Course Outline

Our Vision: Rooted in our communities, we will be a globally recognized college delivering innovative learning opportunities and preparing career-ready graduates to be leaders in their fields.

Mission: We are dedicated to student success, academic excellence, and leadership in our communities.

Land Acknowledgement: St. Lawrence College is situated on the traditional lands of the Haudenosaunee and Anishinaabe People. May we always be grateful to live and learn on these lands.

Basic Calculus

Course Information

Course Code: MATH 20

Program(s): Civil Engineering Technology, Instrumentation and Control Technology

Grade Type: Graded: Yes G/NG:

Credit Weight: 3.0

Total Course Hours: 42

Hours by Instructional Environment: Class: 42 Lab: Field: Other:

Pre-requisite(s): MATH 18

Co-Requisite(s): None

Course Equivalencies: N/A

PLAR: Other

Experiential Learning: N/A

Sustainability Development: N/A

Campus Dean/Associate Dean Signature of Approval: Brad Bankeau

Effective Date: Fall 2024

Course Description

In this course students study techniques and applications of calculus in preparation for use in the field. Students develop and practice algebra skills using several methods of differentiation and integration that they can employ in the industry. Topics include geometric series, limits, and trigonometric identities.

Course Learning Outcomes

At the conclusion of this course, learners will be able to:

Ontario Qualifications Framework Category	Course Learning Outcomes
Depth and Breadth of Knowledge	1. Calculate derivatives and integrals of common engineering functions.
Knowledge of Methodologies	2. Evaluate sums of arithmetic and geometric series. 3. Evaluate limits of mathematical expressions. 4. Evaluate derivatives by the delta-process and the rules of differentiation. 5. Evaluate indefinite and definite integrals.
Application of Knowledge	6. Solve engineering application problems using differentiation and integration. 7. Apply the language of mathematics to problems in science, specifically engineering.
Communication Skills	8. Communicate technical procedures and mathematical solutions.
Awareness of the Limits of Knowledge	9. Recognize when to use assistance, collaboration, and technology to solve math problems, in particular, non-linear equations and the need for numerical approaches.
Professional Capacity/Autonomy	10. Allocate time and resources efficiently to meet deadlines and achieve desired outcomes in a professional setting.

Relationship to Vocational /Program Specific Learning Outcomes

It is expected that all of the approved provincial outcomes (or those approved in the program proposal) will be achieved during the program. This course contributes to learning by supporting the achievement of the following identified (X) vocational/program learning outcomes:

#	VLO/PLO Description – Civil Engineering Technology	Assessed
1	Develop and use strategies to enhance professional growth and ongoing learning in the civil engineering field.	
2	Comply with workplace health and safety practices and procedures in accordance with current legislation and regulations.	
3	Complete duties and assist in monitoring work that is performed in compliance with contractual obligations, applicable laws, standards, bylaws, codes, and ethical practices in the civil engineering field.	
4	Promote and carry out sustainable practices in accordance with contract documents, industry standards and environmental legislative requirements.	
5	Facilitate the collaboration and interaction among the project team and project stakeholders to support civil engineering projects.	
6	Collect, process, analyze, and coordinate technical data to produce written and graphical project-related documents.	X

7	Use industry-specific electronic and digital technologies to support civil engineering projects.	X
8	Participate in the design and modeling phase of civil engineering projects by applying engineering concepts, technical mathematics, and principles of science to the review, production and/or modification of project plans.	X
9	Contribute to the scheduling and coordination and cost estimation of civil engineering projects and monitor their progression by applying principles of construction project management.	
10	Coordinate and perform quality control testing and evaluate equipment, materials and methods used in the implementation and completion of civil engineering projects.	
11	Apply teamwork, leadership, supervision, and interpersonal skills when working individually or within multidisciplinary teams to complete civil engineering projects.	

Table 1: Any VLO/PLO that is associated with this course must also be assessed.

Essential Employability Skills

It is expected that all 11 of the Essential Employability Skills will be addressed during the certificate, diploma, and advanced diploma programs. This course contributes to learning by providing assessed feedback on the following identified (X) essential employability skills.

Type/Category	#	EES Description	Assessed
Communication	1	Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.	
	2	Respond to written, spoken, or visual messages in a manner that ensures effective communication.	
Numeracy	3	Execute mathematical operations accurately.	X
Critical Thinking and Problem Solving	4	Apply a systematic approach to solve problems.	X
	5	Use a variety of thinking skills to anticipate and solve problems.	X
Information Management	6	Locate, select, organize, and document information using appropriate technology and information systems.	
	7	Analyze, evaluate, and apply relevant information from a variety of sources.	
Interpersonal	8	Show respect for the diverse opinions, values, belief systems, and contributions to others.	
	9	Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.	X
Personal	10	Manage the use of time and other resources to complete projects.	
	11	Take responsibility for one's own actions, decisions, and consequences.	

Table 2: Any EES that is associated with this course must also be assessed.

Course Learning Modules

The course will feature the following modules:

Module Title	Module Topic(s)	CLO*	Learning Experiences	Resources
Sequences and Series	Arithmetic series Geometric series Binomial theorem	1-2, 7-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard
Introduction to Calculus	Mathematical limits to functions concept of slope Concept of area under the curve	1, 3, 7-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard
Derivatives	Definition of a derivative Derive the derivative for: $y=ax^n$ (polynomial form) $y=a^x$ (exponential form) y=sin(x) (trigonometry form) Rules of differentiation Product rule Quotient rule Chain rule	1, 3-4, 7-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard
Derivatives	Application of derivatives Tangents and normal functions Max/min problems Applied word problems Higher order derivatives	1, 4, 6-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard
Anti-Derivative (integral)	Definition Indefinite integrals Polynomial form Exponential form Trigonometric form Rules of integration Substitution By parts	1, 5, 7-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard

Module Title	Module Topic(s)	CLO*	Learning Experiences	Resources
Anti-Derivative	Definite integrals Applied word problems	1, 5-8, 10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard
Numerical methods	Approximation to functions Taylor series approximation Approximation to areas under the curve Trapezoid rule	1, 6-10	Direct Instruction Demonstrations Hands-on practice	Materials available in Blackboard

**CLO: Course Learning Outcome*

Assessment Plan

Students will demonstrate learning in the following diverse ways:

Assessment Type	CLO*	VLO/PLO**	Description (e.g. format) as applicable
Assignment	1-8	6-8	Students will showcase their knowledge of various modular concepts.
Knowledge Checks	1-8	6-8	Students will complete an individual knowledge check (quiz, test, exam, etc.) working within a specific time frame (instructor determined – in-class) to demonstrate concepts.
Project	1-10	6-8	Students will develop an excel file numerically solve a non-linear differential equation related to their specific engineering field.

**CLO: Course Learning Outcome; **VLO/PLO: Vocational Learning Outcome / Program Learning Outcome – refer to previous sections for more details.*

College Policies and Procedures

It is important for learners to familiarize themselves with the Academic Policy Manual[1]. This manual contains information on College Policies and Procedures relating to the following:

- Rights and Responsibilities of Students
- Student Academic Appeal Procedure
- Grading/Assessment Description
- Progression Policy
- Program Specific Continuance and Readmission Policy
- Prior Learning and Assessment Recognition (PLAR)
- Attendance and Participation
- Acceptable Use Policy for Computing

Academic Accommodations

St. Lawrence College is committed to creating a welcoming, barrier-free, inclusive learning environment, promoting integration and full participation. This commitment to Universal Design for Learning applies to all instructional settings (e.g., classroom, laboratory, online, placement, etc.), as well as to attitudinal beliefs. It is the policy of SLC to accommodate students with disabilities, ensuring equitable access to and benefits from educational opportunities, in accordance with the Ontario Human Rights Code.

The accommodation process is a shared responsibility. Students with disabilities seeking accommodations are asked to self-identify with Student Wellness & Accessibility[2] as early as possible to ensure timely development and implementation of appropriate accommodations.

Under provincial legislation, students are not required to provide diagnosis information, but rather, may be asked to provide information from a regulated health professional regarding functional limitations and accommodation needs, in order to provide appropriate supports. To maintain student privacy, this information is provided directly to Student Wellness & Accessibility. Once accommodation needs are determined, a member of the Student Wellness & Accessibility team will distribute an Accommodation Letter on your behalf electronically to all Professors identified within your academic schedule.

Amended: March 2023

Use of Electronic Devices

The use of electronic devices used for communications and data storage during classes is at the discretion of the course professor. The professor identifies his/her policy on this under the Special Notes about this course section.

[1]https://www.stlawrencecollege.ca/about/college-reports-and-policies/academic-policies/

[2] https://www.stlawrencecollege.ca/campuses-and-services/services-and-facilities/student-wellness-and-accessibility/

Email Account

All full-time students are provided with a St. Lawrence College email account. This is the only account that will be used by the college or your professors to communicate course or program information or college events. It is the responsibility of each learner to become familiar with and use the college email system.

Grading System

The grading scheme is applicable to all graded courses at St. Lawrence College. All final grade submissions will be numeric representing a percentage score between 0 and 100 and will be converted to letter grades automatically by the student records system, as noted in the Academic Policy Manual[3].

Maintaining Records

Learners are responsible for retaining the course outline and the current Academic Policy Manual for their records. It may be required for future use of applications for transfer credit to other programs or educational institutions.

[3] https://www.stlawrencecollege.ca/about/college-reports-and-policies/academic-policies/