Area of Interest: Engineering and Architecture

**Electrical Engineering Technology (Co-op)**

Ontario College Advanced Diploma                  Academic Year: 2019/2020
3 Years                                            Program Code: 0318X01FWO
Ottawa Campus

**Our Program**

*Advance your skillsets for a career in the electrical engineering technology field.*

In the Electrical Engineering Technology Ontario College Advanced Diploma program, you use state-of-the-art facilities to gain the knowledge and experience necessary to enter the electrical engineering field. This program is the continuation of the Electrical Engineering Technician program, and is open to students who already have an Algonquin College Electrical Engineering Technician Ontario College Diploma and meet the admission requirements.

Through a series of theory courses and extensive practical labs, you learn skills specific to becoming an Electrical Engineering Technologist. You expand your knowledge base of the following:

- electrical principles
- codes
- circuitry
- industrial control systems
- computer applications
- machinery
- AutoCAD
- telecommunications
- electronics
- instrumentation and robotics

Apply your knowledge and skills with an optional paid co-op work placement. During your co-op, you network with industry professionals and gain work experience that better prepares you for a career.

Electives during this program help you specialize in either automation or utilities.

OACETT (Ontario Association of Certified Engineering Technicians and Technologists) recognizes this program as meeting the academic requirements for certification in the Certified Technician (C.Tech) category. While a student, you are encouraged to register as an Associate member of OACETT.

Upon graduation, you may find employment in many different areas of the Electrical Engineering Technology field. You may have titles such as:

- electrical designer
- electrical technologist
- electrical engineering technologist
• AutoCAD draftsperson
• project estimator
• control system designer
• instrumentation & controls (I&C) technologist
• building automation engineering technologist
• telecommunication quality assurance technologist

SUCCESS FACTORS

This program is well-suited for students who:

• Enjoy applying physical and chemical laws and practising logic to find solutions to physical problems.
• Seek variety and opportunity in their career.
• Have strong observational and analytical skills.
• Enjoy working on multidisciplinary projects.

Employment

Graduates may find employment in the following areas: design and testing, manufacturing, installation and/or supervision, diagnostics and analysis of electrical, communication, utilities, and fire protection equipment and systems.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

• Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics.
• Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles.
• Design, use, verify, and maintain instrumentation equipment and systems.
• Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person.
• Commission and troubleshoot static and rotating electrical machines and associated control systems under the supervision of a qualified person.
• Design, assemble, analyze, and troubleshoot electrical and electronic circuits, components, equipment and systems under the supervision of a qualified person.
• Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person.
• Use computer skills and tools to solve a range of electrical related problems.
• Create, conduct and recommend modifications to quality assurance-procedures under the supervision of a qualified person.
• Prepare reports and maintain records and documentation systems.
• Design, install, test, commission and troubleshoot telecommunication systems under the supervision of a qualified person.
• Apply and monitor health and safety standards and best practices to workplaces.
• Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations and ethical principles.

• Configure installation and apply electrical cabling requirements and system grounding and bonding requirements for a variety of applications under the supervision of a qualified person.

• Design, commission, test and troubleshoot electrical power systems under the supervision of a qualified person.

• Select and recommend electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.

• Apply project management principles to contribute to the planning, implementation, and evaluation of projects.

• Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

Program of Study

<table>
<thead>
<tr>
<th>Level: 01</th>
<th>Courses</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>DAT8942</td>
<td>Computer Applications - Electrical</td>
<td>42.0</td>
</tr>
<tr>
<td>ELE8909</td>
<td>Electrical Principles I</td>
<td>84.0</td>
</tr>
<tr>
<td>ELE8913</td>
<td>Codes and Regulations</td>
<td>42.0</td>
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<td>ELE8919</td>
<td>Achieving Success in the 21st Century</td>
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<td>ENL1813T</td>
<td>Communications I</td>
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<td>MAT8100</td>
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<tr>
<td>DAT8921</td>
<td>Introduction to Programming</td>
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<tr>
<td>ELE8921</td>
<td>Electromagnetic Control</td>
<td>70.0</td>
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<tr>
<td>ELE8922A</td>
<td>Electrical Principles - II</td>
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<tr>
<td>ELE8923</td>
<td>Electrical Machinery</td>
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<tr>
<td>PHY8201</td>
<td>Environmental Impact of Technology</td>
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<tr>
<td>WKT2101E</td>
<td>Co-op Work Term Electrical</td>
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<th>Courses</th>
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<tbody>
<tr>
<td>ELE8930</td>
<td>Power Electronics</td>
<td>98.0</td>
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<tr>
<td>ELE8932</td>
<td>Programmable Controllers</td>
<td>84.0</td>
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<tr>
<td>ELE8944</td>
<td>Building Electrical Systems with AutoCAD</td>
<td>56.0</td>
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<tr>
<td>MAT8101</td>
<td>Differential Calculus</td>
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Choose one from equivalencies: Courses

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<tr>
<td>ELE8931</td>
<td>Industrial Instrumentation</td>
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<tr>
<td>ELE8940</td>
<td>Industrial Telecommunications</td>
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<tr>
<td>ELE8941</td>
<td>Robotics and Controls</td>
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<tr>
<td>ELE8949</td>
<td>Project Management for Electrical Engineering Technicians</td>
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<td>ENL2019T</td>
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<td>MAT8102</td>
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<tr>
<td>ELE8945</td>
<td>Distributed Power Systems</td>
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<td>ELE8946</td>
<td>Fire Alarm Systems</td>
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<th>Courses</th>
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Electrical Engineering Technology (Co-op)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CAM8302E</td>
<td>Microcomputer Interfacing</td>
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<tr>
<td>ELE8956E</td>
<td>Electrical Equipment Design</td>
<td>42.0</td>
</tr>
<tr>
<td>ELE8960</td>
<td>Supervisory Control and Data Acquisition</td>
<td>56.0</td>
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<tr>
<td>ENG4001</td>
<td>Project I</td>
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<td>ENL4001</td>
<td>Technology Report Preparation</td>
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<tr>
<td>MAT8103</td>
<td>Ordinary Differential Equations</td>
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<tr>
<td>ELE8958</td>
<td>Protection and Control</td>
<td>70.0</td>
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<tr>
<td>ELE8959</td>
<td>Mechanical-Electrical Systems Integration</td>
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<tr>
<td>Level: 06 Courses</td>
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<tr>
<td>DAT8933</td>
<td>Advanced Computer Applications</td>
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<tr>
<td>ELE8966</td>
<td>Advanced Building Electrical Systems</td>
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<td>ENG4003</td>
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<td>ENG8344E</td>
<td>Control Systems</td>
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<td>ENL4003</td>
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<td>Elective: choose 1 Courses</td>
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<td>ELE8967</td>
<td>Electrical Power Transmission Systems</td>
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<tr>
<td>ELE8968</td>
<td>Building Automation Systems</td>
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Fees for the 2019/2020 Academic Year

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at [https://www.algonquincollege.com/fee-estimator](https://www.algonquincollege.com/fee-estimator).

Further information on fees can be found by visiting the Registrar’s Office site at [https://www.algonquincollege.com/ro](https://www.algonquincollege.com/ro).

Fees are subject to change.

Additional program related expenses include:

Expenses total approximately $1,200 in the first year, $650 in the second year and $400 in the third year. Most supplies can be purchased at the campus store. See [https://www3.algonquincollege.com/etextbooks](https://www3.algonquincollege.com/etextbooks) for more information about books.

Students are responsible for parking and locker fees, if applicable.

All students are responsible to supply their own personal protective equipment, such as CSA-approved safety footwear, protective eyewear, hearing protection, gloves, hard hat, as required in each lab environment.

Admission Requirements for the 2020/2021 Academic Year

Program Eligibility

- Successful completion of Algonquin’s Electrical Engineering Technician program or equivalent with a cumulative GPA of 2.0 and no less than a C- in ENL2019T - Technical Communications and ELE8941 - Robotics and Controls. Plus the specified additional math course, MAT8102. Students not meeting these requirements require department permission to register in technology courses. Applicants from other colleges should contact the program coordinator prior to applying to determine required bridging courses.

Admission Requirements for 2019/2020 Academic Year

Program Eligibility

- Successful completion of Algonquin’s Electrical Engineering Technician program or equivalent with a cumulative GPA of 1.7 and no less than a C- in ENL2019T - Technical Communications and ELE8941 - Robotics and Controls. Plus the specified additional math course, MAT8102. Students not meeting these requirements require department permission to register in technology courses. Applicants from other colleges should contact the program coordinator prior to applying to determine required bridging courses.
Electrical Engineering Technology (Co-op)

- Successful completion of Algonquin’s Electrical Engineering Technician program or equivalent with a cumulative GPA of 1.7 and no less than a C- in ENL2019T - Technical Communications and ELE8941 - Robotics and Controls. Plus the specified additional math course. Students not meeting these requirements require department permission to register in technology courses. Applicants from other colleges should contact the program coordinator prior to applying to determine required bridging courses.

Application Information

ELECTRICAL ENGINEERING TECHNOLOGY (CO-OP)
Program Code 0318X01FWO

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca
60 Corporate Court
Guelph, Ontario N1G 5J3
1-888-892-2228

Students currently enrolled in an Ontario secondary school should notify their Guidance Office prior to their online application at http://www.ontariocolleges.ca/.

Applications for Fall Term and Winter Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants please visit this link for application process information: https://algonquincollege.force.com/myACint/.

For further information on the admissions process, contact:

Registrar’s Office
Algonquin College
1385 Woodroffe Ave
Ottawa, ON K2G 1V8
Telephone: 613-727-0002
Toll-free: 1-800-565-4723
TTY: 613-727-7766
Fax: 613-727-7632
Email: mailto:AskUs@algonquincollege.com

Additional Information

Programs at Algonquin College are Bring Your Own Device (BYOD). To see the BYOD requirements for your program, please visit: https://www7.algonquincollege.com/byod/.

Students are trained on a Windows-based platform, which is the industry standard in the field of engineering. Mac platforms are not acceptable because they are not compatible with the hardware and software used in this program.

OACETT (Ontario Association of Certified Engineering Technicians and Technologists) recognizes this program as meeting the academic requirements for certification in the Certified Technician (C.Tech) category. Students are encouraged to register as Associate members of OACETT. Additional requirements to become fully certified (work experience, the OACETT Professional Practice Examination, peer references, etc.) are the jurisdiction of OACETT.

Levels 05 and 06 include a technology project. Important elements of planning, project selection and team assignment occur at the end of Level 04, usually in April. Students registering for the program after this time may have a limited opportunity for industrial partnerships and inter-professional learning.

For more information, contact Kathryn Reilander, Program Coordinator, at 613-727-4723 ext. 3431 or mailto:Kathryn.Reilander@algonquincollege.com.

CO-OP INFORMATION:
Cooperative education (Co-op) allows students to integrate their classroom learning with a real-world experience through paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op online readiness activities and in-person workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin and other Canadian and international colleges and universities. Algonquin College’s Co-op Department provides assistance in developing co-op job opportunities and facilitates the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to re-locate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid co-op work permit prior to commencing their work term. Without this document, International students are not legally eligible to engage in work in Canada that is a mandatory part of an academic program.

For more information, please visit [https://www.algonquincollege.com/coop](https://www.algonquincollege.com/coop)

**Course Descriptions**

**CAM8302E Microcomputer Interfacing**
Students develop practical knowledge to integrate microcomputer and electronic circuits to control mechanical and electronic devices. Students interface systems using USB, I2C, serial and Ethernet communications. The concept of automation is reinforced by experimenting with industry standard software (LabVIEW) and National Instruments hardware. Closed loop I/O control via a computer is implemented using "C-Language" programs with external devices, such as DC motors, stepper motors and solid state devices. Students use data acquisition systems to acquire data from various sensors.

Prerequisite(s): ELE8941
Corerequisite(s): none

**DAT8921 Introduction to Programming**
Students learn to create structured programs in a high-level language to solve engineering problems. This course emphasizes problem-solving strategies, program design, debugging method and program documentation. Students are introduced to available (std) library resources for a particular language, how to write appropriate user functions, and how to apply code control structures and work with supported data-types and structures, such as arrays.

Prerequisite(s): none
Corerequisite(s): none

**DAT8933 Advanced Computer Applications**
Students are introduced to the basic principles of geographic information systems (GIS), 3D AutoCAD and Microsoft Access. Students learn how a GIS works relating different information in a spatial context and how to reach a conclusion or decision from this analysis. Students also develop an understanding of the 3D features in AutoCAD and customization of AutoCAD. Students learn how to create, manage and use database applications using MS Access.

Prerequisite(s): none
Corerequisite(s): none

**DAT8942 Computer Applications - Electrical**
Students are introduced to the College computer network, spreadsheet applications, word processing software and electrical design software, including Multisim electronic workbench and
AutoCAD. Focus is on AutoCAD, in particular electrical applications.

Prerequisite(s): none
Corerequisite(s): none

**ELE8909 Electrical Principles I**

Students are introduced to the fundamentals of direct current circuit analysis. The standards for electrical measurement are studied and practiced. Electrical circuit design, construction and documentation are also practiced. The first module is a compulsory orientation to safe electrical work practices.

Prerequisite(s): none
Corerequisite(s): none

**ELE8913 Codes and Regulations**

Students locate and interpret the Canadian Electrical Code rules that ensure that electrical systems and equipment do not create hazardous conditions to person or property. This forms the basis for building electrical system design.

Prerequisite(s): none
Corerequisite(s): none

**ELE8919 Achieving Success in the 21st Century**

Rapid changes in technology have created new employment and business opportunities that challenge each of us to find our place as citizens in the emerging society. Life in the 21st century presents significant opportunities, creates potential hazards, and demands that we face new responsibilities in ethical ways. Students explore the possibilities ahead, assess their own aptitudes and strengths, and apply critical thinking and decision making tools to help resolve some of the important issues present in our complex society with its competing interests.

Prerequisite(s): none
Corerequisite(s): none

**ELE8921 Electromagnetic Control**

Students cover the design, installation and troubleshooting of relay logic, electronic logic, electromagnetic controls and AC motor control methods using full voltage starters and selection and installation of variable frequency drivers (VFD’s). Students also study the design of motor power circuits, using the Canadian Electrical Code.

Prerequisite(s): ELE8909
Corerequisite(s): none

**ELE8922A Electrical Principles - II**

Resistive, inductive and capacitive circuits in both DC and AC (including power factor correction) are covered. Operation of basic electronic components, such as diodes, zener diodes, SCRs, voltage regulators, single phase and three phase rectifiers and power supplies are also studied. Students learn to design, construct, analyze and test electronic circuitry at the “breadboard” level.

Prerequisite(s): ELE8909
Corerequisite(s): none

**ELE8923 Electrical Machinery**

Beginning with electromagnetism and induction, single phase and three phase transformers are studied. Schematic representation using single line diagrams is introduced. Students learn the construction, selection and operational characteristics of the most common single phase and three phase motors and generators, including high efficiency designs. The operation of primary and
secondary batteries and related technologies are covered. The time-current characteristics of fuses and breakers are studied.

**Prerequisite(s):** ELE8909  
**Corerequisite(s):** none

**ELE8930 Power Electronics**

This course extends the study of analog circuits and digital logic building blocks from previous courses. Students study the principles and applications of semiconductor devices, BJTs, FETs and IGBTs with an emphasis on their application as switches within power Inverter circuits, variable frequency drives (VFDs), DC power lines, switched mode power supplies. Analog circuits are studied from general purpose operational amplifiers to basic active filters. The lab portion focuses on circuit building, the use of test equipment, collecting, recording and analyzing results, including comparison to calculated values produced by computer simulation. Safe work practices within the lab are an essential part of this course.

**Prerequisite(s):** ELE8922A  
**Corerequisite(s):** none

**ELE8931 Industrial Instrumentation**

The procedures for the selection, connection and calibration of instruments are covered. Instruments are used to measure quantities, such as temperature, pressure, fluid flow and level. Students learn standard testing and calibration procedures of instrumentation and sensing devices. Students connect and program PLCs to measure and control temperature, pressure, flow and level. In addition, students are introduced to process control systems and to the design of instrumentation systems.

**Prerequisite(s):** ELE8932  
**Corerequisite(s):** none

**ELE8932 Programmable Controllers**

This Programmable Logic Controllers (PLC) course extends the principles learned in the first year and applies them to programmable logic controllers. The emphasis is on programming and installing of the current generation of PLC technology. Industrial ladder diagrams, structured text and sequential function chart software are covered. Students develop programs to solve typical industrial applications using relay logic, counters, timers, sequencers, mathematical functions and move commands. Students configure and connect digital and analog input/output modules.

**Prerequisite(s):** ELE8921  
**Corerequisite(s):** none

**ELE8940 Industrial Telecommunications**

Students are introduced to the basic concepts and theories utilized in modern electronic communications. This includes basic signal and information theory, analog and digital modulation, and data communications technologies. In the lab, students gain hands on experience using industry standard communications test equipment. Students conduct experiments in frequency response measurement, signal power measurement, time domain reflectometry, and data communications at both the protocol and physical level.

**Prerequisite(s):** none  
**Corerequisite(s):** none

**ELE8941 Robotics and Controls**

Robotics is approached as a special case within the larger area of interactive, software-driven devices. Students are introduced to the basics of robotics and feedback control, setting up and programming a microcontroller, designing and programming actuation and sensing devices associated with a robot, analogue and digital control and DC motor control using Pulse Width Modulation (PWM).
Electrical Engineering Technology (Co-op)

Prerequisite(s): DAT8921
Corerequisite(s): none

**ELE8944 Building Electrical Systems with AutoCAD**

Students develop their AutoCAD skills including the use of layers, blocks, PaperSpace, ModelSpace, block attributes, dynamic blocks, templates (DWT), drawing standards and DWF (Drawing Web Format). The application of standards, particularly the Canadian Electrical Code, specifications, and manufacturers’ data to the design of both residential and commercial building electrical systems are included.

Prerequisite(s): DAT8942
Corerequisite(s): none

**ELE8945 Distributed Power Systems**

Students examine power generation, transmission and distribution with particular emphasis on the province of Ontario. This includes an understanding of standard voltage levels, energy sources, cost of electricity, environmental impact, major system components, reactive loads, power quality, arc flash safety, effects of weather on the delivery of electricity and organizational structures that control electricity in Ontario.

Prerequisite(s): none
Corerequisite(s): none

**ELE8946 Fire Alarm Systems**

Students are introduced to the fire alarm industry, the applicable codes and standards, the nature of fire and extinguishment processes, different types of systems, verification and inspections. An overview of fire alarm systems emphasizes requirements for initiating devices, signal appliances, and control panels together with the different types of field wiring and microprocessor-based systems.

Prerequisite(s): none
Corerequisite(s): none

**ELE8949 Project Management for Electrical Engineering Technicians**

Students develop the planning, scheduling, budgeting and organizing skills required to manage projects. Relevant industrial examples are used.

Prerequisite(s): ENL1813T
Corerequisite(s): ENL2019T and ENL8720

**ELE8956E Electrical Equipment Design**

Students analyze the design of electrical equipment and systems including solar and wind energy generation, and transformers. Measurement and quality concepts are covered. Thermodynamics, as it relates to energy losses, equipment cooling and the operation of refrigeration and heat pumps, is included. Students apply mathematics and science principles to find solutions technical problems.

Prerequisite(s): none
Corerequisite(s): none

**ELE8958 Protection and Control**

Students examine the types of protection relays and fault protection used in power distribution and transmission. Students study current transformers, fuses, circuit breakers, tap changers, time current curves (TCC curves), single line representations of power systems, typical drawing symbols and terminology, zones of protection, selective coordination, symmetrical components, substation
design and equipment ratings. Protection and control relays for transformers, motors, and feeders are programmed, tested and used in simulation.

Prerequisite(s): ELE8945
Corerequisite(s): none

**ELE8959 Mechanical-Electrical Systems Integration**

Students are introduced to the essential mechanical devices and systems they deal with in design, construction and troubleshooting. Students also examine the use of basic machines, gears, pulleys, pneumatics, hydraulics and pumps. The lab portion includes using programmable logic controllers in conjunction with pneumatic devices and applications of block programming.

Prerequisite(s): none
Corerequisite(s): none

**ELE8960 Supervisory Control and Data Acquisition**

Whether it’s manufacturing, water treatment, or energy production, Supervisory Control and Data Acquisition (SCADA) systems are at the heart of any automated control system. Students explore the hardware and software components of a SCADA system including industrial network protocols, alarm monitoring, and data collection. Students also examine standards, control philosophy, security, and best practices. In the lab, students build, configure and test a SCADA system.

Prerequisite(s): ELE8940
Corerequisite(s): none

**ELE8966 Advanced Building Electrical Systems**

Electrical systems within buildings are analyzed and designed based on CE and Building Code requirements. Students determine feeder sizing, cable selection, raceway options and distribution configurations. Students examine the principal components of electrical installations, including grounding and bonding. The requirements for lighting levels for various space usage are examined and calculated. Economic factors are reviewed with respect to providing efficient lighting solutions. Electrical design issues within buildings are studied, including maximum fault current calculations within the building’s power distribution network. Economic issues relating to power distribution and methods to correct power quality problems, such as voltage sags, transients, waveform distortion, harmonics, and noise are discussed.

Prerequisite(s): none
Corerequisite(s): none

**ELE8967 Electrical Power Transmission Systems**

Students explore the construction and operation of AC and DC transmission systems, modelling transmission lines, control of power flow, performance of a transmission line, maximum power transfer, and common design methods of distributed networks. Students use lab equipment to simulate electrical transmission and distribution faults, while using Switzer Engineering Laboratories (SEL) relay protection and control schemes to indicate fault conditions.

Prerequisite(s): ELE8958
Corerequisite(s): none

**ELE8968 Building Automation Systems**

Various topics related to Building Automation Systems (BAS) are covered. Students are introduced to the main components of the BAS. Many technical aspects of automation including smart thermostats, (Heating Ventilation and Air Conditioning), lighting, access and security, measuring, sensing, actuation and digital controls are covered. Important aspects of building automation are introduced, including the Internet of Things (IoT), Ambient Intelligence (AmI) concepts, real-world applications of Wireless Sensor Networks (WSN) and Data Acquisition Systems (DAQ). In the lab, students design, build, test and troubleshoot various building automation components and subsystems.
Prerequisite(s): CAM8302E  
Corerequisite(s): none

**ENG4001 Project I**

Experience with practical projects provides students with learning opportunities to gain insight and experience, thereby making the connection to industry. Through collaborative participation in applied research projects, students in groups undertake problems of significant technical complexity and work towards solutions using project management methodologies. Student groups initiate projects working closely with stakeholders in real-world workplace environments. There is an option to take the project course ENG4002 as an equivalence to this course. Note: the project courses (ENG4001 and ENG4003) and the supporting communication courses (ENL4001 and ENL4003) have to be done in two consecutive terms.

Prerequisite(s): none  
Corerequisite(s): ENL4001

**ENG4003 Project II**

The ability to identify and satisfy all stakeholder expectations is essential in successful product development. Following up on topics selected in the Project 1 course (ENG4001 or ENG4003) student groups continue to execute projects of significant technical complexity in an applied research context. Student groups work in consultation with faculty and external stakeholders to create deliverables by monitoring and controlling the project resources. The solutions developed are defended in formal oral and written presentations. Students that started with ENG4002 must continue with the project course ENG4004. Note: the project courses (ENG4001 and ENG4003) and the supporting communication courses (ENL4001 and ENL4003) have to be done in two consecutive terms.

Prerequisite(s): ENG4001  
Corerequisite(s): ENL4003

**ENG8344E Control Systems**

Students are introduced to industrial control systems. They develop an understanding of various control systems and their components. Topics covered include open and closed loop control systems, block diagrams, transfer functions, Laplace transforms, sensors and actuators applications, processing analog signals, motion control principles, component selection/integration and system design, discrete control, continuous control and digital and analog controllers. Lab work focuses on the use of sensors, data acquisition and processing, use of DACs and ADCs and industrial controllers.

Prerequisite(s): CAM8302E  
Corerequisite(s): none

**ENL1813T Communications I**

Communication remains an essential skill sought by employers, regardless of discipline or field of study. Using a practical, vocation-oriented approach, students focus on meeting the requirements of effective communication. Through a combination of lectures, exercises, and independent learning, students practice writing, speaking, reading, listening, locating and documenting information and using technology to communicate professionally. Students develop and strengthen communication skills that contribute to success in both educational and workplace environments.

Prerequisite(s): none  
Corerequisite(s): none

**ENL2019T Technical Communication for Engineering Technologies**

The ability to communicate effectively in a technically-oriented interdisciplinary workplace is a foundational skill in an innovation-driven economy. Students are exposed to exercises and
assignments designed to foster independent and collaborative critical thinking, research, writing, visual communication and presentation skills related to technical topics.

Prerequisite(s): ENL1813T
Corequisite(s): none

**ENL4001 Technology Report Preparation**

Students define and describe a problem of significant technical complexity and present a suitable technological solution. Drawing upon skills previously acquired, students plan, conduct research for, and begin the creation of a written report that is based upon the guidelines established by the Ontario Association of Certified Engineering Technicians and Technologists (OACETT).

Prerequisite(s): ENL1819T or ENL2019T
Corequisite(s): ENG4001

**ENL4003 Technology Report**

Students complete the report defined in ENL4001. The completed report forms the basis of an oral presentation to faculty, peers and interested industry personnel in the final weeks of the term. ENL4001 and ENL4003 must be taken in the same academic year unless an exception is approved.

Prerequisite(s): ENL4001
Corequisite(s): ENG4003

**GED0317 General Education Elective**

Students choose one course, from a group of general education electives, which meets one of the following five theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, Personal Understanding, and Science and Technology.

Prerequisite(s): none
Corequisite(s): none

**MAT8100 Essential Mathematics**

The study of algebraic and transcendental functions is an essential prerequisite to Calculus. Students manipulate algebraic expressions, solve algebraic equations and linear systems, and learn the properties of algebraic and transcendental functions. Students graph a variety of functions and solve problems involving complex numbers, trigonometry and vectors. Delivered in a modular format, this course is equivalent to the completion of math modules MAT8100 - a, b, c, d, e, f, g, and i.

Prerequisite(s): none
Corequisite(s): none

**MAT8101 Differential Calculus**

Differential Calculus is the mathematical study of rates of change. The derivative, its definition and interpretation and its applications are studied. Students calculate limits and use first principles to find simple derivatives. Implicit differentiation and the product, quotient and chain rules are used to find derivatives of algebraic functions. Students use differentiation rules to find derivatives of transcendental functions. A variety of applications of derivatives, such as curve sketching, finding the tangent to a curve and finding an approximate solution to an equation using Newton's method are also studied.

Prerequisite(s): MAT8100 or MAT8100P or MAT8050 and MAT8051 or MAT8050P and MAT8051
Corequisite(s): none

**MAT8102 Integral Calculus**

Integral calculus is the study of the definitions, properties and applications of two related concepts,
the indefinite integral and the definite integral. Students find the area under a curve, the area between two curves and the volume of solids of revolution. Students calculate both indefinite and definite integrals, and use the Trapezoidal Rule and Simpson’s Rule to perform numerical integrations. Students integrate polynomial, exponential, logarithmic and trigonometric functions by substitution. Integration by parts and partial fractions are employed to perform complex integrations.

Prerequisite(s): MAT8101
Corequisite(s): none

**MAT8103 Ordinary Differential Equations**

Physical situations such as beam deflection, harmonic motion, circuit theory or Newton’s Laws require solving first or second order ordinary differential equations. Students study first order differential equations and solve these equations using separation of variables, integrating combinations, integrating factors for linear equations and Laplace Transforms. Both homogeneous and non-homogenous second and higher order differential equations with constant coefficients are solved using the method of undetermined coefficients and using Laplace Transforms. Students also use both methods to solve practical applications of second order ordinary differential equations related to students’ program of study. A review of sequences and series is completed in order to prepare students for power series expansions. Students apply Maclaurin series to expand functions as a power series and use the results to approximate values of transcendental functions. Students also study periodic functions and determine their Fourier series expansions.

Prerequisite(s): MAT8102
Corequisite(s): none

**PHY8201 Environmental Impact of Technology**

Every day newspaper headlines, movies, and television have warnings of the dire consequences of some environmental issues, such as global warming, acid rain, climate change and a host of other problems. Students are provided some of the science behind the headlines so they can make informed decisions as citizens, consumers and professionals.

Prerequisite(s): none
Corequisite(s): none

**WKT2101E Co-op Work Term Electrical**

This course includes a work placement, a weekly recording of the activities done in a journal and a final summary report of the overall experience to be submitted before returning to school. The placement has to be in an electrical related industry, preferably to electrical engineering. The timing of the placement depends on the progression pattern of the program and can not be done before completion of the second level of the Electrical Engineering Technician program. The placement is monitored by the College. Feedback from the employer is considered in the final evaluation of the course. All assignments (journal entries and final report) must be provided to pass the course. The College Coop office assist in finding a placement. However, it is the student responsibility to find, apply and get the work term as if they were applying for a job.

Prerequisite(s): none
Corequisite(s): none