HUMBER

Course Outline

Course Name: Applied Calculus (CALC 203)

Academic Period: 2023 - 2024

Faculty:

Faculty Availability:

Associate Dean:
Mike Wells
mike.wells@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:	Applied Calculus (CALC 203)
Pre-Requisites	CALC 103
Co-Requisites	none
Equates	none
Restrictions	none
Credit Value	3
Total Course Hours	42

Developed By:	Prepared By:	Approved by:
		Mike Wells

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.


Critical Thinking


Communication


Strategic Problem-Solving

Course Description

Applied Calculus (CALC 203) reinforces and expands upon the concepts and skills learned in Introduction to Calculus (CALC 103). In this course, students will learn advanced techniques for integration, discover the first and second order differential equations and infinite series (Maclaurin, Taylor, Fourier), get a solid exposure to Laplace transforms and their use in solving differential equations. The emphasis of the course is on problem solving and applications.

Course Rationale

The intent of this course is to provide students with a precise language and advanced mathematical tools for modelling applied problems in sciences and engineering. The knowledge and skills acquired are vital for students' advancement in their core technical studies and success in their respective programs.

Course Learning Method(s)

- Socratic Method
- Lecture
- Online

Learning Outcomes

- Apply effectively the differentiation and basic integration techniques on elementary functions (algebraic, exponential, logarithmic, and trigonometric).
- Evaluate integrals using the standard techniques of integration such as integration by parts, partial fractions and trigonometric substitutions.
- Solve application problems involving definite integrals including average, and root mean square values of a function as well as electronic circuits.
- Determine convergence and divergence of infinite sequences and series.
- Find the Maclaurin series expansion of a function and use algebraic or calculus procedures on known series to obtain other series expansions.
- Construct the Fourier series expansion of a periodic function including the use of the waveform symmetries if applicable.
- Solve first-order differential equations by separation of variables.
- Solve second-order linear differential equations with constant coefficients.
- Apply the Laplace transform to solve linear differential equations with initial conditions.

Assessment Weighting

Assessment	Weight
Instructor-Created Assessments	10%

Assessment	Weight
Quiz	20%
Midterm Exam	35%
Final Exam	35%
Total	**100%**

Modules of Study

Module	Course Learning Outcomes	Resources	Assessments
Module 1: Derivatives of Algebraic, Trigonometric, Logarithmic, and Exponential Functions Review.	• Apply effectively the differentiation and basic integration techniques on elementary functions (algebraic, exponential, logarithmic, and trigonometric).	**27-3**: 17, 35, 37 **27-4:** 9, 31 **27-5:** 11, 37 **27-6:** 5, 23, 31 **27-7:** 1, 3	• MT Exam • Final Exam • Quizzes • Assignments
Module 2: Infinite Series (Convergence and divergence of infinite series; Maclaurin series; operations with power series).	• Determine convergence and divergence of infinite sequences and series. • Find the Maclaurin series expansion of a function and use algebraic or calculus procedures on known series to obtain other series expansions.	**37-1:** 1 to 13 (odd-numbers) **37-2:** 7 to 19 (odd-numbers), 25 **37-4:** 3, 7, 13, 17, 21	• MT Exam • Final Exam • Quizzes • Assignments
Module 3: Methods of Integration Review (Indefinite integral; rules for finding integrals; constant of integration; definite integral; exact area under a curve, integrals of exponential and logarithmic functions; integrals of trigonometric functions).	• Apply effectively the differentiation and basic integration techniques on elementary functions (algebraic, exponential, logarithmic, and trigonometric).	**30-1:** 3, 11, 14 **30-2:** 5, 9 **30-3:** 5, 6 **30-4:** 3, 6, 7 **30-6:** 5, 6 **34-1:** 3, 9 **34-2:** 7, 9, 11, 15	• MT Exam • Final Exam • Quizzes • Assignments
Module 4: Infinite Series (Fourier series; waveform symmetries).	• Construct the Fourier series expansion of a periodic function including the use of the waveform symmetries if applicable.	**37-5:** 1 to 9 (odd numbers) **37-6:** 1 to 15 (odd numbers)	• MT Exam • Final Exam • Quizzes • Assignments

Module	Course Learning Outcomes	Resources	Assessments
Module 5: Methods of Integration (Average and root mean square values; integration by parts; integrating rational fractions; integrating by trigonometric substitution).	• Evaluate integrals using the standard techniques of integration such as integration by parts, partial fractions and trigonometric substitutions. • Solve application problems involving definite integrals including average, and root mean square values of a function as well as electronic circuits.	**34-3:** 1 to 11 (odd numbers) **34-4:** 3, 5, 7, 11, 12, 14 **34-5:** 1, 5, 7, 9, 11, 19 **34-7:** 1 to 9 (odd numbers)	• Final Exam • Quizzes • Assignments
Module 6: Differential Equations (Definitions; first order differential equations, variables separable; series RL and RC circuits; second order differential equations; second-order differential equations with constant coefficients and right side zero; second order differential equations with right side not zero; RLC circuits).	• Solve first-order differential equations by separation of variables. • Solve second-order linear differential equations with constant coefficients.	**35-1:** 1, 3, 4, 5, 7, 9, 11, 13 **35-3:** 1, 3, 5, 7, 15, 19, 29 **35-9:** 1, 3 **35-11:** 1, 3, 5, 7, 11, 15, 19, 23, 25, 27, 29 **35-12:** 1, 3, 7, 9, 13, 17, 23 **35-13:** 9, 11	• Final Exam • Quizzes • Assignments
Module 7: Solving Differential Equations by the Laplace Transform (Laplace transform of a function; inverse transforms; solving differential equations by Laplace transform; electrical applications).	• Apply the Laplace transform to solve linear differential equations with initial conditions.	**36-1:** 1 to 23 (odd-numbers) **36-2:** 1 to 19 (odd numbers) **36-3:** 1 to 13 (odd numbers) **36-4:** 1, 2, 6, 7	• Final Exam • Quizzes • Assignments

Required Resources

Students enrolled in online sections of the course may be required to come to campus to write the tests and exams.

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-FX991ESPLUS (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 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 expanding the areas of application • Written assessments
Critical Thinking and Problem-Solving	• Analysing • Synthesizing • Evaluating	Reinforce 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	Reinforce and measure	• Students will learn how to manage time and effort to complete tasks. • Written assessments

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.

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