HUMBER

Course Outline

Course Name: Introduction to Calculus (CALC 103)

Academic Period: 2022 - 2023

Faculty:

Faculty Availability:

Associate Dean:
Mona Nouroozifar
mona.nouroozifar@humber.ca

Schedule Type Code:

Land Acknowledgement

Humber College is located within the traditional and treaty lands of the Mississaugas of the Credit. Known as Adoobiigok [A-doe-bee-goke], the "Place of the Alders" in Michi Saagiig [Mi-Chee Saw-Geeg] language, the region is uniquely situated along Humber River Watershed, which historically provided an integral connection for Anishinaabe [Ah-nish-nah-bay], Haudenosaunee [Hoeden-no-shownee], and Wendat [Wine-Dot] peoples between the Ontario Lakeshore and the Lake Simcoe/Georgian Bay regions. Now home to people of numerous nations, Adoobiigok continues to provide a vital source of interconnection for all.

Equity, Diversity and Inclusion Statement

Humber College and the University of Guelph-Humber (Humber) are leaders in providing a learning, working and living environment that recognizes and values equity, diversity and inclusion in all its programs and services. Humber commits to reflect the diversity of the communities the College serves. Students, faculty, support and administrative staff feel a sense of belonging and have opportunities to be their authentic selves.

Faculty or Department	Faculty of Liberal Arts & Sciences
Course Name:	Introduction to Calculus (CALC 103)
Pre-Requisites	none
Co-Requisites	none
Equates	none
Restrictions	none
Credit Value	3
Total Course Hours	42

Developed By:	Prepared By:	Approved by:
		Mona Nouroozifar

Humber Learning Outcomes (HLOs) in this course.

The HLOs are a cross-institutional learning outcomes strategy aimed at equipping Humber graduates with the employability skills, mindsets, and values they need to succeed in the future of work. To explore all the HLOs, please consult the Humber Learning Outcomes framework.

Course Description

N/A

Course Rationale

In a systematic way, calculus examines the relationship between quantities and how they change with respect to each other and with respect to time. Students in technical areas of study use calculus to broaden their understanding of the rate of change and how it can be measured; how a dynamic process can be modeled and controlled. This foundational course showcases knowledge, communication and problem-solving skills for students' further studies in all fields of technology.

Course Learning Method(s)

- Socratic Method
- Lecture
- Online

Learning Outcomes

- Evaluate the limits of functions algebraically, numerically and graphically.
- Find derivatives of polynomial, trigonometric, exponential, and logarithmic functions using the rules of differentiation.
- Extend the differentiation technique to find higher order derivatives, derivatives of implicit relations, and differentials.
- Sketch the graph of a function using the elements (extrema and inflection points) of calculus.
- Interpret the role of a derivative as a slope of a tangent line and as a rate of change of a function.
- Use the ideas of maxima and minima to solve optimization problems in a variety of applied contexts.
- Evaluate indefinite and definite integrals of polynomial, trigonometric, exponential, and logarithmic functions.
- Use integration to find the area of regions bounded by the graph of a function and the x-axis.
- Explain the components and approaches to solving basic differential equations through applications.
- Apply differentiation and integration techniques to solve applications involving the rectilinear particle motion and voltage-current-charge relations in electric circuits.

Assessment Weighting

Assessment	Weight
Quiz	20%
Instructor-Created Assessments	10%
Midterm Exam	35%
Final Exam	35%
Total	**100%**

Modules of Study

Module	Course Learning Outcomes	Resources	Assessments
Module 1: Derivatives of Algebraic Functions (Limits; the derivative; derivative of a power function; derivatives of products and quotients; derivatives of implicit relations; higher-order derivatives).	• Evaluate the limits of functions algebraically, numerically and graphically. • Find derivatives of polynomial, trigonometric, exponential, and logarithmic functions using the rules of differentiation. • Extend the differentiation technique to find higher order derivatives, derivatives of implicit relations, and differentials. • Interpret the role of a derivative as a slope of a tangent line and as a rate of change of a function.	**27-1**: 3, 5, 7, 13, 17, 21, 23, 27, 29, 33, 35, **27-2**: 3, 5, 7, 9, 11, 13, 15, 19, 21 **27-3**: 5, 7, 11, 17, 23, 33, 37, 41, 43, 45, 47, 51, 53 **27-4**: 5, 9, 13, 17, 19, 21, 25, 31 **27-5**: 3, 11, 15, 21, 29, 37, 39 **27-6**: 3, 5, 7, 13, 19, 23, 25, 27, 31 **27-7**: 1, 3, 5, 9	• Assignments • Quizzes • MT Exam • Final Exam
Module 2: Graphical Applications of the Derivative (Maximum, minimum and inflection points; sketching, verifying, and interpreting graphs).	• Sketch the graph of a function using the elements (extrema and inflection points) of calculus.	**28-2**: 1 to 19 (odd numbers) **28-3**: 1, 5, 7, 13, 21	• Assignments • Quizzes • MT Exam • Final Exam
Module 3: More Applications of the Derivative (Rate of change, rectilinear motion, application to electric circuits, optimization).	• Interpret the role of a derivative as a slope of a tangent line and as a rate of change of a function. • Use the ideas of maxima and minima to solve optimization problems in a variety of applied contexts. • Apply differentiation and integration techniques to solve applications involving the rectilinear particle motion and voltage-current-charge relations in electric circuits.	**29-1**: 1, 2, 4, 9, 11, 13, 15, 17 **29-2**: 1 to 11 (odd numbers) **29-4**: 1, 3, 5, 7, 9, 33	• Assignments • Quizzes • MT Exam • Final Exam

Module	Course Learning Outcomes	Resources	Assessments
Module 4: Derivatives of Trigonometric, Logarithmic, and Exponential Functions.	• Find derivatives of polynomial, trigonometric, exponential, and logarithmic functions using the rules of differentiation.	**33-**1: 3, 5, 9, 10, 11, 18, 23 **33-2**: 3, 7, 9, 13, 15 **33-4**: 1, 5, 11, 19, 23, 25, 28, 31, 35, 37 **33-5**: 1, 5, 7, 9, 15, 17, 25, 31, 35, 39, 41	• Assignments • Quizzes • Final Exam
Module 5: Integration (Indefinite integral; rules for finding integrals; constant of integration; definite integral; exact area under a curve).	• Evaluate indefinite and definite integrals of polynomial, trigonometric, exponential, and logarithmic functions. • Use integration to find the area of regions bounded by the graph of a function and the x-axis. • Explain the components and approaches to solving basic differential equations through applications.	**30-1**: 1, 3, 5, 9, 10, 11, 14, 18 **30-2**: 1, 3, 5, 9, 10, 12, 13, 15 **30-3**: 1, 2, 3, 4, 5 **30-4**: 1, 2, 3, 4, 5, 6 **30-6**: 1, 2, 3, 4, 5, 6	• Assignments • Quizzes • Final Exam
Module 6: Applications to motion and electric circuits.	• Apply differentiation and integration techniques to solve applications involving the rectilinear particle motion and voltage-current-charge relations in electric circuits.	**31-1**: 1, 3, 5 **31-2**: 1, 3, 5, 7, 9	• Assignments • Quizzes • Final Exam
Module 7: Methods of Integration (Integrals of exponential and logarithmic functions; integrals of trigonometric functions).	• Evaluate indefinite and definite integrals of polynomial, trigonometric, exponential, and logarithmic functions.	**34-1**: 1, 3, 7, 9, 17 **34-2**: 1, 3, 9, 11, 13, 15	• Assignments • Quizzes • Final Exam

Required Resources

Calter, P., Calter, M. A., Wraight, P. D., & White, S. A. (2016). *Technical mathematics with calculus* (3rd Cdn ed. ed.). Toronto, Ontario: Wiley.

Hardcover Book: ISBN 9781118962145 or
Binder Ready Version: ISBN 9781118962169 or
E-Text Version: ISBN 9781119272724

Additional Tools and Equipment

- Scientific Calculator: CASIO-FX991ES PLUS or CASIO-FX991 PLUS 2 (Suggested)

Essential Skills

Section	Skills	Measurement	Details
Communication	• Reading • Writing • Visual Literacy	Reinforce and measure	• communicate in professional environment though use of terminology of calculus; visualize, interpret and model relations using graphs and tools of calculus • Written assessments.
Numeracy	• Understanding and applying mathematical concepts and reasoning • Conceptualizing	Reinforce and measure	• through gradual increase in the complexity of mathematical tools and ideas, and by expanding the areas of application • Written assessments.
Critical Thinking and Problem-Solving	• Analysing • Synthesizing • Evaluating	Teach and measure	• multi-step problem solving; elements of inquiry-based learning; exploring mathematics underlying processes studied in the core technical courses • Written assessments.
Information Management	• Selecting and using appropriate tools and technology for a task or project	Teach and measure	• consistent use of technology to illuminate learning and to support computations and visualization • Written assessments.
Personal Skills	• Managing change and being flexible and adaptable	Teach and measure	• Students will learn how to manage time and effort to complete tasks. • set and enforce task deadlines

Prior Learning Assessment & Recognition (PLAR)

Prior Learning Assessment and Recognition (PLAR) is the formal evaluation and credit-granting process whereby candidates may obtain credits for prior learning. Prior learning includes the knowledge competencies and skills acquired, in both formal and informal ways, outside of post-secondary education. Candidates may have their knowledge, skills and competencies evaluated against the learning outcomes as defined in the course outline. Please review the Assessment Methods Glossary for more information on the Learning Portfolio assessment methods identified below.

The method(s) that are used to assess prior learning for this course may include:

- Challenge Exam (results recorded as a % grade and added to student's CGPA)

Please contact the Program Coordinator for more details.

Academic Regulations

It is the student's responsibility to be aware of the College Academic Regulations. The Academic Regulations apply to all applicants to Humber and all current students enrolled in any program or course offered by Humber, in any location. Information about academic appeals is found in the **Academic Regulations**.

Anti-Discrimination Statement

At Humber College, all forms of discrimination and harassment are prohibited. Students and employees have the right to study, live and work in an environment that is free from discrimination and harassment. If you need assistance on concerns related to discrimination and harassment, please contact the Centre for Human Rights, Equity and Inclusion or the Office of Student Conduct.

Accessible Learning Services

Humber strives to create a welcoming environment for all students where equity, diversity and inclusion are paramount. Accessible Learning Services facilitates equal access for students with disabilities by coordinating academic accommodations and services. Staff in Accessible Learning Services are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. If you require academic accommodations, contact:

Accessible Learning Services

North Campus: (416) 675-6622 X5090

Lakeshore Campus: (416) 675-6622 X3331

Academic Integrity

Academic integrity is essentially honesty in all academic endeavors. Academic integrity requires that students avoid all forms of academic misconduct or dishonesty, including plagiarism, cheating on tests or exams or any misrepresentation of academic accomplishment.

Disclaimer

While every effort is made by the professor/faculty to cover all material listed in the outline, the order, content, and/or evaluation may change in the event of special circumstances (e.g. time constraints due to inclement weather, sickness, college closure, technology/equipment problems or changes, etc.). In any such case, students will be given appropriate notification in writing, with approval from the Dean (or designate) of the School.

Copyright

Copyright is the exclusive legal right given to a creator to reproduce, publish, sell or distribute his/her work. All members of the Humber community are required to comply with Canadian copyright law which governs the reproduction, use and distribution of copyrighted materials. This means that the copying, use and distribution of copyright- protected materials, regardless of format, is subject to certain limits and restrictions. For example, photocopying or scanning an entire textbook is not allowed, nor is distributing a scanned book.

See the **Humber Libraries website** for additional information regarding copyright and for details on allowable limits.
