

ELECTRICAL ENGINEERING TECHNOLOGY

Program Outline

Major:	EETY
Length:	3 Years
Delivery:	6 Semesters, plus 3 work terms
Credential:	Ontario College Advanced Diploma, Co-op
Effective:	2016-2017
Location:	Barrie
Start:	Fall (Barrie), Winter (Barrie)

Description

The curriculum incorporates theory, applications and practical experience from the manufacturing, robotics, computer communications and utilities industries, along with concepts from the sciences and humanities to ensure the graduate is provided with current technical knowledge, skills and practice.

Career Opportunities

There has never been a better time to enter the field of Engineering Technology to serve today's global market economy. The numbers of jobs in Electrical Technology have been growing steadily including opportunities in specialized robotics manufacturers, automotive support industries, equipment manufacturers, and utilities as well as product installation and service, design and testing, research, maintenance, industrial sales and marketing, estimating, contract and project administration as well as quality control.

Program 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;
- apply basic entrepreneurial strategies to identify and respond to new opportunities;
- explain how electrical and electronic systems and work practices impact the environment.

Practical Experience:

Co-operative Education is a mandatory component of all Co-op programs at Georgian College; it has been designed as a process by which students integrate their academic education with work experience related to their programs of study. This integration affects much more than simply earning a salary, including the adjustment to the work environment and the development of professionalism. It also reinforces skills and theory learned during academic semesters, develops professional contacts, job knowledge and career path, improves human relations and communication skills, and promotes personal maturity and financial independence.

Students are requested to register, attend and participate in their scheduled co-operative education classes. These classes are scheduled for all first year students and are expected to be completed in order for students to proceed successfully to their first co-op work experiences. To ensure students are eligible to proceed onto any co-op work experience, students should refer to Promotional Status and Eligibility for Co-op as outlined in the College Calendar. Co-op policies and procedures can be located on our website: www.georgiancollege.ca/student-services/co-op-and-career-services/students-tab/

Georgian College follows the Co-operative Education guidelines set out by the Canadian Association for Co-operative Education (CAFCE) and Education at Work Ontario (EWO) by supporting the learning outcomes designed for the program specific graduate profile and curriculum as set out by the Ministry of Training, Colleges and Universities.

External Recognition:

This program is accredited by Technology Accreditation Canada (TAC) and by the Ontario Association of Certified Engineering Technicians and Technologists (OACETT).

This program is accredited by the Canadian Association for Co-operative Education (CAFCE).

The Program Progression:

Fall Intake - Barrie

Sem 1	Sem 2	Work Term 1	Sem 3	Work Term 2	Sem 4
Fall 2016	Winter 2017	Summer 2017	Fall 2017	Winter 2018	Summer 2018
Work Term 3 Sem 5 Sem 6					
Fall 2018	Winter 2019	Summer 2019			

Winter Intake - Barrie

Sem 1	Sem 2	Work Term 1	Sem 3	Work Term 2	Sem 4
Winter 2017	Summer 2017	Fall 2017	Winter 2018	Summer 2018	Fall 2018
Work Term 3 Sem 5 Sem 6					
Winter 2019	Summer 2019	Fall 2019			

Articulation:

A number of articulation agreements have been negotiated with universities and other institutions across Canada, North America and internationally. These agreements are assessed, revised and updated on a regular basis. Please contact the program co-ordinator for specific details if you are interested in pursuing such an option. Additional information can be found on our website at <http://www.georgiancollege.ca/admissions/credit-transfer/>

Admission Requirements:

OSSD or equivalent with

- Grade 12 English (C or U)
- Grade 12 Mathematics (C or U)

Mature students, non-secondary school applicants (19 years or older), and home school applicants may also be considered for admission. Eligibility may be met by applicants who have taken equivalent courses, upgrading, completed their GED, and equivalency testing. For complete details refer to: www.georgiancollege.ca/admissions/policies-procedures/

Applicants who have taken courses from a recognized and accredited post-secondary institution and/or have relevant life/learning experience may also be considered for admission; refer to the Credit Transfer Centre website for details: www.georgiancollege.ca/admissions/credit-transfer/

Additional Information:

Students who have graduated from Georgian College's Electrical Techniques Certificate program (ELTQ) must apply to be admitted with advanced standing. ELTQ students, upon admission, must complete a selection of semester 1 and 2 courses to align with program progression.

Graduation Requirements:

- 32 Mandatory Courses
- 2 Communications Courses
- 3 General Education Courses
- 3 Co-op Work Terms

Graduation Eligibility:

To graduate from this program, the passing weighted average for promotion through each semester, from year to year, and to graduate is 60%. Additionally, a student must attain a minimum of 50% or a letter grade of P (Pass) or S (Satisfactory) in each course in each semester unless otherwise stated on the course outline.

Mandatory Courses

COMP2123 Introduction to Microprocessors and Computing
COMP3031 Networking
DRFT1003 Introduction to Technical Drafting
ELEC1000 CAD Electrical Circuits
ELEC1001 AC Circuit Fundamentals
ELEC1002 Electrical Systems and Control
ELEC2005 Electrical Machines
ELEC2007 CAD Electrical Layouts
ELEC2008 Programmable Logic Controller 1
ELEC2010 Progressive Electrical Maintenance
ELEC2014 Hydro Codes and Standards
ELEC2023 Power Transmission and Distribution 1
ELEC2024 Electronic Fundamentals
ELEC2025 Digital Circuits
ELEC3002 Instrumentation
ELEC3004 Systems Integration
ELEC3006 Power Quality and Distribution
ELEC3007 Electrical Protection and Control
ELEC3009 Power Transmission and Distribution 2
ELEC3010 Advanced Programmable Logic Controllers
ELEN1000 DC Circuit Fundamentals
ELEN3001 Electronic Motor Control
GEOG2000 Geographic Information Systems
MATH1018 Introduction to Technical Mathematics
MATH1019 Technical Mathematics
MATH3000 Calculus
MGMT2002 Project Management
PHYS1001 Physical Sciences
ROBT2000 Introduction to Robotics
ROBT3003 Advanced Robotics
STAT3002 Applied Statistics
TECR3008 Technical Report

Communications Courses

To be selected at time of registration from the College list, as determined by testing.

General Education Courses
To be selected from College list

Co-op Work Terms
COOP1044 Electrical Work Term 1
COOP2036 Electrical Work Term 2
COOP3014 Electrical Work Term 3

Course Descriptions:

COMP2123 Introduction to Microprocessors and Computing 42.0 Hours
In this course students examine how computers and microprocessors function and interconnect. They analyze the operation of computer hardware and examine the interaction between hardware and software. Through a series of hands-on exercises and the supporting theory students will use microprocessors in control and data acquisition applications.
P- ELEC2018 Electronic Devices or P- ELEC2024 Electronic Fundamentals or P- ELEN2000 Electronic Fundamentals

COMP3031 Networking 42.0 Hours
In this course, students are introduced to data communications, networking fundamentals and interfacing for the purpose of linking PC workstations to equipment for data acquisition and process control. An overview of industrial communication protocols and SCADA systems are also introduced.

COOP1044 Electrical Work Term 1 560.0 Hours
Co-operative Education provides students with the skills to conduct a college supported self-directed job search in their chosen field of study. Students obtain a co-op work experience with an employer for a period of 14 weeks. All students are responsible to submit a work term record for approval prior to starting work, and a work term report indicating achievement of specific learning outcomes during their first co-op work term. Georgian College follows the Co-operative Education guidelines set out by the Canadian Association for Co-operative Education (CAFCE) and Education at Work Ontario (EWO) by supporting the learning outcomes designed for each program.
P- CPHR0001 Co-op and Career Preparation

COOP2036 Electrical Work Term 2 560.0 Hours
Building on previous Co-op experience, students continue to gain valuable experience and develop knowledge and skills related to their program. Students gain experience with a variety of electrical functions in the workplace. Students returning to their previous employer are asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes be achieved.

P- CPHR0001 Co-op and Career Preparation

COOP3014 Electrical Work Term 3 560.0 Hours

Building on previous Co-op experience, students continue to gain valuable experience and develop knowledge and skills related to their program. Students gain experience with a variety of electrical functions in the workplace. Students returning to their previous employer are asked to seek new/more in depth responsibilities so that enhancement of program specific learning outcomes be achieved.

P- CPHR0001 Co-op and Career Preparation

DRFT1003 Introduction to Technical Drafting 42.0 Hours

This course will introduce the student to reading and understanding engineering drawings and the use of the computer as a drafting tool. Emphasis will be on creating accurate, clear drawings. Standards and conventions will be presented and their applications will be shown using CAD.

ELEC1000 CAD Electrical Circuits 42.0 Hours

This course stresses the development of a reasonable skill in preparing and interpreting basic electrical engineering drawings. The student will produce neat and accurate drawings of single line, schematic, connection and inter-connection diagrams. Emphasis will be on industrial power and control applications. Computer Aided Drafting methods will be used to prepare the drawings.

P- DRFT1003 Introduction to Technical Drafting

ELEC1001 AC Circuit Fundamentals 56.0 Hours

A study of single and three phase power systems with various resistive and reactive loads; the relationship between real, apparent and reactive power - including the use of power, phasor and impedance diagrams; methods of measuring power; calculations power factor.

P- ELEN1000 DC Circuit Fundamentals

ELEC1002 Electrical Systems and Control 56.0 Hours

The principles of motor control and protection in both AC and DC circuits are developed for forward, reverse and speed regulating applications using electromechanical devices. Control of special motors such as synchronous and wound rotor are analyzed. Standard motor control circuit diagrams and symbols receive detailed attention.

ELEC2005 Electrical Machines 56.0 Hours

This course examines the basic theory, characteristics, construction operation and application of rotating electrical machines. It includes the study of direct current motors, direct current generators, alternators, synchronous motors, polyphase induction motors and single phase motors.

P- ELEC1001 AC Circuit Fundamentals

ELEC2007 CAD Electrical Layouts 42.0 Hours

This course stresses continued development in the skills of preparing and interpreting electrical drawings with emphasis placed on electrical layout and installation drawings such as electrical panel and equipment layouts, cable schedules and conduit installation drawings. Drawings will be prepared on CAD. Specific customization of CAD as it relates to electrical drawings will also be covered.

P- ELEC1000 CAD Electrical Circuits

ELEC2008 Programmable Logic Controller 1 42.0 Hours

This course develops the functional design, hardware configuration, programming and application of Programmable Logic Controllers (PLC). The design and programming of control circuits using examples from industrial applications will be emphasized. The application of PLC's in process automation will be examined. An overview of functional hardware design will be included. The equipment used will be small and medium sized PLC's with both digital and analog capabilities.

P- ELEC1002 Electrical Systems and Control

ELEC2010 Progressive Electrical Maintenance 42.0 Hours

To be able to manage the maintenance function - to identify safe working habits - interpret all necessary information from various manuals electrical plans - Set up maintenance schemes, lubrication - training - tooling - testing. Repairing. Costing - on various types of plant equipment.

P- ELEC1002 Electrical Systems and Control

ELEC2014 Hydro Codes and Standards 56.0 Hours

This course is designed to introduce the student to the structure and content of the Ontario Electrical Code. Students use design practice and principles applied to distribution and transmission standards as used by utilities in Ontario. Job analysis and design, planning, equipment selection, and government and legal challenges are covered as applied to new upgraded electrical infrastructure.

ELEC2023 Power Transmission and Distribution 1 56.0 Hours

This course is an introduction to power systems. The basic engineering principles of how electrical power is generated, transmitted, distributed and controlled are developed through examination of transformer design, power transmission equipment, and the electrical code.

P- ELEC1001 AC Circuit Fundamentals

ELEC2024 Electronic Fundamentals 42.0 Hours

In this course students explore the theory and principles of electronic devices and circuits. Special attention is devoted to topics related to rectification, power switching and control. Laboratory experiments reinforce theory and provide the student with experience in the use of test instruments and procedures to explore the characteristics and applications of electronics in industrial and commercial applications.

ELEC2025 Digital Circuits 42.0 Hours

This course thoroughly explores the theory and application of digital circuits. Special attention is devoted to topics related to logic gates, flip-flops, encoders, decoders, advanced digital systems, A/D and D/A conversion. Laboratory experiments reinforce lecture theory and provide the student with experience in the use of test instruments and procedures.

ELEC3002 Instrumentation 42.0 Hours

This course will introduce industrial instrumentation as used for troubleshooting, process measurements and process control. Specifically, the course will discuss measurement terminology, differentiating between analog and digital, describe the instrumentation used for electronic testing and develop the principles of operation of transducers used for industrial process measurement and control.

ELEC3004 Systems Integration 42.0 Hours

This course brings together the content of many preceding courses and applies that content to the requirements of systems integration. The problems associated with interconnection and interworking of different components will be explored, and typical solutions will be illustrated using conveyors, manufacturing tools, and robotic devices. The course is largely a hands-on experience in an automated manufacturing environment.

(C- ELEC3010 Advanced Programmable Logic Controllers or C- ELEC3008 Advanced PLCs and Industrial Networks) and P- MGMT2002 Project Management

ELEC3006 Power Quality and Distribution 42.0 Hours

The focus of this course will be on power quality infrastructure, primarily focusing on an AC powerline environment. A review of AC power basics will lead the student into a study of power quality including the causes and effects of transient voltage surges. Surge Protective Devices (SPD's) will be studied in defending against disruptive and damaging effects of surges. Upon completion, the student should be able to properly implement efficient, cost effective SPD installations in a broad range of application environments.

P- ELEC1001 AC Circuit Fundamentals

ELEC3007 Electrical Protection and Control 42.0 Hours

Following a review of power system equipment, students will define common protection terms and use common IEEE device designations while performing acceptance tests on protective relay schemes and elements. Combined with logic statements and a breaker control scheme, students will develop a coordinated over-current protection scheme as found in large manufacturing or utility environments. The culmination of the course will have the students analyze protection event reports to determine correct protection system function.

(P- ELEC2004 Digital Circuits and P- ELEC2006 Power Transmission and Distribution 1) or (P- ELEC2006 Power Transmission and Distribution 1 and P- ELEC2018 Electronic Devices) or (P- ELEC2023 Power Transmission and Distribution 1 and P- ELEC2025 Digital Circuits)

ELEC3009 Power Transmission and Distribution 2 56.0 Hours

This is an advanced Power Transmission and Distribution course where students perform per unit calculations, symmetrical component and fault studies for power system analysis. Power factor correction and energy management techniques are studied within the course. In the lab component, students gain the practical experience needed to work in an industrial and/or power utilities (generation, transmission, distribution) environment.

P- ELEC3007 Electrical Protection and Control

ELEC3010 Advanced Programmable Logic Controllers 56.0 Hours

This course covers advanced programming and hardware concepts. Topics include: advanced relay logic and SFC programming, data types, math, data movement, program control, analog signals and specialized I/O, diagnostic programming, data acquisition, techniques for documenting a PLC program, PLC networking, and revision control.

P- ELEC2008 Programmable Logic Controller 1

ELEN1000 DC Circuit Fundamentals 56.0 Hours

This course introduces the student to the fundamental concepts of direct current electricity using power related applications where possible. Topics include: series and parallel DC circuits, magnetism, inductance, capacitance, DC metering applications and an introduction to network analysis.

ELEN3001 Electronic Motor Control 42.0 Hours

Electronic motor control is rapidly changing the way we use motors. An adjustable speed drive can give closer control of your process, reduce your energy bill and reduce stress on mechanical loads. These benefits are only possible if the ASD is correctly selected, applied and maintained. This course will cover these requirements and will include the usage of modern troubleshooting and diagnostic test instruments.

P- ELEC2005 Electrical Machines

GEOG2000 Geographic Information Systems 42.0 Hours

This course will provide an introduction to the topic of Geographic Information Systems (GIS). It will familiarize the student with the basics of the technology and provide an appreciation for the use of GIS in both business and government. Projects will familiarize the student with the use of digital maps, various forms of data input, analysis and the presentation of finished products.

MATH1018 Introduction to Technical Mathematics 42.0 Hours

Students are provided a foundation in mathematics in engineering technology and related programs. Students will develop skill in mathematical thinking and problem solving, and appropriately apply technology in the solution of engineering related problems using algebra, geometry, right angle trigonometry, trigonometric functions of any angle, systems of linear equations, and exponential and logarithmic functions. Additional time to strengthen and reinforce mathematical competencies will be made available to those students who require it.

MATH1019 Technical Mathematics 42.0 Hours

Students will continue to develop mathematical reasoning and problem solving which will be reinforced through problems in an engineering context. This course extends the mathematics ideas taught in Introduction to Technical Mathematics through advanced mathematics problems needed for mechanical engineering programs. Mathematics concepts reinforced and extended are algebra, systems of linear equations, vectors and oblique triangles, graphs of trigonometric functions, complex numbers, Sequences Series and the binomial theorem.

P- MATH1018 Introduction to Technical Mathematics

MATH3000 Calculus 42.0 Hours

This course in calculus is intended to develop practical skills in differential and integral calculus. As well, it is intended to illustrate various applications of calculus to technical problems. The rules of differentiation will be introduced, and methods of differentiating various algebraic and transcendental functions will be developed. Applications of differential calculus to finding roots of equations by Newton's method, to finding maxima and minima, and to developing power series representation for functions will be studied. Methods of algebraic integration will be introduced, with both definite and indefinite integrals being determined for a variety of functions. The use of tables of integrals for finding solutions for difficult integrals will be introduced. Numerical integration using Simpson's rule will also be developed. Various applications of integration will be studied including Fourier series. First and second order differential equations will be introduced and methods of solving will be developed. These methods will include laplace transforms.

P- MATH1019 Technical Mathematics or P- MATH1006 Mathematics for Technology

MGMT2002 Project Management 42.0 Hours

Throughout their career, technologists will be involved in many projects. Students will be introduced to the fundamental principles necessary for the successful management of any project. Through simulation and real project planning, students will develop skills in creating proposals, budgets, risk assessments, Gantt charts, critical path reports, progress reports, and other industry standard planning and reporting techniques.

PHYS1001 Physical Sciences 42.0 Hours

This is a course designed to introduce students to the basic concepts of Physics. It deals with topics which include basic mechanics, simple harmonic motion natural frequencies

and sound; heat, thermal expansion, temperature and heat transfer; electromagnetic waves, light optics electricity and magnetism. These concepts are developed by considering practical related examples. Laboratory experiments may be used to illustrate and investigate the principles involved.

ROBT2000 Introduction to Robotics 42.0 Hours

This is an introductory course in industrial robots. There are two main classes of industrial robots - continuous path robots and pick- and-place robots. Students in this course will learn to operate, program, and service modern continuous path industrial robots. They will also learn to design, construct, and program pneumatic pick-and-place robots using current industrial standards and materials. Proper robot safety procedures will be emphasized throughout the course.

ROBT3003 Advanced Robotics 42.0 Hours

This course covers advanced programming and hardware concepts associated with industrial robots. In this course, several robots are programmed to work together and with other common automation systems to increase the efficiency and throughput of industrial automation processes. Robot safety procedures and standards will be emphasized throughout the course.

P- ROBT2000 Introduction to Robotics

STAT3002 Applied Statistics 42.0 Hours

Elementary statistical methods and applications to engineering problems, samples and populations, frequency distributions, probability theory, basic distributions, random sampling, point and interval estimation, hypothesis testing and linear regression and correlation are studied.

TECR3008 Technical Report 42.0 Hours

Students complete and present, both written and orally, a major technical report of at least 3000 words in the narrative portion of the report. The course is largely self-directed. The content of the report will be developed around a technical topic that is relevant to the student's program area in Engineering Technology. The content of the report is based on original research and design, includes a review of the literature in a specific technical field and/or is based on data obtained or processes worked on during the student's co-op experiences.

P- MGMT2002 Project Management and (P- COMM1014 Media Communication or P- COMM1015 Proposal Writing or P- COMM1016 Communication Essentials or P- COMM1017 Work Environment Communication or P- COMM1019 Virtual Communication or P- COMM1020 Technical Communication or P- COMM1021 Dynamic Presentations or P- COMM1022 The Visual World)

Course Description Legend

P = Prerequisite; C = Concurrent prerequisite; CO= Corequisite

Information contained in College documents respecting programs is correct at the time of publication. Academic content of programs and courses is revised on an ongoing basis to ensure relevance to changing educational objectives and employment market needs. The college reserves the right to add or delete programs, options, courses, timetables or campus locations subject to sufficient enrolment, and the availability of courses.