

# POWER ENGINEERING TECHNOLOGY

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## Program Outline

<b>Major:</b>	PETY
<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>	2014-2015
<b>Location:</b>	Owen Sound
<b>Start:</b>	Fall (Owen Sound)

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### Description

This program has been developed for those seeking employment as a power engineering technologist, operating and maintaining 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 control room monitoring and analysis, the operation and maintenance of boilers, turbines, and condensers in steam power plants and the operation and maintenance of internal combustion engines. Subjects of instruction will closely follow the Standardized Power Engineers Examination Committee (SOPEEC) syllabus and prepare the students to challenge the Technical Standards and Safety Authority (TSSA) examinations up to 2nd class after 3 years as an Operator.

### Career Opportunities

The graduate of this program will find a rewarding career as a stationary engineering technologist or power plant control technologist 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;
- manage the operation of 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 adapt to changes in the industry;
- relate effectively to coworkers, subordinates, and supervisors in the work environment;
- make decisions 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;
- solve problems related to power plant management by utilizing applied math, science, and critical thinking skills.

### **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 - Owen Sound

Sem 1 | Work Term1 | Sem 2 | Sem 3 | Sem 4 | Work Term 2 | Sem 5

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Fall 2014		Winter 2015		Summer 2015		Fall 2015		Winter 2016		Summer 2016		Fall 2016
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Sem 6  
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Winter  
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.georgianc.on.ca/academics/articulations/>

### **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) (ENG 4C, ENG 4U); plus any Grade 12 College Mathematics (MAP 4C or MCT 4C), or any Grade 12 University Mathematics. Also recommended: Physics: Grade 12 College or University (SPH4C, SPH4U) OR Chemistry: Grade 12 Chemistry College or Grade 11 or 12 University (SCH4C, SCH4U, SCH3U)

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

- Any credit Communication course and most credit mathematics courses taken at Georgian College
- College preparatory programs including those taken at Georgian College: Technology Foundation and Technology Fundamentals\*
- Equivalent courses in English and mathematics 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 and business, apprentice or technical mathematics\*
- Mature student testing in English and mathematics that meets the minimum standards for admission (available through most testing services)\*
- Ontario High School Equivalency Certificate (GED)
- English, Literature or Communication credit courses and most mathematics credit courses from accredited colleges/universities

Home school applicants:

- Applicants can write the mature student testing in English and mathematics 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/)

### **Graduation Requirements:**

- 35 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.

### **Mandatory Courses**

CHEM1004 Chemistry  
 COMP3022 Computer Systems and Networks  
 DRFT1013 Basic Mechanical Drawing and Blueprint Reading  
 ELEC2015 Basic Electricity  
 ELEC2016 Electrical Machines and Power Distribution  
 ENVR2010 Water Treatment and Pollution Control  
 ENVR3005 Clean and Green Plant Management  
 HRAC2001 Industrial Refrigeration and Air Conditioning  
 MATH1018 Introduction to Technical Mathematics  
 MATH1019 Technical Mathematics  
 MENG1014 Basic Applied Mechanics  
 MENG2013 Intermediate Applied Mechanics  
 MENG2014 Basic Instrumentation and Control Systems  
 MENG2015 Engineering Materials  
 MENG3017 Advanced Applied Mechanics  
 MENG3018 Advanced Instrumentation and Controls  
 PENG1000 Industrial Safety  
 PENG1001 Introduction to Power Plants  
 PENG1002 Introduction to Thermodynamics  
 PENG1003 Basic Plant Auxiliary Systems  
 PENG1004 Basic Power Plant Simulation  
 PENG2000 Intermediate Power Plant Simulation  
 PENG2001 Basic Boiler and Steam Systems  
 PENG2002 Prime Movers and Engines  
 PENG2003 Intermediate Thermodynamics  
 PENG2004 Power Engineering Legislation and Standards  
 PENG3000 Advanced Power Plant Auxiliary Systems  
 PENG3001 Advanced Boilers and Steam Systems  
 PENG3002 Advanced Thermodynamics  
 PENG3003 Advanced Power Plant Simulation  
 PENG3004 Power Plant Project Management  
 PENG3005 Advanced Prime Movers  
 PENG3006 Quality Control Systems  
 TECR3007 Technical Report  
 WETC1010 Welding Techniques

#### 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

COOP1030 Power Engineering Work Term 1

COOP2028 Power Engineering Work Term 2

### **Course Descriptions:**

CHEM1004 Chemistry 42.0 Hours

Students are exposed to the structure of matter in this course. Chemical reactions and stoichiometric calculations are completed; combustion of fuels and nuclear chemistry are described; and the corrosion of metals and its prevention is studied. Students will use the content of this course to better understand the processes that occur in a power plant.

COMP3022 Computer Systems and Networks 42.0 Hours

This course introduces the student to computer hardware and applications that are used in industry. Computer operating systems and languages are also covered. The process of troubleshooting hardware and software problems will be examined. Common computer applications in power plants will be examined.

COOP1030 Power Engineering Work Term 1 560.0 Hours

This is the first of two Co-op work terms designed to provide the student with practical work experience to develop the competencies required for a power plant technologist. For most, this first 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.

COOP2028 Power Engineering Work Term 2 560.0 Hours

This is the second of two Co-op work terms and provides the student with the opportunity to continue with practical work experience in a power plant.

DRFT1013 Basic Mechanical Drawing and Blueprint Reading 42.0 Hours

Students are trained in basic drafting and sketching skills in this course. With this ability, a freehand drawing of simple machine parts that require a remake, repair, or modification is produced. Basic blueprints are interpreted and analyzed. Students are also introduced to the interpretation and identification of power plant construction drawings, piping systems and electrical systems.

ELEC2015 Basic Electricity 42.0 Hours

This course covers electrical units and their measurement. Conductors and insulators are described. Basic types of electrical sources and loads are studied. Circuit diagrams are interpreted. Basic DC and AC circuits are analyzed. The response of resistors, capacitors, and coils are examined.

**ELEC2016 Electrical Machines and Power Distribution 42.0 Hours**

This course covers the construction and practical operations of DC and AC equipment including transformers, generators, and motors. Power distribution and control systems are also studied.

**ENVR2010 Water Treatment and Pollution Control 42.0 Hours**

This course covers the study of water and its impurities. The chemical treatment conditioning, and testing of boiler water and cooling water (internal and external) are covered as well as air, water and soil pollution.

**ENVR3005 Clean and Green Plant Management 42.0 Hours**

This is the study of environmental impacts of a power plant and how they can be mitigated.

P- ENVR2010 Water Treatment and Pollution Control

**HRAC2001 Industrial Refrigeration and Air Conditioning 42.0 Hours**

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

**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.

**MATH1019 Technical Mathematics 42.0 Hours**

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

P- MATH1018 Introduction to Technical Mathematics

**MENG1014 Basic Applied Mechanics 42.0 Hours**

This introductory course exposes students to Newton's Laws of Motion and linear and angular motion. Work, energy and power calculations are performed and circular motion is analyzed.

**MENG2013 Intermediate Applied Mechanics 42.0 Hours**

This course covers free body diagrams and friction. Moments of force, stress and strain, bending and shearing forces are also dealt with. The behaviour of a fluid at rest and in motion is covered.

**MENG2014 Basic Instrumentation and Control Systems 42.0 Hours**

This course introduces the student to applications of pneumatic, electric, and electronic control systems and components found in a typical control loop. Process variables such as temperature, pressure, level, and flow are controlled and monitored. Programmable logic controllers and loop controllers are studied. Some hands-on practice in sensor calibration and control system tuning is done.

**MENG2015 Engineering Materials 42.0 Hours**

This course covers the mechanical properties of ferrous and non ferrous metals. Heat treatment and welding metallurgy are covered. Non metallic engineering materials such as plastics and composites are studied.

**MENG3017 Advanced Applied Mechanics 42.0 Hours**

This course is a study of the loading of beams and cantilevers. The strength of engineering materials is reviewed and the ultimate stress and strain on materials is studied.

**MENG3018 Advanced Instrumentation and Controls 56.0 Hours**

This is an advanced study of instrumentation and control systems with emphasis on boiler controls and engine governors. Supervisory control and data acquisition system functions will be studied. The most modern techniques of process control will be covered.

**P- MENG2014 Basic Instrumentation and Control Systems**

**PENG1000 Industrial Safety 42.0 Hours**

In this course students are exposed to the handling and labelling of controlled materials (WHMIS), workplace safety and fire protection systems. Correct use of power tools, ladders and scaffolding are also taught.

**PENG1001 Introduction to Power Plants 42.0 Hours**

In this course students are exposed to the various types of power plants and the equipment and processes they utilize. These processes may be nuclear, fossil fuel, or cogeneration plants with an introduction to their auxiliary systems.

**PENG1002 Introduction to Thermodynamics 42.0 Hours**

Students will study the science of heat in this course. Temperature scales, the thermal expansion of solids, liquids and gases, and methods of heat transfer are studied. The gas laws are studied and basic heat cycles are described.

**PENG1003 Basic Plant Auxiliary Systems 42.0 Hours**



The systems studied in this course are designed to support the safe operation of the prime mover. They include the piping systems and valves, pumping systems, compressors, and heat exchangers.

**PENG1004 Basic Power Plant Simulation 28.0 Hours**

In this course students will be exposed to individual power components and how they work together in a power plant. Students will practice routine power plant operations.

**PENG2000 Intermediate Power Plant Simulation 28.0 Hours**

This course covers the exchange of energy between different systems in a power plant. The flow of energy is managed as it flows from one system to another. The power plant is considered as a whole functioning entity.

**PENG2001 Basic Boiler and Steam Systems 42.0 Hours**

High pressure and heating boiler design, fittings, safe operation, maintenance, and inspection are covered in this course. Furthermore the course also deals with combustion air, fuel, loads and stresses, and testing of boilers.

**PENG2002 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.

**PENG2003 Intermediate Thermodynamics 42.0 Hours**

This course is an introduction to theoretical engine cycles and thermal efficiency. The thermodynamics of steam and steam tables are studied.

**PENG2004 Power Engineering Legislation and Standards 42.0 Hours**

This course covers the purpose, content, and application of the boiler and pressure vessel codes and regulations. ASME codes and calculations are explored.

**PENG3000 Advanced Power Plant Auxiliary Systems 42.0 Hours**

This course is an advanced study of pumps, piping, and auxiliary systems with a particular emphasis on power plant performance and efficiency.

P- PENG1003 Basic Plant Auxiliary Systems

**PENG3001 Advanced Boilers and Steam Systems 42.0 Hours**

This course is a study of modern boiler construction, startup and shutdown procedures, design, and operating parameters. Special consideration is given to safe working practices and improved efficiency.

P- PENG2001 Basic Boiler and Steam Systems

**PENG3002 Advanced Thermodynamics 28.0 Hours**

This course is a detailed study of the various heat engine cycles. Efficiency limits of heat engines and plant efficiencies are studied.

P- PENG1002 Introduction to Thermodynamics

PENG3003 Advanced Power Plant Simulation 56.0 Hours

Control Room monitoring, trouble shooting of power plant problems and environmental impact of plant operations will be studied.

P- PENG1004 Basic Power Plant Simulation

PENG3004 Power Plant Project Management 42.0 Hours

This course develops professionalism in the student and 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.

PENG3005 Advanced Prime Movers 42.0 Hours

This is an advanced study of gas turbines, steam turbines and internal combustion engines and their lubrication and maintenance.

P- PENG2002 Prime Movers and Engines

PENG3006 Quality Control Systems 42.0 Hours

This is the study of continuous plant improvement through a quality control management system.

TECR3007 Technical Report 14.0 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 power engineering equipment or describing a plant's processes.

WETC1010 Welding Techniques 42.0 Hours

The basics of gas and electric welding, cutting, and brazing are introduced in this course. Heat treating and annealing are also covered. Safe working welding practices which can be used for maintenance and minor repair work are also emphasized.

### **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.*