

# CIVIL ENGINEERING TECHNOLOGY

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## Program Outline

<b>Major:</b>	CVTY
<b>Length:</b>	3 Years
<b>Delivery:</b>	6 Semesters, plus 2 work terms
<b>Credential:</b>	Ontario College Advanced Diploma, Co-op
<b>Effective:</b>	2015-2016
<b>Location:</b>	Barrie
<b>Start:</b>	Fall (Barrie)

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### Description

This three-year program is scheduled to take advantage of the construction seasons. The program prepares graduate technologists to work with engineers, designers, and construction project managers as an integral part of the team. Students are exposed to three program principles: 1) proposal development (construction of roads, bridges, sewers, water mains, and other infrastructure), 2) cost estimation, and 3) field work (materials testing and project administration). A comprehensive understanding of the latest codes and standards, site management techniques, and related computer technologies equip graduates to succeed in this rapidly evolving and growing industry.

### Career Opportunities

Graduates find work in the private sector as quantity surveyors (estimators), purchasers, site supervisors and project managers, drafters, or detailers using CAD technology. They may also find employment as assistants in engineering offices. Public sector employment in a variety of government agencies, including building inspection/code enforcement are employment options for the graduate.

### Program Learning Outcomes

The graduate has reliably demonstrated the ability to:

- assemble, analyze, and appropriately apply civil engineering data from existing graphics, reports, and other documents;

- coordinate and facilitate the collection, processing, and interpretation of technical data related to civil engineering projects;
- communicate information effectively and accurately by analyzing, translating, and producing civil engineering documents;
- monitor that all work is completed in compliance with the rights and conditions of contractual obligations; applicable law, standards, bylaws, and codes; and the accepted principles and practices of civil engineering;
- schedule and coordinate civil engineering projects and monitor the quality and quantity of work;
- assist in planning, designing, inspecting, supervising, and constructing civil engineering projects;
- evaluate the methods employed and the use of equipment and materials involved in the implementation and completion of civil engineering projects;
- use electronic technology to support civil engineering projects;
- apply the principles of mathematics and science to analyze and solve technical problems related to civil engineering projects;
- manage and maintain systems for civil engineering project records, logs, and inventories.
- assist in the assessment of the political, social, and environment impacts of civil engineering projects;
- take into account the interdependence of the architectural, structural, mechanical, and electrical disciplines relating to civil engineering projects;
- facilitate liaison among the project stakeholders involved in the design and implementation of civil engineering projects;
- develop and use personal and professional strategies and plans to enhance professional growth and competence.

### **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/](http://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.

### **The Program Progression:**

Fall Intake - Barrie

Sem 1	Sem 2	Work Term 1	Sem 3	Sem 4	Work Term 2-dbl	Sem 5
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Fall	Winter	Summer	Fall	Winter	Summer	
2015	2016	2016	2016	2017	2017	2018
Sem 6						
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Summer						
2018						

### **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/](http://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/](http://www.georgiancollege.ca/admissions/credit-transfer/)

**Graduation Requirements:**

- 29 Mandatory Courses
- 2 Communications Courses
- 5 General Education Courses
- 2 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**

- CIVL1000 Quantity Surveying: Construction Plans and Measurements
- CIVL2000 Engineering Standards and Practices
- CIVL3000 Heavy Construction Estimating: Computer Applications
- CIVL3001 Estimating: Cost Analysis
- COMP1056 Civil Engineering Graphics
- COMP1057 CAD / Civil Construction
- CONS1003 Construction Practices
- CONS1004 Construction Practices and Design: Materials and Material Testing
- CONS2000 Construction Practices: Methods
- CONS2001 Construction Practices: Building Systems
- CONS2002 Site Development and Drainage
- CONS2003 Construction Practices and Design: Municipal and Provincial Codes and Standards
- CONS2004 Construction Practices and Design: Highways
- CONS3000 Structural Analysis: Beams and Columns
- CONS3003 Structural Analysis: Design
- CONS3006 Construction Practices and Design: Reinforced Concrete
- CONS3007 Construction Practices and Design: Structural Steel
- CONS3008 Construction in Ontario
- ECON2004 Engineering Economy
- ENVR1000 Environmental Science and Sustainability

MATH1018 Introduction to Technical Mathematics  
MATH1019 Technical Mathematics  
MENG2003 Statics  
MENG2007 Strength of Materials  
MGMT2002 Project Management  
MGMT3006 Contract Law: Bid Tender Process  
SURV1001 Civil / Construction Surveying  
TECR3005 Technical Project: Civil  
TECR3006 Civil Project Report Presentation

#### 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

COOP1028 Civil Engineering Work Term 1  
COOP2023 Civil Technology Work Term 2-3

#### **Course Descriptions:**

**CIVL1000 Quantity Surveying: Construction Plans and Measurements 42.0 Hours**  
This course introduces the student blue print reading and measurement techniques. Skills in estimating techniques and industry practices are applied to a small project. Students examine infrastructure projects and the computerized tools used to prepare competitive estimates in the bid tender process. Cost analysis, profit requirements and specific performance issues are discussed.

**CIVL2000 Engineering Standards and Practices 42.0 Hours**  
This course introduces the student to Standards from organizations including but not limited to CSA, (Canadian Standards Association), ASTM, (American Society for Testing and Materials), AASHTO, (American Association of State Highway Transportation Officials), and SCC, (Standards Council of Canada), as well as the professional practice requirements found in the industry today.

**CIVL3000 Heavy Construction Estimating: Computer Applications 42.0 Hours**  
The heavy construction industry uses commercial software extensively to prepare its estimates for large infrastructure projects including highway, sewer, and water main. This course presents students with the challenge of estimating costs and scheduling for large projects, utilizing a project driven format and fostering team skills.

P- CIVL1000 Quantity Surveying: Construction Plans and Measurements

CIVL3001 Estimating: Cost Analysis 42.0 Hours

Using the knowledge developed in the measurement and pricing subjects, the student is introduced to concepts of cost planning from project inception to end of contract. This subject covers various types of conceptual estimating, including elemental costing and analysis.

P- CIVL3000 Heavy Construction Estimating: Computer Applications

COMP1056 Civil Engineering Graphics 42.0 Hours

Students develop CAD skills and produce drawings using the standards of the construction industry. The course addresses drawing production in design offices. Its purpose is to convey the process followed at each stage of development between project inception and completion, and explores the interrelationship between the project owner, professionals, regulatory authorities and contractors.

COMP1057 CAD / Civil Construction 42.0 Hours

Continuing the development of students' skill with CAD software by introducing larger scale projects, this course emphasizes the professional quality and standards for drawings in the civil/construction field. The necessity for document control, cross referencing of details, and compliance with formal standards and field practices is key.

P- COMP1056 Civil Engineering Graphics

CONS1003 Construction Practices 42.0 Hours

An introductory study of the methods, and to a lesser extent materials, commonly used in Civil Engineering construction. Students address various equipment and their applications in the field. Efficiency and effectiveness are emphasized along with effective logistical management of a site. This course includes a significant Health & Safety component.

CONS1004 Construction Practices and Design: Materials and Material Testing 42.0 Hours

This course introduces concrete, asphalt, aggregates, and other construction materials and their applications in civil engineering projects. Students are introduced to engineering standards and the standard test methods associated with these common building materials. Mixed designs for concrete and asphalt are explored and tested.

CONS2000 Construction Practices:Methods 42.0 Hours

A study of materials and methods commonly used or seen in construction associated with architecture and infrastructure development are the basis for this course. Also included are common calculations and contract specifications for various types of projects.

CONS2001 Construction Practices: Building Systems 42.0 Hours

This course consists of advanced construction theory topics for architecture and design projects. Emphasis is placed on refinement of building design, materials and construction details. The course integrates architectural drawing standards, acceptable construction detailing principles, building code requirements and building systems.

P- CONS2000 Construction Practices:Methods

CONS2002 Site Development and Drainage 42.0 Hours

This course focuses on the design and installation of municipal services. The main topics are piping materials, sewer and water main appurtenances, and loads (both structural and hydraulic) on storm and sanitary drainage systems.

CONS2003 Construction Practices and Design: Municipal and Provincial Codes and Standards 42.0 Hours

This course introduces the student to practical standards from organizations such as the MTO, (Ministry of Transportation, Ontario), OPS, (Ontario Provincial Standards), and municipal requirements, which explore the application of these standards in design and specification writing.

CONS2004 Construction Practices and Design: Highways 42.0 Hours

This course examines the classification of highways with an emphasis on function. Studies include the relationship of spirals, curves, vertical curves, and super elevation. Students design a highway by conducting appropriate planning and using accepted geometric features and their interrelationships including alignment, intersections, and drainage. Legislation regarding the jurisdiction of roads in Ontario is examined.

CONS3000 Structural Analysis: Beams and Columns 42.0 Hours

This course incorporates the study of beam analysis and design in various materials, further investigation of combined stresses and the introduction of column design and indeterminate beams.

P- MENG2003 Statics and (P- MENG2017 Strength of Materials or P- MENG2007 Strength of Materials)

CONS3003 Structural Analysis: Design 42.0 Hours

This course focuses on the study of loads, design and materials. Overall design concepts are explored for such structures as retaining walls, bridges and different building types and their uses.

P- CONS3000 Structural Analysis: Beams and Columns

CONS3006 Construction Practices and Design: Reinforced Concrete 42.0 Hours

This course explores the design procedures for reinforced concrete. The design elements include one and two way slabs, beams and columns. Drawing details for placement of reinforcing steel are developed.

P- MENG2007 Strength of Materials

**CONS3007 Construction Practices and Design: Structural Steel 42.0 Hours**

The students design basic structural elements and steel including beams and columns and their connections. Connections, including welded and bolted, are evaluated under various loading conditions.

P- MENG2007 Strength of Materials

**CONS3008 Construction in Ontario 42.0 Hours**

This course familiarizes the student with the current environment within which the construction industry functions, and provides them with up-to-date management techniques. The application of quality standards, with specific emphasis on the quality/business aspects of the standard; as well as strategies for business planning and financial analysis as required by, or alluded to, in the standard, are thoroughly explored.

**ECON2004 Engineering Economy 42.0 Hours**

By understanding the financial constraints and opportunities of the industry, technologists contribute to decision making for capital projects and equipment. The course covers the concepts and techniques for the economic justification of engineering proposals and the economic benefits of capital expenditures.

**ENVR1000 Environmental Science and Sustainability 42.0 Hours**

Students will be introduced to ecological principles, population dynamics and energy resources in order to assess their impact on the environment. The major types of pollution are examined and their effects on the various components of the ecosphere analyzed. Strategies for pollution control and the conservation of the Earth's resources are examined in the context of economic considerations and sustainable development.

**MATH1018 Introduction to Technical Mathematics 42.0 Hours**

Students will develop foundational skills 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



#### MENG2003 Statics 42.0 Hours

The ability to analyze how structures react to applied forces is fundamental for Mechanical Engineering Technologists. Students will be introduced to the analysis of forces in and on externally loaded rigid bodies in static equilibrium. The equations of equilibrium are developed based on the Newtonian laws. Other concepts studied include force components, equilibrium, and free-body diagrams. Trusses and machines are also analyzed using the method of joints, the method of sections, and the method of members.

#### MENG2007 Strength of Materials 42.0 Hours

This course introduces students to the internal stresses and strains developed in engineering materials when externally loaded. Stresses, and resultant strains, studied include axial stress, shear stress, bending stress, and torsion. Bearing stress and stresses on oblique planes are also covered.

P- MENG2003 Statics

#### 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.

#### MGMT3006 Contract Law: Bid Tender Process 42.0 Hours

This course introduces specifications and contract building law, including analysis of Construction Law as it relates to the construction process. Legal issues that arise in the bidding process and contract administration are discussed. This is a comprehensive look at the construction industry and value of construction contracts from a practical non-legal framework.

#### SURV1001 Civil / Construction Surveying 42.0 Hours

This is an introductory course to plane surveying as related to the construction industry. Emphasis is placed on obtaining field skills in linear measurement and the operation of levels, transits, theodolites and total stations. Elevations, horizontal, vertical, and spiral curves are explored.

#### TECR3005 Technical Project: Civil 42.0 Hours

The student demonstrates 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 develops around a specific design and project simulation incorporating all of the learning the student has obtained to date. Students may use experience from their work terms as the basis for this design project and report or they may choose a relevant scenario as approved by faculty.

TECR3006 Civil Project Report Presentation 42.0 Hours

The student presents, both written and orally, the technical report introduced in semesters four and five. Presentations are made before an audience of student peers and representatives of the industry.

P- TECR3005 Technical Project: Civil

### **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.*