1. Your Lecturers

P.C. Stangeby
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2. Mental Health and Wellness

As a university student, you may experience a range of health and/or mental health issues that may result in significant barriers to achieving your personal and academic goals. The University of Toronto offers a wide range of free and confidential services and programs that may be able to assist you. We encourage you to seek out these resources early and often.

Health & Wellness Resources: undergrad.engineering.utoronto.ca/advising-and-wellness/health-wellness/

U of T Health & Wellness Website: studentlife.utoronto.ca/hwc

If, at some point during the year, you find yourself feeling distressed and in need of more immediate support, visit the **Feeling Distressed Webpage**: www.studentlife.utoronto.ca/feeling-distressed, for more campus resources.

Off campus, immediate help is available 24/7 through **Good2Talk**, a post-secondary student helpline at 1-866-925-5454.

All students in the Faculty of Engineering have an Academic Advisor who can advise on academic and personal matters. You can find your department's Academic Advisor here: uoft.me/engadvising

3. Accessibility Services

Accommodations:

If you have a learning need requiring an accommodation the University of Toronto recommends that students immediately register at Accessibility Services at www.studentlife.utoronto.ca/as.

Location: 4th floor of 455 Spadina Avenue, Suite 400

Voice: 416-978-8060

Fax: 416-978-5729

Email: accessibility.services@utoronto.ca

The University of Toronto supports accommodations of students with special learning needs, which may be associated with learning disabilities, mobility impairments, functional/fine motor disabilities, acquired brain injuries, blindness and low vision, chronic health conditions, addictions, deafness and hearing loss, psychiatric disabilities, communication disorders and/or temporary disabilities, such as fractures and severe sprains, recovery from an operation, serious infections or pregnancy complications.

4. Personal Information Security

If you are a citizen of another country, and/or accessing your courses at the University of Toronto from a jurisdiction outside of Canada, please note that you may be subject to the laws of the country in which you are residing, or any country of which you have citizenship. The University of Toronto has a long-established commitment to freedom of expression, with this right enabled by an environment valuing respect, diversity, and inclusion. In your classes, you may be assigned readings, or discuss topics that are against the law in other jurisdictions. You are encouragd to become familiar with any local laws that may apply to you and any potential impact on you if course content and information could be considered illegal, controversial, or politically sensitive. If you have any concerns about these issues, please contact your instructor directly to discuss with them.

5. Engineering Learning Strategist

Learning Strategist - Shahad Abdulnour offers one-on-one sessions, programs, and workshops to assess and enhance Engineering students' academic skills related to prioritizing tasks, note-taking, critical thinking, problem solving, test/exam preparation, and coping with stress and anxiety.

Accessibility Advisor - Krysta Halliwell, Engineering's On-Location Accessibility Advisor works with students registered with Accessibility Services. Krysta is also available to work with instructors if you have questions about accommodations or want to learn more about accessible teaching practices.

Health & Wellness Counsellor - Engineering students are able to access individual, time-limited life coaching, personal counseling and solution/goal-focused psychotherapy within a holistic approach to personal wellness through the Faculty's On-Location wellness counsellors. To book an appointment students can obtain a referral from their Academic Advisor or by calling Health and Wellness at 416-978-8030 (selection option 5). Appointments are 45 minutes long.

6. Evaluation

There will be two Term Tests. The first tutorial will occur in the week starting Monday, 12 September. Each week, unless there is a Term Test the following Monday, there will be a Quiz, see below re material to be covered. There will be 9 Quizzes in total, of which the 6 highest marks will be counted. Thus 3 Quizzes can be skipped entirely, which is to cover illness, conflicts with religious holidays, etc. If you miss one of the midterm tests or more than 3 quizzes due to an unforeseen problem (e.g. physical or mental illness, injury, bereavement, etc.), please submit a Petition for Consideration in Course Work to your academic advisor through the central Engineering Portal at www.apsc.utoronto.ca/portal in order to be considered for special accommodation.

For more information please consult your Academic Advisor.

The Term Tests will be:

Term Test 1: Monday 17 October 2022

Term Test 2: Monday 21 November 2022

Calculators are not allowed on Quizzes, Term Tests and the Final Exam.

Marking scheme:
Term Tests	32%
Tutorial Quizzes	18%
Final Examination	50%

7. Text Material

(a) **Textbook**: James Stewart, *Calculus* (9th edition) with Student Solutions manuals, ISBN 978-1-337-62418-3

(b) **Supplement**: E.J. Barbeau and P.C. Stangeby, *Some Foundations of Analysis for Engineering Science (MAT194F)*. This is available on the Course website.

8. Course Website

https://q.utoronto.ca/courses/281914

9. Material to Cover for Quizzes

Each Quiz will consist of three questions taken from the Stewart Textbook, from the Supplement, or questions very similar to these. The Textbook questions are generally taken from a subset of the questions at the end of each section in the Text. These subsets of questions are indicated below in the Course Outline. The specific material to be covered in each Quiz is also given below.

It will be essential for you to know the basics of **trigonometry** for this, as well as for many of the other courses you will take. Some of you will have covered this material already in high school, but some of you will not have. In any event, this material will, for the most part, not be covered directly in this course or in your other first year courses. **You are responsible yourself for making sure that you are on top of this material.** You should set out to do this as early as you can – ideally in the first month of the fall term since **each of the first 3 Quizzes will include a trigonometry question, taken from Appendix D of the Stewart textbook**. You will probably find that the material contained in Appendix D of the Stewart Text, 'Trigonometry', pages A24-A33, is clear enough for you and adequate preparation for the Quizzes.

The 1st Quiz will include one of the questions from Nos. 1 – 34, pgs A33, A34.
The 2nd Quiz will include one of the questions from Nos. 35 – 64, pgs A34, A35.
The 3rd Quiz will include one of the questions from Nos. 65 – 89, pg A35.

10. Proposed Weekly Material Coverage

Week 0:   September 8-9

Lecture 1:   Introduction (1.4 The Tangent and Velocity Problems)

Additional reading: Barbeau-Stangeby Supplement Section 1
                       Stewart Appendix D, Trigonometry

Assigned problems:
   1.4   #3, 5
   Appendix D   #1-34

Week 1:   September 12-16

Lecture 2:   The Real Number System
Lecture 3:   Overview of Basic Mathematical Concepts (Part 1)
Lecture 4:   Overview of Basic Mathematical Concepts (Part 2)

Additional reading: Barbeau-Stangeby Supplement Sections 2.1 – 2.7
                       Stewart Appendix D, Trigonometry

Assigned problems:
   1.1   #30, 33, 35, 36, 43, 47, 48, 52, 55, 72, 75, 76

1.2   #1, 2, 3, 4, 14, 21, 28, 29
1.3   #3, 6, 7, 9, 17, 26, 28, 33, 42, 47, 63
Principles of Problem Solving (Stewart p99-106):   #5, 6, 13, 14
Appendix D   #35-64
Supplement Exercises   #3, 5d, 7 all, 8a-c, 9c, 10a&c, 11 all, 12 all

Week 2:   September 19-23

Lecture 5:   1.5 The Limit of a Function
Lecture 6:   1.7 The Precise Definition of a Limit
Lecture 7:   1.6 Calculating Limits Using the Limit Laws

Additional reading: Barbeau-Stangeby Supplement Sections 3.1-3.2
                       Stewart Appendix D, Trigonometry

Assigned problems:
1.5   #5, 9, 13, 15, 17, 21, 27, 42
1.6   #1, 2, 5, 7, 10, 17, 28, 39, 48, 49, 54
1.7   #3, 4, 6, 10, 13, 17, 19, 22, 34, 38, 42
Appendix D   #65-89
Supplement Exercises   #14, 15, 18, 20

Week 3:   September 28 – 30

Lecture 8:   1.8 Continuity
Lecture 9:   2.1 & 2.2 Derivatives and Rates of Change
Lecture 10:   2.3 Differentiation Formulas
                 2.7 Rates of Change in the Natural Sciences

Additional reading: Barbeau-Stangeby Supplement Sections 2.8, 3.3, 3.4, 4.1

Assigned problems:
1.8   #3, 4, 11, 15, 19, 21, 24, 27, 29, 35, 38, 41, 45, 46, 53, 55, 71, 75
2.1   #5, 7, 12, 13, 23, 25, 38, 44, 46, 49, 51, 53, 56, 58
2.2   #1, 3, 19-30, 42, 45, 55, 63
2.3   #1-14, 15-24, 28, 37-48, 61, 77, 79, 93, 107, 109, 115
2.7   #1, 13, 15, 20, 25, 32, 37
Supplement Exercises   #22, 24, 25, 26, 27

Week 4:   October 3-7

Lecture 11:   2.4 Derivatives of Trigonometric Functions
                 2.5 The Chain Rule
                 2.6 Implicit Differentiation
Lecture 12:   2.8 Related Rates
                 3.1 Maximum and Minimum Values
Lecture 13:   3.2 The Mean Value Theorem
                 2.9 Linear Approximations and Differentials

Assigned problems:
    2.4   #19, 25, 29, 43, 51, 66
    2.5   #23, 41, 78, 83
    2.6   #10, 12, 16, 31, 51, 57, 59, 65
    2.8   #16, 28, 37, 45
    3.1   #3, 13, 23, 29, 41, 51, 57, 59, 68, 73
    3.2   #9, 12, 27, 28, 32, 37, 39
    2.9   #19, 21, 25, 33, 41
    Supplement Exercises   #31, 32, 35, 36, 38

Week 5:   October 11-14

    Lecture 14:   3.3 How Derivatives Affect the Shape of a Graph
                    3.4 Limits at Infinity, Horizontal Asymptotes
    Lecture 15:   3.5 Summary of Curve Sketching

Assigned problems:
    3.3   #19, 20, 23, 31, 39, 49, 77
    3.4   #4, 7, 13, 31, 38, 46, 49, 59, 66, 76
    3.5   #1, 5, 17, 21, 30, 38, 40, 54, 60

Week 6:   October 17-21

    Lecture 16:   3.7 Optimization Problems
                    3.9 Antiderivatives
                    Appendix E, Sigma Notation
    Lecture 17:   4.1 Areas and Distances
    Lecture 18:   4.2 The Definite Integral

Assigned problems:
    3.7   #3, 13, 17, 21, 30, 40, 56, 77, 81
    3.9   #8, 11, 20, 29, 40, 43, 48, 59, 73
    4.1   #3, 9, 17, 18, 23, 34
    4.2   #3, 12, 16, 17, 19-22, 25, 33, 45, 57, 59, 73, 81

Week 7:   October 24-28

    Lecture 19:   4.3 The Fundamental Theorem of Calculus
    Lecture 20:   4.4 Indefinite Integrals and the Net Change Theorem
                    4.5 The Substitution Rule
    Lecture 21:   5.1 Areas Between Curves

Assigned problems:

Week 8:   October 31 - November 4

Lecture 22:   5.2 Volumes
Lecture 23:   5.3 Volumes by Cylindrical Shells
                 5.5 Average Value of a Function
Lecture 24:   6.1 Inverse Functions

Assigned problems:

Week 9:   November 14-18

Lecture 25:   6.2* The Natural Logarithmic Function
Lecture 26:   6.3* The Natural Exponential Function
Lecture 27:   6.4* General Logarithmic and Exponential Functions

Assigned problems:
    6.2*   #6-9, 15, 30, 33, 37, 41, 53, 65, 69, 71, 73, 79, 87, 91
    6.3*   #2-4, 5-8, 9-10, 13, 17, 20, 27, 29, 31-50, 59, 79-90, 93, 94, 95, 96, 102

        1)   a)   Show that $e^x \geq 1 + x$ if $x \geq 0$
                       [Hint: Show that $f(x) = e^x - (1 + x)$ is increasing for $x > 0$]
              b)   Deduce that $\frac{4}{3} \leq \int_0^1 e^{x^2}\, dx \leq e$
               c)   Use the inequality of part (a) to show $e^x \geq 1 + x + \frac{x^2}{2}$ if $x \geq 0$
        2)   a)   Use mathematical induction to prove that for $x \geq 0$ and any
                     positive integer n, $e^x \geq 1 + x + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!}$
               b)   Use part (a) to show that $e > 2.7$
               c)   Use part (a) to show that $\lim\limits_{x \to \infty} \frac{e^x}{x^k} = \infty$, for any positive integer k.

    6.4* #3-6, 7-10, 13, 23, 25-42, 45-50

Week 10:   November 21-25

Lecture 28:   6.6 Inverse Trigonometric Functions
Lecture 29:   9.1 Modelling with Differential Equations
                 9.3 Separable Equations
Lecture 30:   6.5 Exponential Growth and Decay

    6.6   #22-37, 50, 64, 73, 82
    9.1   #15, 24, 26
    9.3   #1-12, 13, 17, 18, 20, 45, 48, 52
    6.5   #4, 8, 11, 15, 19, 21

Week 11:   November 28 – December 2

    Lecture 31:   9.4 Models for Population Growth
                        9.5 Linear Equations
    Lecture 32:   Complex Numbers
    Lecture 33:   17.1 (online) Second Order Linear Equations

Additional reading: Barbeau-Stangeby Supplement Section 5

Assigned problems:
    9.4   #5, 9, 11, 13, 21
    9.5   #3, 9, 14, 23, 31, 39
    17.1   #5, 7, 11, 13, 17, 19, 21, 25, 27, 29, 32

Week 12:   December 5-7

    Lecture 34:   17.2 (online) Nonhomogeneous Linear Equations
    Lecture 35:   Review

    Assigned problems: 17.2   #3, 7, 9, 13, 17, 19, 21, 23, 25