

CURRICULUM GUIDE: OFFICIAL COURSE OUTLINE

Course Code	MATH 151	Course Title	Calculus I			
Credit Value	3	Department	Mathematics and Science			
No. of weeks	14	Hrs. per week	<i>Lecture</i>	<i>Tutorial</i>	<i>Laboratory</i>	<i>Total</i>
			4	0	0	4
Course Description	<p>Functions and graphs, conic sections, limits and continuity, derivatives, techniques and applications of differentiation, trigonometric functions, logarithms and exponentials, extrema, the mean value theorem and polar coordinates.</p> <p><i>Note: Students with credit for MATH 104 may not take MATH 151 for further credit.</i></p>					
Prerequisite(s)	ENGL 088 (formerly EASL 089/ENGL 097), MATH 12 (B) or MATH 100 (C)					
Initial Articulation Targets	<i>UBC</i>	<i>SFU</i>	<i>UVic</i>	<i>UNBC</i>	<i>TRU</i>	
	MATH 100 (3)	MATH 151 (3) – Q	MATH 100 (1.5)	MATH 100 (3)	MATH 1140 (3)	
	For updated information on the transferability of this course, please consult the BC Transfer Guide, www.bctransferguide.ca					
Learning Outcomes	<p>Upon successful completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> • Show an understanding of the concept of ‘limit of a function’ and find the limits of various functions using appropriate techniques including l’Hospital’s rule. • Show an understanding of the concept of ‘continuity of a function’ and determine intervals of continuity for a given function. • Interpret the derivative of a function at a point as the instantaneous rate of change, and as the slope of the tangent line. • Use appropriate differentiation rules and techniques (including chain rules and implicit differentiation) to differentiate various functions (algebraic, exponential, logarithmic, trigonometric and inverse trigonometric). • Use the first and second derivatives to analyze and sketch the graph of a function, including determining intervals where the graph is increasing, decreasing, constant, concave up or concave down and finding any relative extrema or inflection points. • Understand and apply the Rolle’s Theorem, the Mean Value Theorem and the Intermediate Value Theorem. • Solve problems relating to linear approximations, Newton’s Method, optimization, related rates, and growth and decay by calculating derivatives. • Convert between algebraic and parametric expressions for functions in simple cases. • Graph and differentiate functions in parametric and polar forms. 					



	<ul style="list-style-type: none">• Compute antiderivatives of basic functions and apply them to velocity and acceleration problems.
Content	<p>Core topics – all of the following will be covered:</p> <p>Functions and Models</p> <ul style="list-style-type: none">• Four ways to represent a function• Mathematical models: essential functions• New functions from old functions• Exponential functions• Inverse functions and logarithms <p>Limits and Derivatives</p> <ul style="list-style-type: none">• Tangent and Velocity Problems• Limit of a function• Calculating limits using the limit laws• Precise definition of a limit• Continuity• Limits at infinity, horizontal asymptotes• Tangents, velocities, and other rates of change• Derivatives• Derivative as a function <p>Differentiation Rules</p> <ul style="list-style-type: none">• Derivatives of Polynomials and exponential functions• Product and quotient rules• Rates of change in the natural and social sciences• Derivatives of trigonometric functions• The chain rule• Implicit differentiation• Higher derivatives• Derivatives of logarithmic functions• Hyperbolic functions• Related rates• Linear approximations and differentials <p>Applications of Differentiation</p> <ul style="list-style-type: none">• Maximum and minimum values• The mean value theorem• How derivatives affect the shape of a graph• Indeterminate forms and l'Hospital's Rule• Summary of curve sketching• Optimization problems• Newton's method



	<ul style="list-style-type: none"> • Antiderivatives <p>Differential Equations</p> <ul style="list-style-type: none"> • Exponential growth and decay <p>Parametric Equations and Polar Coordinates</p> <ul style="list-style-type: none"> • Curves defined by parametric equations • Calculus with parametric curves • Polar coordinates • Conic sections • Conic sections in polar coordinates <p>Additional topics may also be covered, at the discretion of the instructor.</p>		
Methods of Instruction	Lectures, tutorial, problem sessions, group work		
Required Textbook(s)	<p>The following textbook(s) is/are required, or approved equivalent(s).</p> <p>Strang, Gilbert and Edwin Herman. Calculus Volume 1. OpenStax, 2022.</p>		
Required Equipment and Technology	<p>Students are required to have a computer with internet access.</p> <p>The following resources are provided by the College:</p> <ul style="list-style-type: none"> • Office 365 • Student email 		
Homework Hours	At minimum, students can expect one hour of homework for every hour of instructional time.		
Evaluation	<i>Component</i>	<i>% Value</i>	
	Assignments, in-class activities, participation	10-30%	
	Quizzes (weekly, biweekly, module, chapter)	10-30%	
	Midterm examination(s) Final examination	20-30%	30-35%
Completion Requirements	The minimum grade to pass this course is D (50%). Unless otherwise stated, a minimum grade of C- (55%) is required for this course to fulfil a prerequisite.		
Course Designer(s)	Len Berggren, Ph.D., Department of Mathematics, Simon Fraser University	Consultant(s), if applicable	
Dean's Approval	Barbara Moon, Ph.D., Dean of Arts and Sciences, Alexander College	Dean's Approval Date	September 27, 2006
Curriculum Committee Approval Date	September 27, 2006	First Term Offered	Winter 2007



Last Review Date	March 1, 2023	Next Review Date	March 1, 2028
Revision History	May 1, 2014-All MATH and STAT courses will be 4 hours, commencing Fall 2014, per SASC. January 5, 2015-Revision by Len Berggren, Mathematics faculty March 1, 2023-Minor updates (e.g., assessment ranges, textbooks) by Kelly Cheung and Krishna Subedi		