

# HEATING, REFRIGERATION AND AIR CONDITIONING TECHNICIAN

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## Program Outline

<b>Major:</b>	HRAC
<b>Length:</b>	2 Years
<b>Delivery:</b>	4 Semesters, plus 1 work term
<b>Credential:</b>	Ontario College Diploma, Co-op
<b>Effective:</b>	2013-2014
<b>Location:</b>	Barrie, Owen Sound, South Georgian Bay
<b>Start:</b>	Fall (Barrie, Owen Sound), Winter (South Georgian Bay)

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### Description

Students will develop the skills required to install, service, and maintain the environmental systems for residential buildings. This includes working with a variety of gas appliances as well as an introduction to refrigeration and air conditioning. There will be an emphasis on energy efficient and environmentally friendly approaches. Students will also read, utilize, and produce Heating, Refrigeration, and Air Conditioning (HRAC) drawings using industry standard software. Practical skills with sheet metal will be developed. The program will prepare students to write their Technical Standards and Safety Authority (TSSA) Gas Fitter II exams in order to become a licensed gas technician.

### Career Opportunities

The program primarily prepares students for a career as a gas technician. However, employment may also be found in the areas of technical support and sales within the HRAC industry. Furthermore, this program introduces practical skills as well as industry relevant applied math and science in order to facilitate the transition into a variety of other trades within the HRAC industry (such as sheet metal, air conditioning, refrigeration, plumbing, and pipe fitting). For those who want to work in these trades, an apprenticeship is required after graduation.

### Program Learning Outcomes

The graduate has reliably demonstrated the ability to:

- relate effectively to heating, refrigeration, and air conditioning supervisors, coworkers, and customers;
- work safely and in accordance with all applicable acts, regulations, legislation, and codes to ensure personal and public safety;
- select and use a variety of heating, refrigeration, and air conditioning tools and equipment safely and properly;
- solve math and applied science problems required to effectively install and maintain heating, refrigeration, and air conditioning systems, and associated components;
- prepare and interpret electrical, mechanical, and piping drawings;
- install, service, and troubleshoot heating, refrigeration, air conditioning systems, and associated components;
- develop strategies for ongoing personal and professional development, which will lead to enhanced work performance and career opportunities, and keep pace with industry changes;
- apply environmentally sound practices to work with heating, ventilation, air conditioning, and refrigeration.

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

Fall Intake - Barrie, Owen Sound

Sem 1	Sem 2	Sem 3	TSSA G3 Exam	Work Term 1	Sem 4
Fall 2013	Winter 2014	Summer 2014	Summer 2014	Fall 2014	Winter 2015

Winter Intake - South Georgian Bay

Sem 1	Sem 2	Sem 3	TSSA G3 Exam	Work Term 1	Sem 4
Winter 2014	Summer 2014	Fall 2014	Fall 2014	Winter 2015	Summer 2015

### **Admission Requirements:**

You must meet ONE of the following requirements to be eligible for admission to these programs:

Secondary school applicants:

- OSS curriculum: OSSD or equivalent, with Grade 12 English (C) or (U) (ENG4C, ENG4U)

Non-Secondary school applicants (19 years or older):

- Any credit Communication course taken at Georgian College
- Most college preparatory programs including those taken at Georgian College: Technology Foundation, Technology Fundamentals and General Arts and Science\*
- Equivalent courses in English taken through secondary school or Independent Learning Centres (at the general, advanced, college or university level)
- Academic and Career Entrance Certificate (ACE) program with communications
- Mature student testing in English that meets the minimum standards for admission (available through most testing services)\*
- Ontario High School Equivalency Certificate (GED)
- English, Literature or Communication credit courses from accredited colleges/universities

Home school applicants:

- Applicants can write the mature student testing in English that meets the minimum standards for admission (available through testing services)\*

\* available from Georgian College. For a complete listing please contact the Office of the Registrar.

Non-secondary school 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. Mature applicants must meet all program specific prerequisites including all selection criteria; equivalencies are stated above. Applicants who are unsure whether they meet admission requirements should contact the Office of the Registrar. In addition, 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.

**Credit transfer and course exemptions:**

Applicants who have taken courses from a recognized and accredited post-secondary institution and/or have relevant life/learning experience may be eligible for credit transfer/course exemptions. Courses/experience must match at least 80% of the learning outcomes of a Georgian College course with a minimum grade of 60% or C achieved in previous coursework; some program exceptions apply (see program outline). For further information please visit the Credit Transfer Centre website: [georgiancollege.ca/admissions/credit-transfer/](http://georgiancollege.ca/admissions/credit-transfer/)

**Additional Information:**

Students must have successfully completed the TSSA G3 exam prior to going out on their co-op work term.

**Graduation Requirements:**

- 15 Mandatory Courses
- 2 Communications Courses
- 3 General Education Courses
- 1 Co-op Work Term

**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**

- DRFT2003 Drafting Techniques
- ENVR1000 Environmental Science and Sustainability
- GAST1000 Introduction to Electricity
- GAST1001 Professional Practices

GAST1002 Piping and Tubing Systems  
GAST1003 Introduction to Gas Appliances  
GAST1004 Pressure Regulator Controls  
GAST1006 Gas Appliances  
GAST1008 Forced Air and Space Heating  
GAST1009 Venting  
GAST1011 Water Heaters and Hydronic Heating  
GAST1012 Forced Air Add-Ons and Air Conditioning  
HRAC2000 Refrigeration and Air Conditioning 1  
MATH1018 Introduction to Technical Mathematics  
SCIE2001 Heating and Air Conditioning Science

#### 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 Term

COOP1029 HRAC Work Term 1

#### **Course Descriptions:**

DRFT2003 Drafting Techniques 42.0 Hours

This course covers the drafting skills (traditional as well as computer aided) required by HRAC technicians. Students will create field sketches and use CAD in the process of learning how to read, utilize, and produce drawings such as basic projections, perspectives, elevations, and details.

ENVR1000 Environmental Science and Sustainability 42.0 Hours

This course focuses on 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.

GAST1000 Introduction to Electricity 42.0 Hours

Students study basic electrical theory as it applies to the work of a gas technician. The required practical skills with electricity, such as how to measure supply wiring are covered. This course also introduces students to electrical measuring and testing instruments.

#### GAST1001 Professional Practices 42.0 Hours

This course covers customer relations as well as a variety of professional skills that are important for gas technicians. The course content emphasizes workplace safety and the interpretation of installation codes, acts and regulations. Students also study technical manuals, specifications, schematics, drawings and graphs in order to learn the relationship between mechanical and building systems.

#### GAST1002 Piping and Tubing Systems 42.0 Hours

Students apply the theoretical and practical skills that gas technicians require in order to install, service, and maintain piping and tubing. This includes hands-on work with piping/tubing systems greater than 2" and/or those that supply pressure greater than 0.5" psig.

#### GAST1003 Introduction to Gas Appliances 70.0 Hours

This course identifies the properties and characteristics of natural gas and propane with emphasis on the safe handling of natural gas. Students also apply basic concepts related to gas appliances as well as practical skills with the use of fasteners, hand tools, and power tools.

#### GAST1004 Pressure Regulator Controls 42.0 Hours

This course builds on the skills that students have developed with piping and tubing. This includes the important procedures used by Gas technicians in order to install, service and maintain pressure regulators and relief valves. In addition this course introduces important concepts related to mechanical and electronic controls.

#### GAST1006 Gas Appliances 126.0 Hours

This course identifies advanced concepts related to gas appliances. In addition students apply the practical and theoretical components related to the installation, servicing, and maintenance of non-vented gas appliances (including barbecues), domestic gas-fired refrigerators and conversion burners. This course also covers electrical work as it relates to gas appliances.

#### P- GAST1003 Introduction to Gas Appliances

#### GAST1008 Forced Air and Space Heating 84.0 Hours

The installation, service, and maintenance of forced warm air heating systems is the primary focus of this course. In addition students work with space-heating and decorative appliances. This course also covers the mechanical and electronic controls related to forced warm air heating systems and space heating appliances.

#### GAST1009 Venting 42.0 Hours

The theoretical and practical skills related to venting are covered in this course. Students are introduced to the practical procedures required to size, install, inspect, and repair venting systems.

**GAST1011 Water Heaters and Hydronic Heating 98.0 Hours**

Students are introduced to the skills and knowledge required to install, service, and maintain water heaters, combo units and portable water heaters. In addition this course covers the installation, service, and maintenance of gas fired hydronic heating appliances as well as those accessories that form an integral part of these appliances. Mechanical and electronic controls related to water heaters and hydronic heating devices are also examined.

**GAST1012 Forced Air Add-Ons and Air Conditioning 42.0 Hours**

Students in this course assess duct design, size plenum connection, and tie into an existing duct system. In addition, this course covers the installation, service, and maintenance of forced air add-on devices including the selection.

**HRAC2000 Refrigeration and Air Conditioning 1 70.0 Hours**

This course introduces basic theoretical concepts related to the laws of matter, fluids and pressure enthalpy (PH). The course also covers the practical skills used in working with refrigeration controls, refrigerants, evaporators, condensers and metering devices.

**MATH1018 Introduction to Technical Mathematics 42.0 Hours**

This course provides 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.

**SCIE2001 Heating and Air Conditioning Science 56.0 Hours**

This course provides a background in chemistry and physics as they pertain to the fields of heating, and air conditioning, with an emphasis on environmental themes and energy conservation. This includes topics such as electrochemistry, corrosion, and organic chemistry as well as topics from physics related to thermal expansion, temperature, heat transfer, electricity, and magnetism. The course also includes an introduction to Hydronics, and a practical applications lab.

**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.*