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.

Technical Mathematics with Calculus

Course Information

Course Code: Math 7
Program(s): Energy Systems Engineering Technology/Energy Systems Engineering Technician/Instrumentation and Control Engineering Technology/Instrumentation and Control Engineering Technician
Credit Weight: 4
Total Course Hours: 56
Hours by Instructional Environment: Lecture: 56 Lab: n/a Field: n/a
Pre-requisite(s): Math 2
Co-Requisite(s): n/a
PLAR: Other
Experiential Learning: n/a
Sustainability Development: n/a
Campus Dean/Associate Dean Signature of Approval: _____
Effective Date: Winter 2024

Course Description

In this course, students learn about vectors and the complex number system. Learners explore basic statistics and differential and integral calculus. Students manipulate and solve exponential and logarithmic functions.

Course Learning Outcomes

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

Ontario Qualifications Framework Category	Course Learning Outcomes
Depth and Breadth of Knowledge	1. Identify key elements required to complete various technical energy operations.
Knowledge of Methodologies	2. Apply differential calculus techniques to solve applied technical problems. 3. Analyze data using statistical methods
Application of Knowledge	4. Solve exponential and logarithmic equations. 5. Perform calculations with complex numbers in rectangular and polar forms. 6. Calculate indefinite and definite integrals using methods of integration to solve technical problems. 7. Model data using statistical methods
Communication Skills	8. Communicate technical procedures and mathematical solutions effectively.
Awareness of the Limits of Knowledge	9. Identify areas in need of investigation to solve equations and use statistical and mathematical methods.
Professional Capacity/Autonomy	10. Seek advice and assistance during learning process. 11. Manage time and resources to achieve course objectives.

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 your program. This course contributes to your learning by supporting you in achieving the following identified vocational/program learning outcomes:

Energy Systems Engineering Technology

#	VLO/PLO Description	Assessed
1	Collect, analyze and interpret data to determine the energy usage of residential, commercial and institutional facilities.	X
2	Contribute to the selection, design, installation, maintenance and assessment of commercially available sustainable energy systems for residential, commercial and institutional facilities.	X
3	Summarize and report, through effective written and verbal communication to clients or supervisors, the findings of building energy audits and energy system designs.	X
4	Recommend retrofits to buildings and sustainable energy systems based on performance, economic analysis and energy auditing.	X
5	Contribute to the selection, design, installation, maintenance and assessment of conventional energy systems for residential, commercial and institutional facilities.	X

#	VLO/PLO Description	Assessed
6	Articulate the underlying principles of operation of energy systems for colleagues, customers and project team leaders.	
7	Apply relevant legislation, policies, standards, regulations, and best practices to the field of energy systems.	
8	Communicate detailed results of the design and analysis process to a broad audience.	
9	Use industry specific software to achieve optimal design of sustainable energy systems.	
10	Perform whole-building energy simulations, including economic analysis, on new and existing facilities.	
11	Apply project management principles to contribute to the planning, implementation and evaluation of projects.	
12	Recommend wired and wireless control and data acquisition strategies and technologies to enable effective energy management.	
13	Perform effectively as a member of an engineering team and contribute to the success of the team by applying self-management and interpersonal skills.	

Energy Systems Engineering Technician

#	VLO/PLO Description	Assessed
1	Collect, analyze and interpret data to determine the energy usage of residential, commercial and institutional facilities.	X
2	Contribute to the selection, design, installation, maintenance and assessment of commercially available sustainable energy systems for residential, commercial and institutional facilities.	X
3	Summarize and report, through effective written and verbal communication to clients or supervisors, the findings of building energy audits and energy system designs.	X
4	Recommend retrofits to buildings and sustainable energy systems based on performance, economic analysis and energy auditing.	X
5	Contribute to the selection, design, installation, maintenance and assessment of conventional energy systems for residential, commercial and institutional facilities.	X
6	Articulate the underlying principles of operation of energy systems for colleagues, customers and project team leaders.	
7	Apply relevant legislation, policies, standards, regulations, and best practices to the field of energy systems.	

Instrumentation and Control Engineering Technology

#	VLO/PLO Description	Assessed
1	Comply with and monitor health and safety practices and procedures in accordance with current legislation, regulations and organizational policy.	

#	VLO/PLO Description	Assessed
2	Select, install, calibrate, troubleshoot, analyze and redefine equipment used in the measurement and control of process parameters.	
3	Contribute to the design and specification of process control components and systems, and select and install components to conform to system specifications and related safety requirements.	
4	Contribute to the design, configuration and modification of electronic and computer-based controllers to optimize the performance of process control systems.	
5	Analyze and solve complex technical problems associated with wireless and wired control systems applying mathematical, scientific, electrical, electronic, and digital principles.	X
6	Co-ordinate and supervise the installation and commissioning of a control system as a member of a multi-disciplinary team.	
7	Work in compliance with relevant industry standards, codes, policies and procedures.	
8	Analyze, prepare and present documentation, technical and technology reports and engineering drawings for instrumentation and process control* systems that conform to industry standards.	
9	Develop strategies for ongoing professional development to enhance work performance as an instrumentation and control* engineering technologist.	

Instrumentation and Control Engineering Technician

#	VLO/PLO Description	Assessed
1	Comply with current health and safety legislation and regulations, as well as organizational practices and procedures.	
2	Select, install, calibrate and troubleshoot equipment used in the measurement and control of process parameters.	
3	Select and install components to conform to instrumentation and process control system specifications and related safety requirements.	
4	Operate and configure electronic and computer-based controllers to optimize the performance of process control systems.	
5	Repair and maintain wireless and wired control system components applying basic electrical, electronic and digital principles to the operating systems and firmware.	X
6	Assist with the installation of a control system as a member of a multidisciplinary team.	
7	Work in compliance with relevant industry standards, codes, policies and procedures.	
8	Prepare documentation, technical reports and drawings for instrumentation and process control systems that conform to industry standards.	
9	Develop strategies for ongoing professional development to enhance work performance as an instrumentation and control* engineering technician.	

Essential Employability Skills

It is expected that all 11 of the Essential Employability Skills will be acquired during certificate, diploma, and advanced diploma programs. This course contributes to your learning by providing assessed feedback on the following 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.	X
	2	Respond to written, spoken, or visual messages in a manner that ensures effective communication.	X
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.	
Personal	10	Manage the use of time and other resources to complete projects.	
	11	Take responsibility for one's own actions, decisions, and consequences.	

Resources

Required Resources

A scientific calculator is required in this course. (Example: Casio FX-991 MS)

Learning Modules

The course will feature the following modules:

Module Title	Module Topic(s)	CLO*	Learning Experiences	Resources
Complex Numbers	- Components of Vectors - Basic Operations with Complex Numbers - Products, Quotients, Powers and Roots of Complex Numbers	1, 5, 8-11	Guided notes and examples, discussion, practice problems	• Blackboard • Textbook • Class Notes
Logarithms	- Examine the characteristics and graphing of exponential functions - Use the logarithmic form of exponential equations - Use the properties of logarithms to change the form of expressions - Solve exponential and logarithmic equations	1, 4, 8-11	Guided notes and examples, discussion, practice problems	• Blackboard • Textbook • Class Notes
Statistics	- Interpret measures of central tendency and dispersion - Solve problems using probability rules - Model data using statistical methods	1, 3, 7-11	Guided notes and examples, discussion, practice problems	• Blackboard • Textbook • Class Notes
Differential Calculus	- Limits - The Slope of a Tangent to a Curve and Definition of the Derivative - The Derivative of a Power of a Function Derivatives of Products and Quotients - Optimization Problems and Related Rates	1, 2, 6, 8-11	Guided notes and examples, discussion, practice problems	• Blackboard • Textbook • Class Notes

Module Title	Module Topic(s)	CLO*	Learning Experiences	Resources
Integral Calculus	- Anti-derivatives - The Area Under a Curve - The Indefinite and Definite Integral - Technical Applications of Calculus	1, 6, 8-11	Guided notes and examples, discussion, practice problems	• Blackboard • Textbook • Class Notes

**CLO: Course Learning Outcome*

Assessment Plan

Students will demonstrate learning in the following ways:

Assessment Type	CLO*	VLO/PLO**	Description (e.g. Frequency, format)
Self-Assessment	1-11	ESET: 1-5 ICET: 5	Take home assessments completed on a regular basis for the student to reflect and improve upon throughout the course
Knowledge-Check	1-11	ESET: 1-5 ICET: 5	Written in-class assessments performed prior to summative assessments to ensure students are understanding the course material
Summative Assessments	1-11	ESET: 1-5 ICET: 5	Culminating performance evaluations for each module

**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 students 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
- Continuance 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. 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: April 2020

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/