

# POWER ENGINEERING TECHNOLOGY

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## Program Outline

<b>Major:</b>	PETY
<b>Length:</b>	2 Years
<b>Delivery:</b>	5 Semesters, plus 1 work term
<b>Credential:</b>	Ontario College Advanced Diploma, Co-op
<b>Effective:</b>	2015-2016
<b>Location:</b>	Owen Sound
<b>Start:</b>	Fall (Owen Sound), Winter (Owen Sound)

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### Description

This program has been developed for those seeking employment as power engineering technologists who operate and troubleshoot the energy components in such industries as industrial power plants (chemical, food, pulp and paper etc.), electrical power plants (coal, gas, nuclear, wind, solar, methane, cogeneration, flex fuel etc.), or commercial buildings. The work may involve system monitoring and work with boilers, turbines, and condensers in steam power plants as well as internal combustion engines. Subjects of instruction will follow the Standardized Power Engineers Examination Committee (SOPEEC) syllabus and prepare the students to write the Technical Standards and Safety Authority (TSSA) examinations for 4th and 3rd class certification after 2 years as an operator. This program features co-operative training and use of a state-of-the-art power systems control room simulator.

### Career Opportunities

The graduate of this program may find a rewarding career as a power or operating engineer in a wide variety of industries including electrical power generating plants, heavy and lighter industries, schools, hospitals and other commercial buildings. This may include operation of a small scale power plant such as those that exist in remote northern aboriginal communities.

### Program Learning Outcomes

The graduate has reliably demonstrated the ability to:

- work in accordance with practices and procedures that minimize risk and enhance personal and public safety;
- operate the components of a power plant including boilers, turbines, internal combustion engines, generators, condensers, and auxiliary equipment;
- use industry standard power engineering technology in the performance of work and be able to adapt to changes in the industry;
- relate effectively to coworkers, subordinates, and supervisors in the work environment;
- perform duties in accordance with established codes, regulations, and legislation;
- work in a professional manner and employ ethical practices;
- use strategies that mitigate the effects of power generation on the environment;
- identify problems with power plant systems and equipment;
- apply basic entrepreneurial strategies to identify and respond to new opportunities.

### **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 - Owen Sound

Sem 1 | Sem 2 | Work Term | Sem 3 | Sem 4 | Sem 5

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Fall		Winter		Summer		Fall		Winter		Summer
2015		2016		2016		2016		2017		2017

Winter Intake - Owen Sound

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

### **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:**

23 Mandatory Courses

- 1 Work Integrated Learning
- 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 unless otherwise stated on the course outline.

**Mandatory Courses**

CHEM1010 Chemistry and the Environment  
CHEM2003 Advanced Chemistry and the Environment  
ELEC1009 Electricity and Controls  
ELEC3011 Instrumentation and Control Systems  
ELEC3012 Power Engineering Electricity  
HRAC1000 Refrigeration and Air Conditioning  
HRAC3006 Advanced Refrigeration and Air Conditioning  
MATH2010 Power Engineering Mathematics  
MENG2018 Applied Mechanics  
PENG1005 Power Plant Simulation  
PENG1006 Power Plant Operations  
PENG1007 Introduction to Power Engineering  
PENG1008 Power Engineering Sciences  
PENG1009 Power Engineering Skills Lab  
PENG1010 Heating Systems  
PENG1011 Prime Movers and Engines  
PENG2005 Power Engineering Skills Lab 2  
PENG2006 Thermodynamics and Fluid Mechanics  
PENG2007 Advanced Power Plant Operations  
PENG2008 Advanced Prime Movers and Engines  
PENG2009 Power Plant Management  
PENG3007 Piping and Auxiliaries  
WETC1012 Welding and Metallurgy

**Work Integrated Learning**

PENG3008 Power Engineering Work Integrated Learning

**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

COOP1030 Power Engineering Work Term

**Course Descriptions:**

CHEM1010 Chemistry and the Environment 42.0 Hours

The structure of matter and chemical reactions are covered in this course. Students are introduced to the equipment and chemistry of boiler water treatment and perform water testing. Environmental pollutants are introduced.

CHEM2003 Advanced Chemistry and the Environment 42.0 Hours

Chemical reactions are examined and stoichiometric calculations are performed. Combustion processes and byproducts are predicted and analyzed. Metals are studied to understand their structure and corrosion mechanisms.

P- CHEM1010 Chemistry and the Environment

COOP1030 Power Engineering Work Term 560.0 Hours

This Co-op work term is designed to provide students with practical work experience to develop the competencies required for a power plant technologist. For most, this Co-op placement represents the beginning of a power engineering career. As such, students are expected to be involved in learning about the power plant's operations, the command structure and safety procedures.

ELEC1009 Electricity and Controls 70.0 Hours

Students learn about electricity and analyze electric circuits. Applications such as motors, generators and transformers are analyzed. Students also learn about power plant instrumentation and related control systems.

ELEC3011 Instrumentation and Control Systems 40.0 Hours

This course concentrates on process control for power systems. Students learn how processes are controlled and the factors that influence control system performance. Students test and calibrate sensors.

P- ELEC1009 Electricity and Controls

ELEC3012 Power Engineering Electricity 40.0 Hours

This course provides an in-depth look at electric machines and equipment such as motors, generators, transformers and switches. Students analyze AC circuitry and perform calculations on these circuits.

P- ELEC1009 Electricity and Controls

HRAC1000 Refrigeration and Air Conditioning 56.0 Hours

This course covers the properties of refrigerants and compression type and absorption type refrigeration. Refrigeration system auxiliaries, operation, and trouble shooting of refrigeration and air conditioning systems are covered.

HRAC3006 Advanced Refrigeration and Air Conditioning 40.0 Hours

Students analyze compression and absorption refrigeration processes and equipment in preparation for 3rd class TSSA examinations. Students also operate and maintain refrigeration systems in the lab portion.

P- HRAC1000 Refrigeration and Air Conditioning

MATH2010 Power Engineering Mathematics 42.0 Hours

Concepts in algebra, trigonometry and mensuration are expanded on from PENG 1008 Power Engineering Sciences. Students learn about logarithms and imaginary number applications. Students are introduced to statistical analysis and apply these principles using spreadsheet software.

P- PENG1008 Power Engineering Sciences

MENG2018 Applied Mechanics 42.0 Hours

Students study forces and equilibrium, stress and strain and material properties. Students apply these skills at interpreting and performing calculations related to the ASME Boiler and Pressure Vessel Code. Students also explore concepts of work, power and motion in preparation for their TSSA 3rd class exams.

P- PENG1008 Power Engineering Sciences

PENG1005 Power Plant Simulation 42.0 Hours

In this course students are introduced to processes that occur in a power plant using simulation software. Students operate a virtual steam power plant and practice routine operations and troubleshooting. Students also practice written and verbal communication skills.

PENG1006 Power Plant Operations 84.0 Hours

This is the first course on boilers and steam systems. Students learn about different boiler configurations and auxiliary systems in the classroom and get practical operating experience in the lab.

PENG1007 Introduction to Power Engineering 28.0 Hours

Students are introduced to the occupation of power engineering. Certification, legislation and industrial safety are covered.

PENG1008 Power Engineering Sciences 56.0 Hours

Students are taught math and science at a 4th class operating engineer level. Topics include Algebra, Geometry, Laws of Motion, and Thermodynamics.

PENG1009 Power Engineering Skills Lab 56.0 Hours

The skills lab is used to introduce students to working with their hands. Students learn to select proper tools for a job and use them safely and effectively. Students practice routine maintenance of equipment and do basic repairs and disassembly of power plant components.

**PENG1010 Heating Systems 56.0 Hours**

Hot water and low pressure boiler designs are studied. Students also learn about steam heating systems and their applications.

**PENG1011 Prime Movers and Engines 42.0 Hours**

This course covers the constructional details and operation of steam turbines, gas turbines, and internal combustion engines. Start up and shut down procedures are analyzed.

**PENG2005 Power Engineering Skills Lab 2 28.0 Hours**

Students learn to use machine shop and welding equipment to do repairs and fabricate replacement parts from mechanical drawings. Safe workshop practices are demonstrated.

P- PENG1009 Power Engineering Skills Lab

**PENG2006 Thermodynamics and Fluid Mechanics 56.0 Hours**

The first law of thermodynamics is introduced. Equipment is analyzed on a first law energy basis. Phase changes are discussed and energy exchange quantified using steam tables and gas laws. Heat transfer mechanisms are described and evaluated. Fluid systems are analyzed to understand flows, pressures and losses. Pumps are discussed and concepts such as pump head and cavitation are explored.

P- PENG1008 Power Engineering Sciences

**PENG2007 Advanced Power Plant Operations 70.0 Hours**

Students operate equipment in the power lab including a boiler, water treatment plant and steam engine. Boiler maintenance is performed including lay-up procedures and internal inspection. Students write operating procedures according to best engineering practices and legislation. Boiler components and auxiliary systems are studied in preparation for TSSA 3rd class exams.

P- PENG1006 Power Plant Operations

**PENG2008 Advanced Prime Movers and Engines 42.0 Hours**

Students learn about the construction, operation and maintenance of gas turbines, steam turbines and internal combustion engines in preparation for writing their TSSA 3rd class exams. Cogeneration systems are also introduced in this class.

P- PENG1011 Prime Movers and Engines

**PENG2009 Power Plant Management 56.0 Hours**

This course prepares students for plant operations at a 3rd class level from a management perspective. Health and safety, legislative and pressure vessel codes are analyzed. Students plan and administer maintenance shutdowns. Students use teamwork and communication skills in order to perform simulated power plant operations. Troubleshooting of power plant malfunctions is practiced.

P- PENG1007 Introduction to Power Engineering

PENG3007 Piping and Auxiliaries 50.0 Hours

Piping systems for water, steam, compressed air and fuels are discussed. Materials, codes and best engineering practices are analyzed for pipes, valves and piping accessories. Students build and test piping systems in the lab portion of this course.

PENG3008 Power Engineering Work Integrated Learning 160.0 Hours

Students assist operators at a power plant to meet practical time requirements towards operating engineer certifications. Students are assigned projects to complete during their field placement and are expected to present their projects in order to successfully complete this placement.

P- CHEM1010 Chemistry and the Environment and P- ELEC1009 Electricity and Controls and P- HRAC1000 Refrigeration and Air Conditioning and P- PENG1005 Power Plant Simulation and P- PENG1006 Power Plant Operations and P- PENG1007 Introduction to Power Engineering and P- PENG1008 Power Engineering Sciences and P- PENG1009 Power Engineering Skills Lab and P- PENG1010 Heating Systems and P- PENG1011 Prime Movers and Engines and P- WETC1012 Welding and Metallurgy and P- CHEM2003 Advanced Chemistry and the Environment and P- MATH2010 Power Engineering Mathematics and P- MENG2018 Applied Mechanics and P- PENG2005 Power Engineering Skills Lab 2 and P- PENG2006 Thermodynamics and Fluid Mechanics and P- PENG2007 Advanced Power Plant Operations and P- PENG2008 Advanced Prime Movers and Engines and P- PENG2009 Power Plant Management and P- ELEC3011 Instrumentation and Control Systems and P- ELEC3012 Power Engineering Electricity and P- HRAC3006 Advanced Refrigeration and Air Conditioning and P- PENG3007 Piping and Auxiliaries

WETC1012 Welding and Metallurgy 28.0 Hours

Students learn about the properties of metals and their relationship to power engineering. Students are introduced to gas and electric welding, cutting, and brazing. Students learn about weld inspection and testing methods used in the power industry.

### **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.*