

# MARINE ENGINEERING TECHNOLOGY

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## Program Outline

<b>Major:</b>	MTCY
<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>	2012-2013
<b>Location:</b>	Owen Sound
<b>Start:</b>	Fall (Owen Sound)

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### Description

This program has been planned in co-operation with Transport Canada and Canada's shipping companies. It offers a complete education for those seeking employment as a ship's Engineering Officer. The specialized competencies and work experience also provide the graduate with opportunities for employment in government and in other marine-related industries. NOTE: This is a Transport Canada approved program

### Career Opportunities

The graduate of this program will find a rewarding career as a ship's officer on board commercial vessels throughout Canada and the world. This 3 year co-operative cadet training program may lead to career advancement to senior ranks on board ship and to positions of leadership in the marine industry. Graduates are eligible to write the Transport Canada 4th Class Marine Engineer certificate and can gain employment in a large variety of marine commercial professions on board and ashore in both the domestic and international shipping industries.

### Program Learning Outcomes

The graduate has reliably demonstrated the ability to:

- communicate and manage information in a variety of forms;
- solve simple and complex problems related to both academic and ship board challenges;

- work with others to safely and effectively function as a member of a large dynamic team whose goal is to transport cargo in a safe and environmentally sustainable manner;
- measure and calculate, estimate and evaluate problems and solutions;
- use appropriate tools for fabrication and repair operations typically performed on ships;
- use hand tools and measuring equipment for dismantling, maintenance, repair and re-assembly of shipboard plant and equipment;
- apply knowledge of electrotechnology, electronics and electrical equipment to operate alternators, generators, AC and DC motors;
- use electrical and electronic measuring and test equipment for fault finding, maintenance and repair operations;
- maintain safety of engine equipment, systems and services while conducting an engineering watch;
- operate main and auxiliary machinery and associated control systems and evaluate engine performance and capacity;
- describe the fundamentals of automation, instrumentation and control systems;
- maintain the seaworthiness of the ship, including ship stability and structural condition;
- respond to emergencies and distress signals at sea, prevent and control fires and operate lifesaving appliances;
- apply medical first aid on board ship;
- inspect the ship for defects and damage;
- practice and develop effective basic management skills with respect to human and physical resources.

### **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/](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	Sem 2	Work Term 1	Sem 3	Sem 4	Sem 5	Work Term 2
Fall 2012	Winter 2013	Summer 2013	Fall 2013	Winter 2014	Summer 2014	Fall 2014
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Sem 6						
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Winter 2015						

### **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:**

Applicants must meet ONE of the following requirements to be eligible for admission to this program:

- OSS Curriculum: OSSD or equivalent with Grade 12 English (C) or (U) (ENG4C, ENG4U); plus Grade 12 College Mathematics (MAP4C or MCT4C), or any Grade 12 University Mathematics, or equivalent. 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).
- 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

Note: Applicants must provide a valid Transport Canada Marine Medical stating 'fit for sea service' or 'fit for sea service with limitations'. In the case of an applicant with a

certificate 'fit for sea service with limitations', the application will be reviewed 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 counseling, 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.

**Additional Information:****Co-operative Work Term**

This is a fully integrated co-operative education program, wherein the cadet will participate in semesters of academic study at the Owen Sound Campus interspersed with work term placements on board ships. Hence, undergraduates are involved in work activities directly related to their educational objectives. As well, the college provides Pre-Sea Safety and Marine Emergency Duty training which are required before a cadet may proceed to the shipboard work placement.

While every assistance will be provided in finding Co-op placements, positions are not guaranteed. Canadian flagged ships only accept Canadian Citizens or Permanent Residents for employment. International students are encouraged to investigate Co-op opportunities prior to commencing studies. Cadets may be subjected to adverse environmental conditions while on board ship (noise, dirt, dust, confined quarters and heavy lifting). Anyone with known allergies should consult with the Co-op department.

**Eligibility to enter the U.S.**

Although not an admission requirement, all shipping companies, whether Canadian or foreign, which have vessels trading in U.S. ports require that all their shipboard personnel be eligible to legally enter the U.S.

**Graduation Requirements:**

- 43 Mandatory Courses
- 2 Communications 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**

CHEM2000	Chemistry for Marine Technology
DRFT1004	Basic Blueprint Reading and Freehand Technical Sketching
DRFT1005	Advanced Blueprint Reading and Freehand Technical Sketching
ELEC2001	Direct Current Circuits
ELEC2002	Alternating Current Circuits and Electrical Machines
ELEC3000	Electrical Machine Control and Power Distribution
MARE1006	Basic Skills Training
MARE1007	Basic Engineering Knowledge
MARE1011	Welding
MARE1021	Ship Construction
MARE1025	Marine Basic First Aid
MARE1027	STCW Basic Safety Training
MARE1028	Engineering Knowledge-Diesel
MARE1029	Engine Room Simulator 1
MARE2001	Electrical Control Systems
MARE2003	Modulating Control Systems
MARE2005	Transverse Stability
MARE2006	Hydraulics and Pneumatics
MARE2019	Computer Applications and Networks
MARE2023	Proficiency in Survival Craft
MARE2027	Engineering Knowledge -General
MARE3000	Advanced Skills Training - Electrical
MARE3002	Materials
MARE3004	Machine Shop
MARE3005	Advanced Skills Training - Mechanical
MARE3008	Naval Architecture for Engineers
MARE3020	Ships Master's Business
MARE3022	Advanced Firefighting
MARE3023	Marine Advanced First Aid
MARE3026	Engineering Knowledge - Steam
MARE3027	Engine Room Simulator 2
MARE3028	Engine Room Simulator 3
MATH1018	Introduction to Technical Mathematics
MATH1019	Technical Mathematics
MATH2001	Mathematics with Calculus

MENG1004 Basic Applied Mechanics  
MENG1005 Introduction to Thermodynamics  
MENG2000 Fluid Mechanics for MTCY  
MENG2001 Principles of Applied Thermodynamics  
MENG2002 Strength of Materials  
MENG3001 Refrigeration and Air Conditioning  
MENG3002 Applied Thermodynamics  
MENG3015 Advanced Applied Mechanics

#### Communications Courses

To be selected at time of registration from the College list, as determined by testing.

#### Co-op Work Terms

COOP1032 Marine Engineering Work Term 1  
COOP2030 Marine Engineering Work Term 2

#### **Course Descriptions:**

CHEM2000 Chemistry for Marine Technology 64.0 Hours

This course gives the student a basic knowledge of chemical reactions and then uses this knowledge to convey an understanding of the effect of impurities in boiler feed and cooling water systems, and the chemistry of corrosion and combustion. With this background, the student will better appreciate the importance of the monitoring and treatment processes applied on board ship.

COOP1032 Marine Engineering Work Term 1 840.0 Hours

This is the first of two Co-op sea terms designed to provide the student with practical work experience to develop the competencies required of a ship's officer. Students are expected to be involved in learning about the vessel's operations, the command structure and safety procedures. In this course the student is to commence work on a cadet training manual or logbook. The focus for this phase is shipboard and personal safety.

COOP2030 Marine Engineering Work Term 2 840.0 Hours

This is the second of two Co-op sea terms and is a continuation of the practical work experience on board a merchant ship thus enabling the cadet to develop the competencies required of a ship's officer. During this sea term the student is required to complete the logbook that was commenced during the first Co-op work term. Upon return to school from the second Co-op work term the college will evaluate your logbook and assign a final mark. The fully completed training record book is required by Transport Canada. The focus for this phase is shipboard operations.

**DRFT1004 Basic Blueprint Reading and Freehand Technical Sketching 64.0 Hours**  
Run in conjunction with the Basic Skills Training course, this course aims to develop measurement and sketching skills. With this ability, a freehand drawing of simple machine parts that require a remake, repair, or modification can be produced. This important skill stems from the distance between a ship at sea and the machine shop.

**DRFT1005 Advanced Blueprint Reading and Freehand Technical Sketching 80.0 Hours**  
Technical freehand sketching skills are further developed. The student is then introduced to the interpretation and identification of ship construction drawings, piping systems and electrical systems. This knowledge is an important part of systemic fault finding on board ships.

**ELEC2001 Direct Current Circuits 80.0 Hours**  
This course is designed to develop an intuitive understanding and working knowledge of the basic electrical phenomena employed in marine electrical equipment.

**ELEC2002 Alternating Current Circuits and Electrical Machines 80.0 Hours**  
This course provides the student with the knowledge of the theory and operation of alternating current generation, conversion, distribution and consumption equipment used in marine plant.

**ELEC3000 Electrical Machine Control and Power Distribution 80.0 Hours**  
This course covers the construction and practical operations of DC and AC equipment including transformers, generators, and Motors. Marine power distribution and control are also studied. Together with ELT 4125 and ELT 4214, this course covers the syllabus for the MOT 2nd class electrotechnology exam.

**MARE1006 Basic Skills Training 128.0 Hours**  
Students in this course develop proficiency in the safe use and care of all common hand tools, power tools and fasteners found on board ships. This will be accomplished through the completion of bench fitting projects and the overhaul of simple engine room components. Safe working practices are stressed throughout the course.

**MARE1007 Basic Engineering Knowledge 48.0 Hours**  
This course is a basic study of common systems, machinery, pipeline components, and fittings on board steam and diesel powered ships. This knowledge prepares a student for the co-op work terms and offers familiarization for some of the systems present on board ships.

**MARE1011 Welding 112.0 Hours**  
The basics of welding, cutting and brazing are introduced to the student. Safe working practices and the theory of proper welding prepares the student for the practical part of this course. Gas and arc welding techniques are taught so that they can be used for maintenance and minor repair work required on the ship.

**MARE1021 Ship Construction 64.0 Hours**

Many types of ships sail the waters of the world. The basic principles of ship construction are the same for all. Students will study the principles of ship structures, the materials used in ship construction and the processes of building a ship. This helps in the understanding of the stresses which a ship must withstand due to inclement weather and the loading of a ship.

**MARE1025 Marine Basic First Aid 16.0 Hours**

This course will enable every seafarer who is designated to apply immediate basic first aid in the event of an accident or illness on board the skill necessary to perform those duties.

**MARE1027 STCW Basic Safety Training 43.0 Hours**

This course prepares students to respond to marine emergencies in preparation for co-op work terms on board ship. This course meets the international training requirements of the STCW (Safety, Training and Certification of Watchkeepers) convention for all seafarers before going to sea. There is an introduction to the types of hazards and emergencies that can occur in the marine environment. Firefighting theory and fire control onboard ship is supported by using firefighting equipment to extinguish small fires in a controlled environment.

**MARE1028 Engineering Knowledge-Diesel 64.0 Hours**

Diesel power plants are the most common used in the marine industry. The construction and operating principles of diesel engines form the core of this course. Efficient and safe operational practices are emphasized.

**MARE1029 Engine Room Simulator 1 32.0 Hours**

Using the Engine Room Simulator the student learns marine power plant machinery operation and systems arrangements. This is the first course of a succession of three courses required to meet certification standards of Transport Canada.

P- MARE1007 Basic Engineering Knowledge and P- MENG1005 Introduction to Thermodynamics and (C- MARE1028 Engineering Knowledge-Diesel or C- MARE1010 Engineering Knowledge - Diesel / Simulator 1)

**MARE2001 Electrical Control Systems 48.0 Hours**

This course introduces the student to electronic components used in industry, binary numbers, Boolean algebra, digital logic, and automatic control systems.

**MARE2003 Modulating Control Systems 80.0 Hours**

This course gives the student an overview of marine automatic surveillance and control systems as used on Great Lakes vessels. Emphasis on system principles is balanced by detailed study of discrete components and shipboard systems, and hands-on practice in sensor calibration and control system tuning.



**MARE2005 Transverse Stability 48.0 Hours**

In this course, the student will be introduced to basic stability theory and definitions. The student will be able to recognize the factors that keep a ship floating upright. The course will consist of many calculations about the effects of loading a weight on a ship's centre of gravity, hydrostatics, coefficients of form, Simpson's rules for determining areas, and volumes, and moments of inertia.

**MARE2006 Hydraulics and Pneumatics 80.0 Hours**

This course provides the student with a comprehensive grounding in the basic principles, construction and operation of hydraulic and pneumatic equipment as used in shipboard applications such as controllable pitch propellers, mooring winches, start air systems, etc.

**MARE2019 Computer Applications and Networks 48.0 Hours**

This course introduces the student to computer hardware and applications that may be used on modern vessels. Computer operating systems and languages are also covered. The process of troubleshooting hardware and software problems will be examined. Common computer applications on ships will be examined.

**MARE2023 Proficiency in Survival Craft 28.0 Hours**

This course is another requirement for seafarers under the STCW (Standards of Training, Certification of Watchkeepers) convention of the International Maritime Organization. In the event that an emergency at sea requires a seafarer to abandon ship, this course prepares a student for the proficient use of lifeboats and life rafts. Further topics included in this course will discuss rescue by helicopter and the use of signalling apparatus.

C- MARE1022 STCW Basic Safety Training or C- MARE1027 STCW Basic Safety Training

**MARE2027 Engineering Knowledge -General 64.0 Hours**

This course concentrates on Marine Engineering Knowledge General. Emphasis will be placed on understanding the basic principles and theory of operation of a variety of marine auxiliary machinery, with special emphasis on the established need for the equipment, advantages and disadvantages, operating difficulties and safe practices.

**MARE3000 Advanced Skills Training - Electrical 64.0 Hours**

This course concentrates on care and maintenance of Marine electrical equipment. Emphasis will be placed on personal safety and safe working practices and procedures. The student will be dismantling, examining, cleaning, checking of tolerances, repairing, reassembling and testing of various pieces of electrical equipment.

**MARE3002 Materials 90.0 Hours**

This course provides the student with the opportunity to study material identification, and selection as needed for on-board maintenance and repair.

**MARE3004 Machine Shop 128.0 Hours**

This course provides the cadet with the basic machine shop skills needed for on-board maintenance and repair.

**MARE3005 Advanced Skills Training - Mechanical 160.0 Hours**

This course extends the student's overhaul skills to those encountered in the more complicated marine equipment, including purifiers, steering gear components, refrigeration systems, boilers, engines, etc. In each case the student will be involved in dismantling, examining, checking of tolerances and clearances, repairing, reassembling and testing.

**MARE3008 Naval Architecture for Engineers 48.0 Hours**

This course is designed to provide the student with a basic knowledge of ship stability, under normal and abnormal conditions such as flooding, rudder theory, powering and fuel consumption.

**MARE3020 Ships Master's Business 64.0 Hours**

This course will give the student a broad introduction to the business and regulatory regime of the marine industry. The student will study the international and domestic rights, responsibilities and regulations of every seafarer, as well as safety, health and marine pollution prevention. Cargo and insurance requirements and documentation, operational, financial, and project management are all discussed in detail.

**MARE3022 Advanced Firefighting 37.0 Hours**

This course is another requirement for seafarers under the STCW convention of the International Maritime Organization. In the event that an emergency at sea requires a seafarer to fight a fire, this course prepares a student to respond to and fight a fire on board ship from a leadership point of view. Further topics included in this course will discuss management of injured persons, inspection and maintenance of emergency equipment, crowd management, communication and search and rescue.

(P- MARE1022 STCW Basic Safety Training or P- MARE1027 STCW Basic Safety Training)

**MARE3023 Marine Advanced First Aid 31.0 Hours**

This course will enable every seafarer who is designated to apply immediate advanced first aid in the event of an accident or illness on board the skill necessary to perform those duties.

**MARE3026 Engineering Knowledge - Steam 64.0 Hours**

This course concentrates on Marine Steam Engineering Knowledge. Emphasis will be placed on understanding the basic principles of operation of steam machinery with special emphasis on safe and efficient operational practices.

**MARE3027 Engine Room Simulator 2 32.0 Hours**

This course further develops the student's watchkeeping skills and responsibilities by using the Engine Room Simulator. The student learns to operate, analyze and troubleshoot a marine power plant.

C- MARE1029 Engine Room Simulator 1 or C- MARE1010 Engineering Knowledge - Diesel / Simulator 1

MARE3028 Engine Room Simulator 3 16.0 Hours

This course prepares the student for all aspects of independent watchkeeping onboard a vessel. This final Simulator course prepares the student for Transport Canada certification as a 4th and 3rd Class Engineer.

(P- MARE3027 Engine Room Simulator 2 or P- MARE2004 Engineering Knowledge - General/Simulator 2)

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

MATH2001 Mathematics with Calculus 64.0 Hours

This course reviews Exponential and Logarithmic Functions and the complex numbers. Differential and integral calculus are covered in detail with applications.

(P- MATH1009 Advanced Algebra or P- MATH1018 Introduction to Technical Mathematics or P- MATH1022 Advanced Algebra or P- MAT4142 Advanced Algebra or P- MAT9101 Algebra) and (P- MATH1010 Math For Marine Technology or P- MATH1019 Technical Mathematics or P- MAT4143 Math For Marine Technology or P- MATH1006 Mathematics for Technology or P- MAT9104 Mathematics For Technology)

MENG1004 Basic Applied Mechanics 64.0 Hours

This course provides a sound working knowledge of the fundamentals of Applied Engineering Mechanics including kinematics, dynamics, statics, and elementary strength of materials.

**MENG1005 Introduction to Thermodynamics 48.0 Hours**

A student is familiarized with the basic principles of Thermodynamics. These principles are applied in subsequent courses to solve problems in the field of steam cycles, internal combustion engines, air compressors and refrigeration.

**MENG2000 Fluid Mechanics for MTCY 64.0 Hours**

This course gives the student the basic principles of fluid mechanics and the application of the principles to practical and applied problems. Primary emphasis is on the topics of fluid statics, flow of fluid in pipes, open channel flow, flow measurement, and forces developed by fluids in motion.

**MENG2001 Principles of Applied Thermodynamics 64.0 Hours**

In this course the student continues to learn the basics of thermodynamics including irreversibility, heat flow, use of "Properties of Fluids" tables, steam processes, steady flow processes, heat transfer and heat exchangers, and engine testing.

**MENG2002 Strength of Materials 32.0 Hours**

The course builds upon previous courses in mathematics, physics and ship instruction to assist the student in understanding the stresses and forces involved in materials used to build and operate a ship.

P- MENG1004 Basic Applied Mechanics or P- ENM4111 Applied Mechanics 1

**MENG3001 Refrigeration and Air Conditioning 48.0 Hours**

The student shall study the theory of refrigeration and air conditioning systems and have knowledge of refrigerants, lubrication, system components and the running and maintenance procedures.

**MENG3002 Applied Thermodynamics 80.0 Hours**

This course presents the thermodynamic analysis of steam plant internal combustion engines and other air breathing marine power devices, including gas turbines and air compressors. The course is based on the fundamental thermodynamic concepts and analysis techniques learnt in the Thermodynamics 1 and 2 courses.

P- MENG2001 Principles of Applied Thermodynamics or P- EML4218 Princ Of Appld Thermodynamics

**MENG3015 Advanced Applied Mechanics 64.0 Hours**

This is the final Applied Mechanics course and completes coverage to 1st Class MOT level. The course starts with a review of the earlier Applied Mechanics 1 and 2 courses and then goes on to complete the analysis of friction and anti- friction devices, structural strength and stiffness, and machinery vibration.

P- MENG1004 Basic Applied Mechanics or P- ENM4111 Applied Mechanics 1

**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.*