MARINE ENGINEERING TECHNICIAN

Program Outline

Major: METC
Length: 2 Years
Delivery: 4 Semesters, plus 2 work terms
Credential: Ontario College Diploma, Co-op
Effective: 2015-2016
Location: Owen Sound
Start: Fall (Owen Sound)

Description
The Marine Engineering Technician program is an internationally recognized program that has been designed in co-operation with Transport Canada Marine Safety and Security (TCMSS) and Canada's shipping companies. This program incorporates theory and practical experience to prepare students for the fast paced marine industry. The program focuses on developing competencies required to function as part of an engineering team at the operational level. Students can expect to gain knowledge and skills around shipboard functions and effective marine power plant operations.

NOTE: This is a Transport Canada designated program.

Career Opportunities
The graduate of this program will find a rewarding career as a ship's junior engineering officer (4th Class) on board commercial vessels throughout Canada and the world, such as bulk carriers, tugs, ferries, tankers, cruise ships, coast guard and fishing vessels. This 2 year co-operative training program may lead to career advancement to senior ranks onboard ships and to positions of leadership in the marine industry upon completion of additional (TCMSS) approved courses at the management level.

Program Learning Outcomes
The graduate has reliably demonstrated the ability to:

- use principles of leardership, team management and conflict resolution in the capacity of a marine engineering officer at the operational level;
- apply principles of safety and environmental sustainability to the marine transportation of cargo;
- perform all work in accordance with legislation, regulation, policies and practices relating to health and safety, accessibility, human rights and environmental management;
- analyze the power plant for performance efficiencies using charting and trending;
- assist in improving plant performance using effective critical thinking and decision-making;
- carry out operational and maintenance procedures through the use of handbooks, catalogues, manufacturer's specifications, checklists, and legislative codes;
- prepare and interpret installation drawings, assembly drawings and detail drawings and compile technical specifications;
- apply knowledge of electro-technology, electronics and electrical equipment to the operation of alternators, generators, AC and DC motors;
- participate in the installation and maintenance of marine equipment and systems at the operational level;
- perform effective watchkeeping practices in a marine power plant using the science of energy production and its transformations;
- apply computer skills to daily power plant operations.

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/

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

Semester 1	Semester 2	Semester 3	Work Term 1	Semester 4
Fall 2015	Winter 2016	Summer 2016	Fall 2016	Winter 2017

Work Term 2
Summer 2017

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/

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/

Additional Information:

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 onboard ships. Hence, undergraduates are involved in work activities directly related to their educational objectives.

Every effort is made to arrange work term placements, however, cadets must qualify for such and no guarantee of placement can be made.

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 a Georgian College 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.

TCMSS Certification
Students interested in writing the TCMSS engineering certificate must comply with their legal requirements as described in the Canada Shipping Act Marine Personnel Regulations. These include proof of Canadian citizenship or proof of permanent resident status and a valid marine medical certificate. Marine emergency duties courses are also additional requirements for certification by TCMSS.

Graduation Requirements:
32 Mandatory Courses
2 Communications Courses
3 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
CHEM1006 Fuel Combustion Chemistry
CHEM1007 Industrial Chemistry
ELEC1008 Basic Electrical Engineering
ELEC2019 Thermodynamics
ELEC2020 Advanced Electrical Engineering
ELEC2021 Shipboard Elect Knowldg/Skills
ENGN1001 Basic Engineering Science
ENGN1002 Basic Control Engineering
HRAC2002 Refrigeration and Air Conditioning
HRAC2003 Shipboard Refrigeration and Air Conditioning
MARE1040 Marine Engine Plants

MARE1041 Marine Steam Plants
MARE1042 Marine Auxiliary Systems
MARE1043 Marine Systems and Components Blueprint
MARE1044 Marine Plant Energy Distribution
MARE1045 Hydraulics and Pneumatics
MARE1046 Ship Construction for Engineers
MARE2019 Computer Applications and Networks
MARE2032 Advanced Marine Power Plants
MARE2033 Advanced Marine Power Plants Steam
MARE2034 Shipboard Materials
MARE2035 Marine Power Plant Watchkeeping
MARE2036 Shipboard Power Plant Studies
MARE2037 Shipboard Control Strategies
MARE2038 Stability
MARE3020 Ships Master's Business for Engineers
MARE3032 Leadership and Managerial Skills
MATH1018 Introduction to Technical Mathematics
MATH1019 Technical Mathematics
MCHN2000 Machining
MENG1018 Basic Applied Mechanics
WETC2000 Welding

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

Course Descriptions:
CHEM1006 Fuel Combustion Chemistry 32.0 Hours
This course gives the student a basic knowledge of marine fuels and lubricants. Students learn about fuels used on board a vessel and what happens when a fuel is combusted. Calculations are made to determine the products of combustion and compared to actual sampled data. Chemical properties of lubricating oil with their additives are researched.

CHEM1007 Industrial Chemistry 32.0 Hours

This course completes the study of chemistry. Topics covered include mixtures, solutions, boiler water chemistry, corrosion, and alkalinity. Students learn fundamentals of atom structures, acidity, alkalinity, corrosion, and water testing and treatment relating to marine boilers and engines.

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.

ELEC1008 Basic Electrical Engineering 64.0 Hours
Electrical engineering principles are taught in this course. Topics include circuit theory, electronics, alternating current theory, induction, motors, cabling, batteries and shipboard applications. Use of electrical labs is included.

ELEC2019 Thermodynamics 64.0 Hours
This course presents theoretical material relating to how energy in motion can put matter in motion. Knowledge of how energy flows from one form to another is investigated in relation to ship board systems and processes.

ELEC2020 Advanced Electrical Engineering 96.0 Hours
This course covers the construction and practical operations of DC and AC equipment including transformers, generators, and motors. Practical knowledge will be given in the Lab component of this course.

ELEC2021 Shipboard Elect Knowldg/Skills 96.0 Hours
This is an online course delivered during the second work term. The course material supplements the engineering knowledge presented in the student’s Transport Canada Training Record Book. The material relates to electrical installations and maintenance.

ENGN1001 Basic Engineering Science 64.0 Hours

This course covers topics relating engineering science. These include dynamics, energy, fluids, and heat. Students learn about Newton's laws, solve problems relating to speed, distance and time, friction, energy forms, fluids, and basic thermodynamics heat concepts and calculations.

ENGN1002 Basic Control Engineering 96.0 Hours
Modern ships are highly automated and it is vital that a marine engineer understand how automation works. This course teaches the fundamentals of control theory with the addition of basic electronics theory. The student will learn a portion of this material in the propulsion plant lab.

HRAC2002 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.

HRAC2003 Shipboard Refrigeration and Air Conditioning 16.0 Hours
This is an online course delivered during the second work term. The course material supplements the engineering knowledge presented in the student's Transport Canada Training Record Book. The material relates to shipboard refrigeration and air conditioning.

MARE1040 Marine Engine Plants 64.0 Hours
Understanding the working cycles, components and thermodynamics of a diesel engine is important in the safe operation of a vessel. Students learn engine plant preparation, operation, construction, and fault detection necessary to prevent damage. Thermodynamic heat-engine cycles for most common engine types are taught. This course combines classroom studies and projects in the propulsion plant lab relating to diesel engines.

MARE1041 Marine Steam Plants 64.0 Hours
A thorough understanding of the working cycles and components of a steam powered propulsion plant is important. Students learn auxiliary steam boiler construction and operation, and fault detection necessary to prevent damage. This course combines classroom studies and propulsion plant lab projects to teach this material.

MARE1042 Marine Auxiliary Systems 64.0 Hours
This course uses a combination of classroom studies and propulsion plant lab exercises to teach shipboard auxiliary equipment. Studies include pumps, heat exchangers, water production equipment, purifiers, steering gear, deck equipment, oily water separators, etc.

MARE1043 Marine Systems and Components Blueprint 32.0 Hours

This course introduces the basic concepts of technical freehand sketching and print reading as it relates to ship's drawings. Students learn the basics of line constructing, projections, purpose of drawings, views, development of basic 3 dimensional shapes and dimensioning. The students learn to interpret existing drawings relating to hydraulics, pneumatics, electronics, electrical power distribution, engine systems, and supplied manufacturers' data.

MARE1044 Marine Plant Energy Distribution 112.0 Hours
Understanding of energy and its uses makes up the content of this course. The course introduces thermodynamic principles, shipboard system operations and basic electrical theory. The lab component of this course will be done in the engine room simulator.

MARE1045 Hydraulics and Pneumatics 32.0 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.

MARE1046 Ship Construction for Engineers 48.0 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.

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.

MARE2032 Advanced Marine Power Plants 144.0 Hours
This course in motor and auxiliary systems engineering combines classroom studies and propulsion plant lab projects to teach. The student will learn large-bore engine details, medium speed engine details, engine types, and operation and principles.

MARE2033 Advanced Marine Power Plants Steam 80.0 Hours
This course focuses on steam power plants. Students learn propulsion steam boiler construction and operation, turbine construction and operation and fault detection necessary to prevent damage. This course combines classroom studies and propulsion plant lab projects to teach this material.

MARE2034 Shipboard Materials 64.0 Hours

This course provides the student with the opportunity to study material identification, and selection as needed for on-board maintenance and repair. Students learn about the physical ferrous and non-ferrous metals. The also learn about heat treatment, temperature induced stresses, Hooke's law, stress and strain relationships, vibration, bonding methods and adhesives.

MARE2035 Marine Power Plant Watchkeeping 32.0 Hours
The skills necessary to stand an engineering watch are taught in this course. All of the material is delivered in the Propulsion Plant Simulator Lab facility. Instruction on how to prepare a ship's power plant for safe passage will be stressed. Proper communication skills are also taught.

MARE2036 Shipboard Power Plant Studies 64.0 Hours
This is an online course delivered during the first work term. The course material supplements the engineering knowledge presented in the student's Transport Canada Training Record Book. Content include power plant arrangements, standard operating procedures, watchkeeping duties, safety systems, and ship construction.

MARE2037 Shipboard Control Strategies 48.0 Hours
This is an online course delivered during the first work term. The course material supplements the engineering knowledge presented in the student's Transport Canada Training Record Book. The material relates to shipboard automation and controls.

MARE2038 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, co-efficient of form, Simpson's rules for determining areas, and volumes, and moments of inertia.

MARE3020 Ships Master's Business for Engineers 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.

MARE3032 Leadership and Managerial Skills 32.0 Hours
This course is designed to blend theoretical and practical skills necessary to be an effective shipboard leader. As a leader, a large part of your responsibility is anticipating issues and implementing directives and standard operating practices. Students will learn tools and management techniques to manage workload and resources, assess situations and manage risk within a team environment.

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

MCHN2000 Machining 48.0 Hours
This course provides the cadet with the basic machine shop skills needed for on-board maintenance and repair. This course is conducted in the machine shop.

MENG1018 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 hydraulics.

WETC2000 Welding 64.0 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.

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.