



## MARINE – TECHNOLOGIST (MATY 2021)

### **Preamble**

The Canadian Technology Standards (CTS) are a collection of learning outcomes for Canada's engineering technology and applied science profession at the technician and technologist level.

### **Stakeholders**

The CTS may be utilized by accreditation bodies, provincial professional associations, educational institutions, government agencies, industry and others for the purposes accreditation, certification and other applications.

### **Educational Programs**

The Marine CTS is relevant to programs including, but not limited to, marine systems design and maritime systems at the at the technologist level.

### **Learning Outcomes**

This CTS list Discipline Learning Outcomes (DLO) which describe the significant and essential learning that students have achieved and can reliably demonstrate at the time of graduation. Each DLO has a number of Learning Outcome Indicators (LOI), which are examples illustrating, defining and clarifying the level of performance expected. The list of LOI is not comprehensive and there may be other indicators which can be used to assess achievement of learning outcomes.

### **Graduate Capability**

Students graduating from an accredited program have demonstrated achievement of all general learning outcomes, including a prescribed level of math, and discipline learning outcomes selected by the program.

Having completed a program that is based on applied mathematics and scientific and engineering theory, principles and practices and having acquired the knowledge, skills and attitudes to function in the work place, graduates are;

- able to evaluate assignments, establish objectives, set parameters and determine appropriate procedures and actions.
- able to exercise due diligence in the workplace and adhere to related practices, applicable laws and health and safety practices.
- able to work in accordance with labor-management principles and practices.
- able to work independently or interdependently as part of a discipline or multi-disciplinary team.
- prepared to assume responsibility for their work.

### **Graduate Career Opportunities**

Graduates of Marine Engineering Technology - Technologist programs have career opportunities in such areas as: business, industry, construction, government, and public organizations. They may find employment in careers such as: design of equipment, processes, infrastructure, or systems; maintenance of equipment or systems; interpretation or preparation of specifications, technical drawings, or instructions; quality management and inspection; project management and contract management; administration; field and customer service; estimating; and supervision of projects and training activities.

## Discipline Learning Outcomes (DLOs)

### **MATY01 Ship Design and Detailing**

- Apply and explain principles of naval architecture in ship design and detailing.

Learning Outcome Indicators include:

- 1.1 Identify and clarify ship's mission profile and needs of project stakeholders.
- 1.2 Analyze construction documents, including drawings and specifications.
- 1.3 Create and present information as drawings using standard drafting conventions.
- 1.4 Evaluate and record modifications to drawings to reflect as-built conditions.
- 1.5 Communicate project related information effectively.
- 1.6 Create computer aided design (CAD) drawings.

### **MATY02 Ship Piping Systems**

- Prepare ship piping systems designs including all pipe systems, HVAC, and systems required in ship design and allocate equipment.

Learning Outcome Indicators include:

- 2.1 Implement calculations in accordance with design criteria.
- 2.2 Prepare preliminary and final designs.
- 2.3 Interpret and design ship piping drawings, specifications, codes, standards, and technical literature.
- 2.4 Resolve technical problems regarding piping layouts and designs for ship spaces.
- 2.5 Determine machinery requirements for piping applications and piping systems.
- 2.6 Create detailed specifications and estimates.
- 2.7 Interpret and design ship protection systems drawings, specifications, codes, standards, and technical literature with respect to regulatory guidelines.

### **MATY03 Technical Documentation**

- Create CAD drawings, specifications, estimates, and other technical documentation.

Learning Outcome Indicators include:

- 3.1 Create engineering drawings using CAD software and standard drafting techniques.
- 3.2 Use CAD software in design and manufacturing of components and systems.
- 3.3 Create detailed specifications and estimates.
- 3.4 Resolve technical problems utilizing computer application software.
- 3.5 Access, exchange, and store data applying file management techniques.

## **MATY04 CAD Systems**

- Apply working knowledge of setup and management of CAD systems.

Learning Outcome Indicators include:

- 4.1 Maintain currency in technologies that affect engineering work.
- 4.2 Select and retrieve information from existing sources using computerized techniques.
- 4.3 Access and share information using electronic communications effectively.
- 4.4 Resolve engineering problems applying knowledge of computers and application software.
- 4.5 Design and illustrate projects using latest technology.
- 4.6 Integrate data between architectural drawings and database applications.
- 4.7 Evaluate CAD and analytical software.
- 4.8 Manage electronic drawing files effectively.

## **MATY05 Ship Systems Drawings**

- Create complete sets of piping drawings for ship service and engine support for ship construction/repair projects.

Learning Outcome Indicators include:

- 5.1 Identify and clarify needs of project stakeholders.
- 5.2 Analyze construction documents including drawings and specifications.
- 5.3 Create and present information as drawings using standard drafting conventions.
- 5.4 Evaluate and document modifications to drawings to reflect as-built conditions.
- 5.5 Communicate project related information in oral and written formats in an effective manner.
- 5.6 Create ship systems drawings and pipe drawings such as flow diagrams, piping instrumentation diagrams, piping composites, and pipe spools using CAD software and standard pipe drafting techniques.

## **MATY06 Relationship Among Disciplines**

- Explain relationships among naval architectural, structural, mechanical, electrical, and environmental ship building systems.

Learning Outcome Indicators include:

- 6.1 Apply relevant naval architectural, structural, mechanical, electrical, and environmental theory and research when contributing to design, implementation and evaluation of construction projects.
- 6.2 Explain role of and the relationship between architectural, structural, mechanical, electrical, and environmental disciplines as they relate to ship design/ construction projects.
- 6.3 Resolve problems regarding specialized equipment and systems in consultation with appropriate specialists.
- 6.4 Integrate and coordinate clearances, locations, and interferences between structural, mechanical, environmental, and electrical services.

- 6.5 Explain the skills needed to work effectively with marine engineering professionals.

### **MATY07 Mechanical Engineering Design**

- Resolve complex technical problems related to mechanical engineering design applications.

Learning Outcome Indicators include:

- 7.1 Identify the technical criteria necessary to design and construct mechanical engineering components, processes, and systems.
- 7.2 Apply engineering principles to the analysis, design, and construction of mechanical engineering projects.
- 7.3 Implement standard procedures involving design, implementation, monitoring, and reporting of experimental operations.
- 7.4 Communicate findings effectively.

### **MATY08 Modifying Existing Vessels**

- Modify existing system designs and class upgrades of marine vessels.

Learning Outcome Indicators include:

- 8.1 Explain concept of sustainable design, including classification society certification.
- 8.2 Interpret existing drawings with respect to specifications, standards, technical literature, and compliance to current regulatory bodies and guidelines.
- 8.3 Analyze and modify existing designs to suit current standards.
- 8.4 Implement calculations in accordance with design criteria.
- 8.5 Resolve technical problems regarding existing piping layouts and ship spaces to suit modifications.
- 8.6 Create preliminary, as-built, and final designs.

### **MATY09 Ship Auxiliary Systems and Propulsion Plants**

- Design and create specifications for ship auxiliary systems and propulsion plants.

Learning Outcome Indicators include:

- 9.1 Analyze applications of ship's propulsion systems and required power systems.
- 9.2 Implement calculations in accordance with design criteria.
- 9.3 Identify propulsion and auxiliary systems requirements.
- 9.4 Interpret and design ship and engine auxiliary systems drawings, specifications, standards, and technical literature with respect to regulatory bodies and guidelines.
- 9.5 Apply machinery components auxiliary systems.
- 9.6 Apply propulsion components to propulsion systems.
- 9.7 Create preliminary and final designs.

### **MATY10 Heat Transfer**

- Apply concepts of conduction, convection, radiation, and heat transfer in analysis of properties and heat transfer problems.

Learning Outcome Indicators include:

- 10.1 Analyze thermodynamic properties.
- 10.2 Analyze and resolve heat transfer problems.
- 10.3 Interpret technical literature regarding thermodynamic principles and equipment.

### **MATY11 Fluid Mechanics**

- Analyse and resolve problems of fluid mechanics.

Learning Outcome Indicators include:

- 11.1 Analyze properties of fluids and solve problems involving fluid pressures.
- 11.2 Analyze dynamics of fluid flow.
- 11.3 Determine friction losses in piping systems.
- 11.4 Resolve fluid viscosity problems.
- 11.5 Design piping systems applying fluid mechanics techniques specific to piping systems designs.

### **MATY12 Ship Electrical Systems**

- Analyze design of ship electrical systems.

Learning Outcome Indicators include:

- 12.1 Analyze properties of shipboard electrical systems and design of electrical systems for ships.
- 12.2 Analyze principles of operation and the function of different components in ships' electrical systems.
- 12.3 Identify ship electrical loads and requirements based on systems needs and equipment.
- 12.4 Apply electrical theory.
- 12.5 Work effectively determining skills needed to work effectively with electrical staff of design office or shipyard.
- 12.6 Create technical reports outlining ship's electrical system.

### **MATY13 Codes and Regulations**

- Apply knowledge of applicable codes, regulations, and environmental constraints to ship systems designs.

Learning Outcome Indicators include:

- 13.1 Calculate all systems requirements to meet applicable codes and regulatory bodies' rules.

- 13.2 Prepare data matrix and calculation booklet.
- 13.3 Identify inspection requirements and schedule site visits for regulatory bodies.

### **MATY14 Cost Estimating**

- Create preliminary and final cost estimates.

Learning Outcome Indicators include:

- 14.1 Prepare preliminary and detailed cost estimates.
- 14.2 Analyze time studies to produce accurate unit prices of construction activities.
- 14.3 Prepare cost plans, elemental estimates, budget forecasts, and project estimates applying principles of cost accounting.
- 14.4 Determine measurements and document quantities.

### **MATY15 Communication**

- Communicate effectively with clients, contractors, other shipbuilding professionals, and regulatory authorities.

Learning Outcome Indicators include:

- 15.1 Create, present, and defend technical reports.
- 15.2 Interpret and communicate technical drawings.
- 15.3 Communicate technical information to diverse groups.
- 15.4 Write, prepare, and present proposals and contract documents.
- 15.5 Create and deliver presentations.
- 15.6 Create accurate and timely inspection reports.
- 15.7 Explain the importance of preparing accurate submissions to regulatory authorities.

### **MATY16 Project Management**

- Plan, manage, schedule, and monitor projects applying principles of project management.

Learning Outcome Indicators include:

- 16.1 Analyze, monitor, document, and report progress of construction projects.
- 16.2 Create and monitor project schedules.
- 16.3 Audit and validate inspection of construction projects.
- 16.4 Interpret and use results of quality assurance testing to make adjustments or changes to project schedules.
- 16.5 Evaluate and monitor projects comparing activities and results to data from a variety of sources, including reports, minutes, field data and field notes, site inspections, established criteria, site and weather demands, schedule, projected cost estimates, and actual costs.
- 16.6 Resolve construction problems related to materials, scheduling, resources, and budgetary concerns in order to implement and complete construction projects.
- 16.7 Create deficiency lists and take appropriate actions to resolve deficiencies.

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