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.

Technical Mathematics

Course Information

Course Code: MATH 1004

Program(s): Electrical Engineering Technician, Energy Systems Engineering Technician/Technology, Instrumentation and Control Engineering Technician/Technology, and Wind Turbine Technician

Grade Type: Graded: Yes G/NG:

Credit Weight: 3.0

Total Course Hours: 42

Hours by Instructional Environment: Class: 28 Lab: 14 Field: Other:

Pre-requisite(s): None

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 Barkman

Effective Date: Fall 2024

Course Description

This course covers the core principles and operations of algebra and trigonometry, including linear, quadratic, and trigonometric functions, graphs, and equations. Emphasis is placed on developing fluency and conceptual understanding through practice, preparing students for further studies in applied mathematics, fostering both fluency and conceptual depth through interactive learning experiences.

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. Apply algebraic skills to manipulate technical formulas used commonly in the engineering field.
Knowledge of Methodologies	2. Perform calculations with algebraic expressions and solve equations using common methods. 3. Use trigonometric functions to solve applied problems using right angle triangles. 4. Solve systems of linear equations using substitution.
Application of Knowledge	5. Apply the language of mathematics to problems in science, specifically engineering.
Communication Skills	6. Communicate technical procedures and mathematical solutions effectively.
Awareness of the Limits of Knowledge	7. Recognize when to use assistance, collaboration, and technology to solve math problems, in particular, non-linear equations with their respective difficulty and the need for numerical approaches.
Professional Capacity/Autonomy	8. 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**.** *****See appendix for the vocational/program learning outcomes assessed in this course by program.***

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.	
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.	

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

Numbers	• Types of numbers
	  ○ Integers
	  ○ Fractions
	  ○ Decimals
	• Scientific notation
	• Precision calculations
		1, 6	Direct instruction
			Demonstration
			Hands-on practice
				Materials available on Blackboard

Units	• Unit conversion from traditional and unconventional units	1, 3, 6	Direct instruction Demonstration Hands-on practice Lab exercises	Materials available on Blackboard MS Excel
Trigonometry	• Scalar and vectors • Definitions of trigonometric functions • Degrees and radians • Right angle triangle	1, 2, 6	Direct instruction Demonstration Hands-on practice Lab exercises	Materials available on Blackboard MS Excel
Algebra	• The BEDMAS system • Introduction of variables • Operations with algebraic expressions • Equations and formulas • Introduction of functions and notation	1, 2, 6	Direct instruction Demonstration Hands-on practice Lab exercises	Materials available on Blackboard MS Excel

2-Variable Algebra	• Solving sets of equations
	  ○ Substitution method
	  ○ elimination method
	  ○ matrix method
		1, 4, 6, 7	Direct instruction
			Demonstration
			Hands-on practice
			Lab exercises
				Materials available on Blackboard
				MS Excel

Module Title	Module Topic(s)	CLO*	Learning Experiences	Resources
Graphing	• Plotting • 2 variables • Coordinates • Figure formatting	1, 4, 6, 7	Direct instruction Demonstration Hands-on practice Lab exercises	Materials available on Blackboard MS Excel

**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
Assignments	1-6		Students will showcase their knowledge of technical mathematics.
Knowledge Checks	1-6		Students will be tested on modular concepts using knowledge checks such as quizzes, tests, exams, etc.
Computer Labs	1-6, 8		Students will complete various excel projects focusing on modular concepts.

**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/

Appendix

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:

Electrical Engineering Technician		
#	**VLO/PLO Description**	**Assessed**
1	Interpret and produce electrical and electronics drawings including other related documents and graphics.	
2	Analyze and solve routine technical problems related to electrical systems by applying mathematics and science principles.	X
3	Use, verify, and maintain instrumentation equipment and systems.	
4	Assemble, test, modify and maintain electrical circuits and equipment to fulfill requirements and specifications under the supervision of a qualified person.	
5	Install and troubleshoot static and rotating electrical machines and associated control systems under the supervision of a qualified person.	
6	Verify acceptable functionality and apply troubleshooting techniques for electrical and electronic circuits, components, equipment, and systems under the supervision of a qualified person.	
7	Analyze, assemble and troubleshoot control systems under the supervision of a qualified person.	
8	Use computer skills and tools to solve routine electrical related problems.	
9	Assist in creating and conducting quality assurance procedures under the supervision of a qualified person.	
10	Prepare and maintain records and documentation systems.	
11	Install, test and troubleshoot telecommunication systems under the supervision of a qualified person.	
12	Apply health and safety standards and best practices to workplaces.	
13	Perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.	
14	Grounding and bonding requirements for a variety of applications under the supervision of a qualified person.	
15	Assist in commissioning, testing and troubleshooting electrical power systems under the supervision of a qualified person.	
16	Select electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.	
17	Apply project management principles to assist in the implementation of projects.	

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

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.	
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.	
5	Contribute to the selection, design, installation, maintenance and assessment of conventional energy systems for residential, commercial and institutional facilities.	
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.	

Table 2: Any VLO/PLO that is associated with this course must also be assessed.

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.	
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.	
5	Contribute to the selection, design, installation, maintenance and assessment of conventional energy systems for residential, commercial and institutional facilities.	
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.	

Table 3: Any VLO/PLO that is associated with this course must also be assessed.

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.	
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.	

Table 4: Any VLO/PLO that is associated with this course must also be assessed.

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.	
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.	

Table 5: Any VLO/PLO that is associated with this course must also be assessed.

Wind Turbine Technician		
#	**VLO/PLO Description**	**Assessed**
1	Assemble, analyze, and appropriately apply engineering data from existing graphics, reports and other documents.	X
2	Verify acceptable function of and use a variety of troubleshooting techniques to identify problems with electrical and mechanical components of wind turbines, following established procedures.	
3	Use, calibrate and maintain test equipment.	
4	Recognize the environmental, economic, legal and ethical implications of wind energy plants.	
5	Apply safety procedures and use personal protective equipment in all aspects of work related to wind turbines.	
6	Use and maintain documentation, inventory, and records systems.	
7	Conduct quality control and quality assurance procedures.	
8	Disassemble, assemble, and commission electrical circuits and mechanical components and systems.	

Table 6: Any VLO/PLO that is associated with this course must also be assessed.

Electrical Techniques Certificate		
#	**VLO/PLO Description**	**Assessed**
1	Assist in the interpretation and preparation of electrical drawings including other related documents and graphics.	
2	Analyze and solve simple technical problems related to basic electrical systems by applying mathematics and science principles.	X
3	Use and maintain test and instrumentation equipment.	
4	Assemble basic electrical circuits and equipment to fulfill requirements and specifications under the supervision of a qualified person.	
5	Assist in the installation and troubleshooting of basic electrical machines and associated control systems under the supervision of a qualified person.	
6	Assist in testing and troubleshooting electrical and electronic circuits, equipment, and systems by using established procedures under the supervision of a qualified person.	

7	Assist in the troubleshooting of control systems under the supervision of a qualified person.	
8	Use computer skills and tools to solve basic electrical related problems.	
9	Assist in conducting quality assurance procedures under the supervision of a qualified person.	
10	Assist in the preparation and maintenance of records and documentation systems.	
11	Install and assist in testing telecommunication systems under the supervision of a qualified person.	
12	Apply health and safety standards and best practices to workplaces.	
13	Perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.	
14	Apply basic electrical cabling requirements and install and test system grounding for a specified number of applications under the supervision of a qualified person.	
15	Identify problems and troubleshoot electrical systems under the supervision of a qualified person.	
16	Assist in the selection of electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.	

Table 7: Any VLO/PLO that is associated with this course must also be assessed.