UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

Mathematics 265 University Calculus I

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

Syllabus

Topic	Number of Instructional Hours
Limits: motivating examples; evaluation of limits graphically; limit laws and limits of algebraic, exponential, logarithmic and trigonometric functions; infinite limits and limits at infinity; continuity and the intermediate value theorem	8
The derivative and differentiation: motivation and examples from the natural sciences; tangent lines; differentiation laws; higher-order derivatives; implicit differentiation; inverse functions and their derivatives; logarithmic differentiation	4
Applications of differentiation: related rates; linear approximation and Newton's method; Taylor polynomials and Taylor's theorem; L'Hôpital's rule; the Mean Value theorem; critical points and intervals of increase/decrease; absolute extrema and the closed interval method; local extrema and the first derivative test; concavity, inflection points and the second derivative test; optimization problems	12
Integration: the area problem and definite integrals; antiderivatives and indefinite integrals; the Fundamental Theorem of Calculus; the substitution method; improper integrals; area between curves (time-permitting); volumes and surfaces of revolution (time-permitting)	10
Introduction to functions of several variables (time-permitting): domains and level curves; partial derivatives	2
	Total Hours: 36

Course Outcomes

Overview. This course is the first course in the university calculus stream. We shall study the fundamental concepts and build the basic skills of Calculus. Specifically, by the end of this course students should be able to

1. use the language and notion of differential calculus, and apply the key concepts to compute derivatives of functions of a real variable.

2. explore the relationship between key calculus concepts and their geometric representation, and seek to apply calculus techniques to a wide variety of practical problems.

3. recognize that not only the technology can be used to achieve some desired results; but it also has limitations.

Subject specific knowledge.

4. **Mathematical Literacy.** This includes the fluent reading, manipulation, and graphic interpretation of algebraic expressions and functions.

5. **The concept of Limit.** Students will gain an intuition of the concept of limit, and acquire a basic level of mathematical literacy on limits and their computations.

6. **The concept of Derivative.** Students will be to associate the concept of differentiation with rates of change, and they will be able to compute and manipulate derivatives.

7. **Applications of Derivatives.** Students will be able to analyze the shape of functions through their derivatives. Students will use derivatives to solve a variety of applied problems, including optimization problems.

8. **The Riemann Integral.** Students will explore the process of estimating areas under a curve, develop the notion of integral, and compute basic integrals. Students will be able to demonstrate the fundamental relations between the processes of integration and differentiation.