ELECTRO-MECHANICAL ENGINEERING TECHNICIAN – ROBOTICS

Ontario College Diploma
2 years

01.07.12

PROGRAM DESCRIPTION

This two-year Ontario College Diploma program provides students with the technical skills required to repair and modify automated equipment used in the home automation, retail, manufacturing, gaming, security, medical and energy sectors. Robotics technicians acquire knowledge in many aspects of electronics and mechanics including: programmable logic devices (PLD), programmable integrated circuits (PIC), programmable logic controllers (PLC), computer-aided design (CAD), computer numerical control (CNC), motor controls, programming embedded systems, machine tool operations and fluid power.

With intakes in the Fall, Winter, and Spring terms, this year-round program can be completed in four consecutive terms (or in the traditional two-year format) and provides greater flexibility for students than other conventional programs.

The Electro-Mechanical Engineering Technician – Robotics program is continually under review to address the needs of an ever-changing industry. Graduates enjoy many rewards including personal satisfaction and exciting career opportunities.

This program is part of Algonquin's mobile learning initiative. All students entering into the program are expected to have and use a laptop or mobile computing device that meets or exceeds the recommended hardware requirements as designated by the program. Students in mobile learning programs will use their devices to enhance their learning experience, obtain and work with course materials, participate in collaborative and mlearning environments and become skilled, confident users of the technologies used within an educational environment and workplace. Hardware and software specifications are outlined at ***http://mlearning.algonquincollege.com***. Computers and supplies can be purchased directly from Algonquin's New Technology Store at educational rates.

SUCCESS FACTORS

This program is well-suited for students who:

- Are self-motivated.
- Enjoy working with their hands.
- Like problem solving through troubleshooting.
- Have good oral and written communication skills and work well with others.
- Are interested in how things are made using automation.
- Are looking for a comprehensive and challenging career.

EMPLOYMENT OPPORTUNITIES

Upon graduation, an EMET - Robotics Technician has a wide selection in terms of the areas of industry where they may find employment. Graduates from this program can be found repairing, adapting and performing preventative maintenance in the manufacturing and service industry.

ADDITIONAL INFORMATION

For more information, please contact S. Ryan, Program Coordinator, at 613-727-4723 ext. 5798 or *ryans@algonquincollege.com*.

PROGRAM OF STUDY

Programs at Algonquin College are delivered using a variety of instruction modes. Courses may be offered in the classroom or lab, entirely online, or in a hybrid mode which combines classroom sessions with online learning activities. Upon registration, each full-time student is provided an Algonquin email account which is used to communicate important information about program or course events.

Level: 01		Hours
DAT9102	TECHNOLOGY AS A USEFUL TOOL	45.0
ELN8613	BASIC ELECTRONIC ASSEMBLY	30.0
ELN9103	DC AND AC ELECTRONICS	135.0
MAT8001	MATH FUNDAMENTALS	45.0
ROB8201	PNEUMATICS	45.0
WEL9107	WELDING – OXYACETYLENE AND ARC	45.0

Level: 02		Hours
ELN9192	CIRCUIT APPLICATIONS	90.0
ENL1813T	COMMUNICATIONS I	45.0
MAC9200	MACHINE SHOP	90.0
PHY9182	SUSTAINABILITY IN TODAY'S MODERN WORLD	45.0
ROB8311	ELECTRO-PNEUMATICS	60.0

Level: 03		Hours
CAD9101	COMPUTER-AIDED DESIGN AND COMPUTER NUMERICAL CONTROL	60.0
ELN8303	DIGITAL LOGIC ANALYSIS	135.0
ELN9203	MICROCONTROLLERS	60.0
ELN9211	DC AND AC MOTOR CONTROLS	45.0

Choose one from equivalencies:

GED0550	GENERAL EDUCATION ELECTIVE	45.0

Level: 04		Hours
ELN9204	MICROCONTROLLER INTERFACING AND PROGRAMMING	75.0
ELN9206	MECHANISMS	30.0
ELN9207	PROGRAMMABLE LOGIC CONTROLLERS	60.0
ENL1819T	REPORTING TECHNICAL INFORMATION	60.0
ROB9205	INDUSTRIAL ROBOTS	60.0

ADMISSION REQUIREMENTS

Admission Requirements listed are in effect for the **2013-2014** academic year.

College Eligibility

- Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
- Academic and Career Entrance (ACE) certificate; OR
- General Educational Development (GED) certificate; OR
- Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing for which a fee of $40 (subject to change) will be charged.

Program Eligibility

- English (Grade 12 ENG4C) or equivalent.
- Mathematics (Grade 12 MAP4C) or equivalent.

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

FEES AND EXPENSES

Information on tuition fees, ancillary fees and program expenses (including books and supplies) for this program for the 2012/2013 academic year can be found by going to the program webpage under Full-time Programs on the Algonquin College website at: *www.algonquincollege.com*.

APPLICATION INFORMATION

ELECTRO-MECHANICAL ENGINEERING TECHNICIAN – ROBOTICS Program Code 0550X01FWO

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

Applications are available online at *www.ontariocolleges.ca*. A $95 fee applies.

Applications for Fall Term, Winter Term and Spring 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 applying from out-of-country can obtain the International Student Application Form at *https://xweb.algonquincollege.com/FormIE/index.aspx* or by contacting the Registrar's Office.

For further information on the admissions process, contact:

Registrar's Office
Algonquin College
1385 Woodroffe Ave, Room C150
Ottawa, ON K2G 1V8
Telephone: 613-727-0002
Toll-free: 1-800-565-4723
TTY: 613-727-7766
Fax: 613-727-7632
Email: *AskUs@algonquincollege.com*

COURSE DESCRIPTIONS

DAT9102   TECHNOLOGY AS A USEFUL TOOL
Topics, such as standard computer software (word processors and spreadsheets), Internet and email basics and LAN Technology are covered. Issues, such as ethics (personal and business), problem-solving skills and time management are addressed and the benefits that computers can add to our daily lives are explored.

ELN8613   BASIC ELECTRONIC ASSEMBLY
Students are exposed to soldering techniques. Brief lecture sessions provide the theoretical background followed by practical skills demonstrations by the instructor. Students do practical labs based on the theory/demo to develop various skills, such as Printed Circuit Board component soldering (and de-soldering) for both traditional Through-Hole and Surface Mount Technology. They build their own set of meter leads and a functional project, (such as a Logic Probe) which they retain for use in other electronic courses.

ELN9103   DC AND AC ELECTRONICS
Emphasis is placead on labs. Areas of study include what electricity is, how it is produced, voltage, current, power, resistance and how to identify and measure the various components, as well as the relationship between them, the theory of alternating current and its special applications in electronic circuits. Topics covered include RMS, average, applied, peak-to-peak and instantaneous values. Lab experiments deal with RC and RL circuits, transformer characteristics and LC filters. RLC circuits, and series and parallel resonance are also covered. Corequisite(s): MAT8001

MAT8001   MATH FUNDAMENTALS
Students learn foundational mathematics required in many College technical programs. Students also solve both measurement problems involving a variety of units and ratio and proportion problems. They manipulate algebraic expressions and solve equations. Students evaluate exponential and logarithmic expressions, study the trigonometry of right triangles and graph a variety of functions.

ROB8201   PNEUMATICS
Students demonstrate theoretical knowledge through the use of practical pneumatic circuits. Areas of study include designing and building pneumatic circuitry to address specific real-world industrial applications. Topics include but are not limited to units of measure, directional control valves, check valves, limit switches, flow controls and different pneumatic actuators.

WEL9107   WELDING – OXYACETYLENE AND ARC
This is a hands-on course in oxyacetylene, shield metal arc (SMAW), gas metal arc (MIG) and gas tungsten arc (TIG) welding. Students learn the basic setup and safe operation of all of these welding processes. Independent study and project-based learning are emphasized.

ELN9192   CIRCUIT APPLICATIONS
This is an intense theory and lab course offered in an independent learning mode. The properties and uses of semi-conductors are related to solid-state devices, diodes, transistors and integrated circuits. Lab experiments examine and illustrate the proper use of semi-conductor components. Components are then tied together to form amplifiers, operational amplifiers and power supplies. The course is built on a series of modules, where each module is a building block for the next. Analytical skills and troubleshooting skills are further developed through the use of experiments. The theory and experience used have widespread applications in electronics. Prerequisite(s): ELN9103

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 practise 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.

MAC9200   MACHINE SHOP
The principles of machining are covered. Focus is on metal removal operations and the selection of machine tools for specific operations, including the use of drill presses, lathes, milling machines, and grinders and jig borers. Prerequisite(s): MAT8001

PHY9182   SUSTAINABILITY IN TODAY'S MODERN WORLD
Social and economic aspects of sustainability are examined. Students explore a variety of topics that examine the ethics of current industry and how one issue can affect many other elements. Topics include: what is sustainability; and how does it affect me in my home; my employer; and our government. Sustainability, is it economically feasible. Making informed choices about sustainability for green energy, waste control and water conservation can only improve the planet.

ROB8311   ELECTRO-PNEUMATICS

Students demonstrate theoretical Electro-Pneumatic knowledge. Students use simulation software to design task specific Electro-Pneumatic circuits then select hardware to implement their designs. Circuit applications mimic real life industrial situations. Adaptation and modification criteria cause students to be resourceful and to think outside the box. Curriculum includes exposure to Units of measure, types of directional control valves, soleniods, flow control, various actuators timers and ladder diagrams. Prerequisite(s): ROB8201

CAD9101   COMPUTER-AIDED DESIGN AND COMPUTER NUMERICAL CONTROL

Students use Computer-Aided Design and Computer Numerical Control equipment to produce prototype parts. Students produce drawings on a CAD system and program a CNC machining centre to produce the desired design. Independent study and lab-centered exercises are emphasized. Innovative design is encouraged.

ELN8303   DIGITAL LOGIC ANALYSIS

The theory of digital logic, including number systems is covered. Topics of study include logic gates and Boolean algebra, the introduction to PLD's, sequential logic, combinational logic, flip-flops, counters and shift registers. Using lab experiments, students learn to design and apply modern digital circuitry. Prerequisite(s): ELN9192

ELN9203   MICROCONTROLLERS

The microcontroller is one of the most comprehensive and versatile self-contained electronic control components in existence. Working as a tiny dedicated computer, this chip is perfect for applications requiring mobility. As a result, an understanding of the microcontroller is vital to any study of robotics. A PIC microcontroller and assembly language are used to expose the student to various fundamental programming and interfacing techniques. Analytical and troubleshooting skills are further developed through experiments with the PIC and its associated components. Prerequisite(s): ELN9192

ELN9211   DC AND AC MOTOR CONTROLS

DC and AC motors are an intricate part of any industrial process. A thorough knowledge of how motors are controlled is a great asset to any electro-mechanical technician. Various motors and their control circuits are examined. The student gains practical experience wiring and troubleshooting single and three phase circuits using logic control, forward/reverse starters, multiple motor control, relays and timers. Prerequisite(s): ELN9192

ELN9204   MICROCONTROLLER INTERFACING AND PROGRAMMING

Interfacing the PIC microcontroller to an assortment of electronic components demonstrates many of the various ways these components can be used in industry. Topics include Temperature Sensors, Proximity Sensors, EEPROM Programming, Analog to Digital Conversion, Clocking Data in and out, Interfacing Displays, Real-Time Interfacing and Programming the PIC using C. Different methods of circuit analysis and troubleshooting skills are examined through experimentation with the PIC and its associated components. Prerequisite(s): ELN8303 and ELN9203

ELN9206   MECHANISMS

Students are exposed to a variety of mechanical components found in almost all machines. These components include bearings, seals, shafts and keys, couplings, brakes, and clutches and threaded fasteners. Types of friction and lubrication are introduced.

ELN9207   PROGRAMMABLE LOGIC CONTROLLERS

The programmable logic controller has become the most powerful change to occur in the electronics world for factory automation. The ability to replace large banks of mechanical timers and relays with a software alternative has provided large cost savings in terms of equipment and upgrades. As an electro-mechanical technician, you run into the PLC in a wide variety of applications. Practical experience in interfacing the PLC to conveyor belts, motors, sensors, pneumatic circuits, level sensors, robots and more is provided. Completion of this course enables a technician to convert a machine that is presently controlled by relay logic and motor driven timers to one that is PLC controlled. Knowledge gained from this course shows you that the PLC is as important to the industrial automation world as the personal computer is to the business world. Prerequisite(s): ELN9211

ENL1819T   REPORTING TECHNICAL INFORMATION

Students draw upon knowledge acquired through their studies and through research to improve their skills in communication, critical thinking, and the documentation, and evaluation of both primary and secondary sources. These combined skills are demonstrated in the production of workplace-oriented, vocationally-related documents and presentations. Emphasis is placed on technical communication goals which students are required to achieve for graduation. Prerequisite(s): ENL1813T

ROB9205   INDUSTRIAL ROBOTS

Students explore robotic applications and the various elements of robotic systems. They are exposed to a variety of robots and their various parts; drives, controllers, arms, sensors and end effectors. This course involves research and creativity on the part of the student and a final project that simulates an industrial process. Prerequisite(s): ELN8303 and ELN9203

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GED0550   GENERAL EDUCATION ELECTIVE

For this course, students have the opportunity to choose one from a group of general education electives. Options include courses which cover the following broad topic areas: Arts in Society, Civic Life, Social and Cultural Understanding, and Personal Understanding.

Equivalents*: ARC9001, DSN2001, ENL7643, ENV0002, FAM1218, FIN2300, GED1896, GED5002, GED5005, GED5006, GED5008, GED5200, GED6022, GEN1001, GEN1957, GEN2000, GEN2003, GEN2007, HIS0001, HIS2000, HOS2228, LIB1982, MGT7330, MVM8800, PSI1702, RAD2001, SOC2003 or PSI0003

** Course descriptions for equivalents are available for viewing through the online version of this brochure at **www.algonquincollege.com/full-timeprograms**.*