

Area of Interest: Construction and Skilled Trades

Electrical Techniques - Apprenticeship

Ontario College Certificate

Program Code: 0506X01FWO

28 Weeks

Ottawa Campus

Our Program

Learn the theoretical principles and trade skills required to becoming an electrician.

To enrol in the Electrical Techniques - Apprenticeship Ontario College Certificate program, applicants must:

- be currently employed in the trade
- be formally registered as apprentices with the Ministry of Labour, Training and Skills Development (MLTSD)
- have a valid Offer of Classroom Training from the Ministry of Labour, Training and Skills Development that includes a Ministry Client ID and approved Class Number

Eligibility is determined by the Ministry of Labour, Training and Skills Development.

The Electrician Construction and Maintenance trade is a compulsory trade in Ontario and requires certification.

To learn more about apprenticeships, visit <http://www.ontario.ca/page/skilled-trades> for detailed information.

For Registered Apprentices:

This 28-week program fulfills all in-class requirements for your apprenticeship. It is divided into three levels (Beginner, Intermediate and Advanced) where you alternate between going to school and working in the field for 12-18 months.

You take courses on:

- the Canadian Electrical Code
- electrical theory
- electronics
- instrumentation
- installation methods

You also learn about prints, standards and electrical principles, practical installations and how to work in a variety of specialty areas.

At the end of this program, you are qualified to write the exam to earn a Certificate of Qualification in the Electrician Construction and Maintenance trade. To work outside of Ontario, you need to test for the Red Seal Endorsement (RSE) in Industrial or Construction specializations.

NOTE: Although a Grade 10 education is the minimum entry requirement for an electrical apprentice, the level of education required for success in today's electrical industry is constantly increasing; therefore, it is strongly recommended that electrical apprentices entering the in-school training program have a minimum equivalent of Grade 12 physics, chemistry, English and mathematics.

SUCCESS FACTORS

This program is well-suited for students who:

- Work well with others.
- Have a strong sense of responsibility.
- Are safety aware.

Employment

Graduates may find employment as electricians working closely with every trade area, including millwrights, heating and refrigeration technicians, stationary engineers and instrumentation technicians.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Assist in the interpretation and preparation of electrical drawings including other related documents and graphics.
- Analyze and solve simple technical problems related to basic electrical systems by applying mathematics and science principles.
- Use and maintain test and instrumentation equipment.
- Assemble basic electrical circuits and equipment to fulfill requirements and specifications under the supervision of a qualified person.
- Assist in the installation and troubleshooting of basic electrical machines and associated control systems under the supervision of a qualified person.
- Assist in testing and troubleshooting electrical and electronic circuits, equipment, and systems by using established procedures under the supervision of a qualified person.
- Assist in the troubleshooting of control systems under the supervision of a qualified person.
- Use computer skills and tools to solve basic electrical related problems.
- Assist in conducting quality assurance procedures under the supervision of a qualified person.
- Assist in the preparation and maintenance of records and documentation systems.
- Install and assist in testing telecommunication systems under the supervision of a qualified person.
- Apply health and safety standards and best practices to workplaces.
- Perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.
- Apply basic electrical cabling requirements and install and test system grounding for a specified number of applications under the supervision of qualified person.
- Identify problems and troubleshoot electrical systems under the supervision of a qualified person.
- Assist in the selection of electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.

Program of Study

Level: 01 (Basic)	Courses	Hours
ELE8711	Canadian Electrical Code - Level 1	32.0
ELE8712	Prints - Level 1	32.0
ELE8713	Electrical Theory - Level 1	64.0
ELE8714	Installation Methods - Level 1	48.0
ELE8715	Instrumentation - Level 1	24.0
ELE8716	Electronics - Level 1	40.0
Level: 02 (Intermediate)	Courses	Hours
ELE8721	Canadian Electrical Code - Level 2	40.0
ELE8722	Prints - Level 2	30.0
ELE8723	Electrical Theory - Level 2	80.0
ELE8724	Installation Methods - Level 2	40.0
ELE8725	Instrumentation - Level 2	40.0
ELE8726	Electronics - Level 2	40.0
ELE8727	Monitoring and Communication Systems - Level 2	30.0
Level: 03 (Advanced)	Courses	Hours
ELE8731	Canadian Electrical Code - Level 3	30.0
ELE8732	Prints - Level 3	30.0
ELE8733	Electrical Theory - Level 3	60.0
ELE8735	Instrumentation - Level 3	40.0
ELE8737	Electronics - Level 3	60.0
ELE8740	Installation Methods - Level 3	80.0

Fees for the 2023/2024 Academic Year

Tuition Fees: \$400 for Level 01.

Incidental Fee: \$150 per level.

Information Technology Fee: \$43.86 for Level 01.

Books and supplies can be purchased at the campus store.

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

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

Admission Requirements for the 2024/2025 Academic Year

College Eligibility

- Ontario Secondary School Diploma (OSSD) or equivalent; OR
- Mature Student status (19 years of age or older and without a high school diploma at the start of the program).

Program Eligibility

- Prospective students must be registered apprentices with the Ministry of Labour, Training and Skills Development and must be a member in good standing with Skilled Trades Ontario (STO).
- Eligibility is determined by the Ministry of Labour, Training and Skills Development.

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Application Information**ELECTRICAL TECHNIQUES - APPRENTICESHIP**
Program Code 0506X01FWO

Registration for Apprenticeship programs takes place through the Ministry of Labour, Training, and Skills Development.

For further information, contact:

Ministry of Labour, Training, and Skills Development
347 Preston Street 3rd Floor, Suite 310
Ottawa, ON K1S 3H8

<https://www.ontario.ca/page/start-apprenticeship>

Telephone: 613-731-7100

Toll-free: 1-877-221-1220

Contact Information**Program Coordinator(s)**

- Andrew Meek, <mailto:meeka@algonquincollege.com> , 613-727-4723, ext. 6704

Course Descriptions**ELE8711 Canadian Electrical Code - Level 1**

Upon successful completion, the apprentice is able to apply the requirements of the Canadian Electrical Code - Part 1 (CEC) to identify and interpret the general requirements of the CEC; identify and interpret the CEC requirements for conductor ampacity including free air, above and underground installations, grounding and bonding, wiring methods, class 1 and 2 circuits, receptacles and lighting in residential occupancies, single-dwelling and dwelling units, pools, tubs and spas, and temporary installations; and be able to calculate the service requirements for a residential occupancy, single-dwelling and row-housing.

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

ELE8712 Prints - Level 1

Upon successful completion, the apprentice is able to identify and interpret the alpha numerical lines; use the metric and imperial scales and be able to convert between them; obtain information from architectural, structural and mechanical drawings, specifications, building code and CEC to complete an electrical installation for a single-dwelling; draw and label a panel schematic for a single-dwelling; and complete a material take-off for a single-dwelling.

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

ELE8713 Electrical Theory - Level 1

Upon successful completion, the apprentice is able to understand electron theory; define voltage, current and resistance, as well as electrical and mechanical power and energy; describe the effects of electricity on the human body; explain the principles of common sources of Electro-Motive Force (EMF); and to analyze series, parallel and combination DC circuits by applying Ohm's Law and Kirchoff's Laws; describe magnetic lines of force and list their characteristics; describe the relationship between magnetism and EMF.

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

ELE8714 Installation Methods - Level 1

Upon successful completion, the apprentice is able to demonstrate the operation of common hand and power tools; install common switching devices, outlets and enclosures; correctly terminate conductors; demonstrate the installation procedures for non-metallic sheathed cable, armoured cable, mineral insulated cable, rigid conduits, flexible conduits, liquid-tight conduit, electrical metallic tubing, and electrical non-metallic tubing, including supports and tools required; install a 100 amp. residential consumer's service and associated branch circuits; layout a service mast installation; install door, signal and extra-low voltage lighting devices; identify and terminate copper communication and hard wired cables.

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

ELE8715 Instrumentation - Level 1

Upon successful completion, the apprentice is able to explain common terms used in instrumentation systems; work with the SI and Imperial system of measurement for pressure and temperature; convert between the four temperature scales; describe the operation, applications and limitations of thermocouples, thermistors, and RTD's; install, connect, and test thermocouples, thermistors, and RTD's; identify deformation elements of pressuring measuring equipment; determine the accuracy of pressure measuring equipment; explain relationships between gauge and absolute pressure, and vacuum; explain the operation, construction and applications of typical industrial pressure sensors; Identify ISA instrumentation symbols and draw basic process (P) and Instrumentation (I) diagrams for pressure and temperature devices; explain the operation of light and sound meters.

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

ELE8716 Electronics - Level 1

Upon successful completion, the apprentice is able to identify schematic symbols for North American and European basic logic gates; describe the operation of basic logic gates; use basic logic gates to create digital logic circuits; state Boolean equations for simple logic gates; design and test combination logic circuits; describe the voltage requirements for TTL and CMOS logic circuits; demonstrate the use of R.S. and D type flip-flop; use a logic probe to troubleshoot a digital

circuit; demonstrate procedures for soldering and de-soldering; state the standard resistor colour code; connect resistors in series, parallel and combination circuits; describe the properties of N and P type semiconductor materials; explain current, voltage and biasing requirements for silicon and germanium diodes, and LED's demonstrate the operation of a bipolar diode; identify the symbols for and describe the operation and biasing for NPN and PNP Bipolar transistors; and demonstrate how a transistor can be used as a switch; demonstrate the common applications for an opto-coupler.

Prerequisite(s): none

Corerequisite(s):none

ELE8721 Canadian Electrical Code - Level 2

Upon successful completion, the apprentice is able to: interpret the CEC requirements pertaining to the installations for: interior and exterior lighting systems; fire alarms and fire pumps, emergency systems, unit equipment and exit signs; fuses, circuit breakers and ground fault protection and control devices; equipment in hazardous locations; hospitals and patient care areas; storage batteries; individual continuous and non-continuous duty service motors; and to calculate conductor and overcurrent device sizes required for specific continuous and non-continuous loads and the minimum ampacity of conductors and overcurrent devices for apartment and similar buildings.

Prerequisite(s): none

Corerequisite(s):none

ELE8722 Prints - Level 2

Upon successful completion, the apprentice is able to: determine utility location and site features using site drawings; determine methods of construction using architectural and structural drawings; determine the electrical characteristics and layout of mechanical equipment and systems; lay out commercial distribution and service equipment and wiring; lay out branch circuit for lighting and equipment; prepare a material take off using drawings, specifications; prepare sketches to solve and document construction problems and solutions; prepare as-built drawings; and develop basic single line, schematic and wiring diagrams.

Prerequisite(s): none

Corerequisite(s):none

ELE8723 Electrical Theory - Level 2

Upon successful completion, the apprentice is able to: describe magnetic flux and flux density; solve problems associated with magnetic energy; explain Ohm's Law as applied to magnetic circuits; describe factors which affect inductance and perform related calculations; apply Fleming's hand rules and Lenz's law; describe the types, construction, operation and characteristics of DC machines; describe a sine wave; calculate RMS, average, maximum, and instantaneous values; calculate frequency, electrical and mechanical degrees; calculate phasors, vectors and vector diagrams; describe the effects of alternating voltage and current in a resistive device; calculate inductive reactance, voltage, current, and power of an inductive circuit; calculate capacitive reactance, voltage, current, power and phase relationships of a capacitive circuit; calculate values for RL/RC/RLC series and parallel circuits; and calculate resonant circuits.

Prerequisite(s): none

Corerequisite(s):none

ELE8724 Installation Methods - Level 2

Upon successful completion, the apprentice is able to: identify the mechanical parts, windings and wiring connections of DC machines; demonstrate manual and magnetic across-the-line starting techniques for motors; demonstrate methods for forward-reverse control of motors; demonstrate reduced voltage starting techniques for DC motors; identify the mechanical parts, windings, and wiring connections for a single- and three-phase squirrel cage induction AC motor (SCIM); demonstrate manual and magnetic across-the-line starting techniques for single- and three-phase squirrel cage motors; demonstrate methods for forward and reverse control of single- and three-phase squirrel cage motors; demonstrate the control of a Single Phase Capacitor Start Dual

Voltage Motor with a reversing drum switch, manual starter and a reversing magnetic starter; state the procedures for installing and aligning belt driven motors; and calculate and connect single-phase, 3-wire transformer services.

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

ELE8725 Instrumentation - Level 2

Upon successful completion, the apprentice is able to: identify and describe the operation of various level and flow sensing instruments; draw basic process and instrument diagrams using standard ISA instrumentation symbols; explain the operation and applications of typical level and flow measurement devices and transmitters; demonstrate the hydrostatic pressure principle of liquid level measurement; predict with calculations the effect of liquids of different specific gravities on the system; demonstrate the use of the venturi and the orifice plate in flow measurement; and install, connect and test load cells in typical weight measurement applications.

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

ELE8726 Electronics - Level 2

Upon successful completion, the apprentice will have demonstrated the ability to: use an oscilloscope to test circuits; explain the importance of isolation when using test equipment; describe and demonstrate half and full wave rectification; connect capacitors and inductors to filter a power supply output; demonstrate the use of a zener diode as a regulator; demonstrate the operation of an SCR; demonstrate the operation of a DIAC and TRIAC; demonstrate how a DIAC and RC network can be used to phase shift a TRIAC; describe the operation and applications of a pulse transformer; explain the operation of a field effect transistor (FET) and operational amp (Op Amp); calculate the expected gain of inverting and non-inverting OP-Amp circuits; and demonstrate the operation of an Op-Amp used as a comparator and an amplifier.

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

ELE8727 Monitoring and Communication Systems - Level 2

Upon successful completion, the apprentice will have demonstrated the ability to: describe the operation, installation, testing and troubleshooting requirements for initiation, signal, ancillary and supervisory circuits and devices, in a single two stage fire alarm system using the NBC, CEC, ULC and manufacturer's documentation; describe the basic operation of wet and dry sprinkler systems; describe the fire suppression agents, components and systems used in fire suppression systems; describe the methods used to terminate and test fibre optic cables; demonstrate an understanding intrusion systems and devices; describe the wiring and operation of nurse call systems; demonstrate the wiring and operation of nurse call systems; layout and wire common paging and communications systems; describe the operation of institutional clock systems; and describe the operation and installation requirements for common home automation systems.

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

ELE8731 Canadian Electrical Code - Level 3

Upon successful completion, the apprentice is able to interpret the CEC requirements pertaining to the installations for: two or more continuous and non-continuous duty service motor on a feeder or branch circuit; hermetic refrigerant motor-compressor; power and distribution transformers on a feeder and branch circuit; welders on a feeder and branch circuit; capacitors on a feeder, branch circuit and motor branch circuit; high-voltage installations; overcurrent and device selection based on load, interrupting ratings and coordination.

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

ELE8732 Prints - Level 3

Upon successful completion, the apprentice is able to: obtain installation details for a construction project from a complete set of drawings and specifications; develop complex single line, schematic and wiring diagrams; layout single- and three-phase systems for feeder and branch circuits from utility supply to utilization points; calculate pulling stresses on a conductor/cable; layout the grounding and bonding requirements for high-voltage indoor and outdoor substations and vaults; identify precautions for installing stress cones; describe the requirements for terminating shielded and concentric neutral high-voltage cables; and describe the testing methods and safety requirements for testing high-voltage cables.

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

ELE8733 Electrical Theory - Level 3

Upon successful completion, the apprentice is able to: list the advantages of three phase circuits over single phase circuits; state the advantages and disadvantages of three phase Wye and Delta systems; calculate voltage, current, power and power factor for three-phase Wye and Delta systems, three-phase series and parallel RLC circuits; connect wattmeters, power-factor meters and phase-angle meters in a three-phase system; list different types of transformers and their applications and associated losses; explain the principles of three-phase open delta connections; describe the theory of operation and the synchronizing of alternators; illustrate by calculation the principles for single and three-phase power conversion; describe the construction, operation and troubleshooting procedures for single- and three-phase AC induction motors; identify connections for multiple voltages and speeds for AC motors; describe the construction, operation and troubleshooting procedures for AC wound rotor motors; describe the construction, operation, power factor correction and troubleshooting procedures for three-phase synchronous motors; state the types of insulation.

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

ELE8735 Instrumentation - Level 3

Upon successful completion, the apprentice is able to: describe the use and list the requirements for instrumentation air supplies; explain terminology of instrumentation systems; describe the operation and applications of proportional 3-15 psi pneumatic instrumentation systems; connect and adjust pneumatic control valves to current/pressure (I/P) and pressure/current (P/I) devices; calibrate typical pneumatic valves; explain the principles of ON/OFF control; identify the four basic elements of a control system; explain the two general categories of automatic control and shielded cable in instrumentation systems; demonstrate shield grounding techniques; connect, program and test microprocessor based ultrasonic measuring transmitters; explain the operation and application of position measurement devices; install, connect and test resolver and shaft encoders; explain the principles of Proportional Integrated Derivative (PID) control; explain the advantages and limitations of the common methods of communicating instrumentation information; and revise and explain control loops on instrumentation drawings.

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

ELE8737 Electronics - Level 3

Upon successful completion, the apprentice is able to: state how three-phase rectification is accomplished; connect a single quadrant DC motor drive system; describe the relationship between firing angle, load, voltage, CEMF, and motor speed; describe application of two and four quadrant drive systems; describe and connect open and closed loop speed control systems; explain the operation of DC chopper drive controller; connect, calibrate and test an SCR speed controller for a DC system motor; describe the operation of a three-phase AC variable speed drive controller; connect, calibrate and confirm the operation of an AC variable speed drive controller; identify the major components of AC variable speed drive controller; explain the procedure to test, remove and replace the output transistors in an AC variable speed drive; describe the effects of harmonics on AC systems; explain the operation of reactors and their application to AC variable speed drive systems to control harmonics on AC Power Systems; describe the operation and application of encoders, resolvers, and tachogenerators as feedback devices; and explain the

operation of and identify hardware and protocol for serial communication.

Prerequisite(s): none

Corerequisite(s):none

ELE8740 Installation Methods - Level 3

Upon successful completion, the apprentice is able to: test transformers to determine polarity, impedance, winding ratio and insulation resistance; connect three-phase transformers in Wye and Delta configurations; connect three-phase RLC loads to transformers in balanced and unbalanced configurations; connect single- and three-phase auto transformers for reduced voltage motor starting; identify the parts and connections for a three-phase wound rotor motor; describe the effects of differing resistance in the rotor circuit of a wound rotor motor under varying loads; connect a two-speed control circuit for a two-speed squirrel-cage motor; state the functions and applications of a Programmable Logic Controller (PLC); determine language and addressing requirements of a PLC; demonstrate the programming of common relay instructions, timers, counters, mathematic functions, and word comparisons on a PLC; identify methods and hard wiring of PLC's to equipment; demonstrate manner using many of the internal functions of a PLC.

Prerequisite(s): none

Corerequisite(s):none