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

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Course Syllabus (Section C)
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Student Resources and Support

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Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Student Health and Wellness Resources

- Melda Murray Student Centre (Sexton Campus) https://www.dal.ca/faculty/engineering/mmsc.html
- Student Health & Wellness https://www.dal.ca/campus_life/health-and-wellness.html

Safety

- FoE Environmental Health & Safety (https://dalu.sharepoint.com/sites/eehs)
- Biosafety (http://www.dal.ca/dept/safety/programs-services/biosafety.html)
- Research Laboratory Safety Policy Manual (http://www.dal.ca/dept/safety/documents-policies-procedures.html)
- Laboratory Chemical Safety Manual http://www.dal.ca/dept/safety/programs-services/chemical-safety.html
- Radiation Safety Manual http://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.