ORIGINAL COURSE IMPLEMENTATION DATE:	September 1993
REVISED COURSE IMPLEMENTATION DATE:	September 2026
COURSE TO BE REVIEWED (six years after UEC approval)**:**	December 2031

Course outline form version: 26/01/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 112

Number of Credits: 4 Course credit policy (105)

Course Full Title: Calculus II

Course Short Title: Calculus II

Faculty: Faculty of Science

Department (or program if no department): Mathematics & Statistics

Calendar Description:

Integral calculus of a function of one variable, in the context of elementary functions (algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic). Definition, properties, and evaluation of definite integrals, with applications to problems such as areas, volumes, and average value, numerical integration, improper integrals, an introduction to differential equations, polynomial approximations to functions, and sequences and series. Applications will frequently be contextualized within the natural and social sciences.

Prerequisites (or NONE):	MATH 111 with a C or better.
Corequisites (if applicable, or NONE):	None.
Pre/corequisites (if applicable, or NONE):	None.

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	60
Total hours	**60**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**

(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**

(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: **No**

(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	February 12, 2025
Faculty Council approval	**Date of meeting:**	September 5, 2025
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	December 19, 2025

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Building upon their knowledge of differential calculus, successful students will be able to:

1. Communicate all results and computations using rigorous notation and terminology.
2. Interpret the definite integral as an area, expressing it as a limit of Riemann sums.
3. Evaluate definite integrals using the Fundamental Theorem of Calculus in combination with other classical techniques.
4. Use definite integrals to model and solve problems in the natural and social sciences.
5. Test the convergence of improper integrals.
6. Solve separable first order differential equations.
7. Model simple real-world situations with first order differential equations.
8. Determine convergence and divergence of sequences, series, and power series.
9. Construct the power series representation of a function.
10. Demonstrate proficiency with the use of graphing technology to explore mathematical concepts.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	Assignments:	10%		%
Quizzes/tests:	50%		%		%

Details:

To pass the course, students must achieve at least 40% on the comprehensive final exam.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures are interspersed with problem sessions; Mathematical software will be incorporated by various means.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Feldman, Rechnitzer, & Yeager	CLP-2 Integral Calculus	2017
2.	Textbook	Stewart, Clegg, & Watson	Single Variable Calculus, Early Transcendentals, 9th ed. Cengage	2021
3.				
4.				
5.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Course Content and Topics

Exact course content and ordering may vary slightly from year to year but will encompass the following:

1. Integrals:

   Brief review of derivatives and antiderivatives
   a. Areas and distances
   b. Definite integrals
   c. indefinite integrals; Fundamental Theorem of Calculus
   d. approximate integration including Riemann sums, trapezoid and midpoint rules and, as time permits, Simpson's rule and/or error analysis
   e. improper integrals

2. Applications: constructing Riemann sums and evaluating integrals in a wide variety of settings, including
   a. area
   b. volume
   c. average value of a function
   d. further applications to be chosen from work, arc length, area of a surface of revolution, and other applications from the natural and social sciences

3. Techniques of Integration:
   a. integration by parts
   b. integration by substitution (including trigonometric substitutions)
   c. trigonometric integrals

   d. integration of rational functions by partial fractions

4. Differential Equations:
   a. direction fields*
   b. Euler's method*
   c. separable equations
   d. applications to growth and decay problems, including exponential, and logistic models
   e. modelling real-world situations with initial-value problems
   f. further applications, as time permits: Newton’s law of cooling and/or predator-prey systems

5. Infinite Sequences and Series:
   a. sequences and series
   b. series convergence tests (including divergence test, integral test, ratio test, alternating series test)
   c. absolute and conditional convergence
   d. power series
   e. Taylor series* and intervals of convergence
   f. polynomial approximations and, as time permits, error estimation

* While graphing software is used throughout the course, it is particularly useful in helping students explore these concepts.