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: 2012-2013
Location: Barrie
Start: Fall (Barrie), Winter (Barrie)

Description

The Electrical Engineering Technology Program 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:
- communicate effectively and use interpersonal skills;
- utilize computer aided drafting media to plan and organize graphical layouts;

- work effectively as an individual and team member in any setting with an awareness of leadership responsibilities;
- use computer and electronic systems literacy in a range of applications;
- analyze problems using critical thinking and create innovative problem solving solutions;
- apply generic and workplace skills for personal and professional growth;
- apply the benefits of general education to participate in society as an informed citizen and pursue an enriched personal and professional life;
- apply all skills and knowledge acquired in co-op work experiences;
- apply a wide variety of mathematical techniques with the degree of accuracy required to solve problems and make decisions;
- apply and specify instrumentation in electrical, electronic, pneumatic, and hydraulic control systems for manufacturing, process control and robotics operations;
- compare designs against engineering Standards;
- summarize the basic equipment needs of motion control systems;
- apply the basic principles of automatic control systems;
- perform calculations for power circuits;
- apply specific knowledge in the use and specification of automated test equipment;
- specify interfaces, communication protocols and automated systems integration solutions for computer based networked control systems;
- select and use software programs appropriate to the test equipment and task;
- assist in conducting quality control and quality assurance procedures in the distribution network in the power industry;
- prepare and maintain records and documentation systems;
- apply principles of networking, microprocessor systems, instrumentation, telecommunications, and other related technologies to reach completion of electrical engineering tasks in automation, power generation, distribution, and utilities industries;
- analyze grid systems using per unit, scalar and vector modeling encompassing paralleling effects of power generators and transformers;
- perform tasks in accordance with relevant law, policies, procedures, standards, regulations, environmental and ethical principles.

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 paid work experience related to their program 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 to proceed successfully to their first co-op work experience. 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.georgianc.on.ca/careers/for-students/

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.

The Program Progression:

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Fall Intake - Barrie

Sem 1 | Sem 2  | Work Term 1 | Sem 3 | Work Term 2 | Sem 4
-------------------------------------------------------------
Fall  | Winter | Summer      | Fall  | Winter      | Summer
2012  | 2013   | 2013        | 2013  | 2014        | 2014

Work Term 3 | Sem 5  | Sem 6
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Fall        | Winter | Summer
2014        | 2015   | 2015

Winter Intake - Barrie

Sem 1  | Sem 2  | Work Term 1 | Sem 3  | Work Term 2 | Sem 4
-------------------------------------------------------------
Winter | Summer | Fall        | Winter | Summer      | Fall
2013   | 2013   | 2013        | 2014   | 2014        | 2014

Work Term 3 | Sem 5  | Sem 6
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Winter      | Summer | Fall
2015        | 2015   | 2015
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Admission Requirements:
Applicants must meet ONE of the following requirements to be eligible for admission to this program:
- OSS Curriculum: OSSD or equivalent Grade 12 English (C) or (U) (ENG4C, ENG4U); plus any Grade 12 College Mathematics (MAP4C or MCT 4C), or any Grade 12 University Mathematics. Also recommended: any Grade 11 (C) or (U/C) and/or any Grade 12 (C) or (U/C) Physics)

- Academic and Career Entrance Certificate (ACE) program with: Communications; Business, Apprentice or Technical Mathematics
- Ontario High School Equivalency Certificate (GED)
- Mature applicant with standing in the required courses and/or mature student testing that meets the minimum standards for admission

Applicants who are 19 years of age or over by the first day of classes, and who lack the academic entrance qualifications, may be considered for entrance to an appropriate post-secondary diploma or certificate program as mature applicants. Each applicant will be considered on an individual basis and acceptance will be determined by counselling, Communication Placement Assessment (CPA), previous post-secondary education and evaluation of experience. Some programs also have specific prerequisite requirements that must be met prior to admission. Mature applicants must meet all program specific prerequisites. Those applying as mature students and having no documentation of Grade 12 education must supply, if required, proof of age, such as a copy of an official birth certificate or driver's licence. Refer to Section 2.5 and 2.6 of the Academic Calendar for further details.

Graduation Requirements:
29 Mandatory Courses
2 Communications Courses
5 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.

Mandatory Courses
DRFT1003   Introduction to Technical Drafting
ELEC1000   CAD-Electrical Circuits
ELEC1001   AC Circuit Fundamentals
ELEC1002   Electrical System and Control 1
ELEC2005   Electrical Machines
ELEC2006   Power Transmission and Distribution
ELEC2007   CAD Electrical Layouts
ELEC2008   Programmable Logic Controller 1

ELEC2010   Progressive Electrical Maintenance
ELEC2011   Power Transmission and Distribution 2
ELEC2014   Hydro Codes and Standards
ELEC2018   Electronic Devices
ELEC3002   Instrumentation
ELEC3004   Systems Integration
ELEC3006   Power Quality and Distribution
ELEC3007   Electrical Protection and Control
ELEC3008   Advanced PLCs and Industrial Networking
ELEN1000   DC Circuit Fundamentals
ELEN3001   Electronic Motor Controls
ENVR1003   Environmental Health and Safety
GEOG2000   Geographic Information Systems
MATH1006   Mathematics for Technology
MATH3000   Calculus
MGMT2002   Project Management
PHYS1001   Physical Sciences
ROBT2000   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
COOP1022   Electrical Work Term 1
COOP2017   Electrical Work Term 2
COOP3009   Electrical Work Term 3

Course Descriptions:
COOP2017 Electrical Work Term 2 560.0 Hours
Co-operative Education will allow students to gain new and /or enhanced technical work experience. As students begin to recognize their chosen academic strengths and career direction, they will be better prepared to choose their academic courses and professional options. All students are responsible for submitting a work term report and employer evaluation form following this work term.

P- COOP1022 Electrical Work Term 1

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.

ELEC1002 Electrical System and Control 1   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.

ELEC2006 Power Transmission and Distribution   42.0 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.

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, conduit installation

drawings and printed circuit design. Drawings will be prepared on AutoCAD. Specific customization of AutoCAD 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 developes 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.

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.

ELEC2011 Power Transmission and Distribution 2   42.0 Hours
This is an advanced Power Distribution course that performs per unit calculations for grid system analysis. Scalar and vector modeling are used to describe the paralleling effects of generator and transformers. 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 environment and/or power utilities (generation, transmission, distribution).

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.

ELEC2018 Electronic Devices   56.0 Hours
This course explores the theory and principles of electronic devices and 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, power switching and control. 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.

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.

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- ELEC2011 Power Transmission and Distribution 2

ELEC3008 Advanced PLCs and Industrial Networking   56.0 Hours
This course covers advanced programming and hardware concepts of PLC's and their electrical, electronic, mechanical and software integration. It also covers networking fundamentals and interfacing of electrical equipment for the purpose of data acquisition and process control. Topics include data management, program control, analog and scaling, programming languages, data communication standards, network adapter configurations and networking hardware. A system overview of industrial SCADA systems is also introduced.

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 Controls   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.

ENVR1003 Environmental Health and Safety   42.0 Hours
This course provides an overview of the requirements of current legislation and standards pertaining to environmental health and safety in the workplace. Health and safety management systems, hazardous materials management, WHMIS, biological, physical and chemical hazards, environmental monitoring devices, confined space entry, personal protective equipment, and emergency response will be examined.

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.

MATH1006 Mathematics for Technology   42.0 Hours
This course provides a foundation in mathematics for students in engineering technology or engineering related programs. Mathematical techniques are applied to a range of technical and financial problems.

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.

MGMT2002 Project Management   42.0 Hours

This course introduces the fundamental principles necessary for successful management of projects. Project planning, management and control techniques will be discussed and the application of computers in project management will be studied.

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 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.

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
The student will demonstrate communication skills by completing and presenting, 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 may be based on original research and/or based on a current review of the literature in a specific technical field and/or based on data obtained or processes worked on during the student's co-op experiences.

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.