



Republic of the Philippines

# Department of Education

DepEd Complex, Meralco Avenue, Pasig City

**STRENGTHENED SENIOR HIGH SCHOOL CURRICULUM**

## **MARITIME ENGINEERING AT THE SUPPORT LEVEL**

**Grade 11/12**

**Course Description:**

This course is designed to equip learners with the competencies to perform electrical, electronic and control engineering, maintenance and repair, control the operation of the ship and care for persons on board in Marine Engineering at the support level. All competencies are based on Table A-III/4 and A-III/5 of Standard of Training of Certification and Watchkeeping (STCW) Convention 1978, as amended and geared towards producing future-ready and competent maritime graduates. Upon completion of this course together with the required seagoing service, the learners can obtain Certificate of Proficiency under Regulation III/4 and III/5 (subject to appropriate sea service) of the said Convention issued by the Maritime Industry Authority (MARINA), pursue higher education and careers relative to maritime industry sector.

**Elective:** Technical Professional

**Prerequisite:** None

**Time Allotment:** In Grade 11, 320 hours for two semesters, 8 hours per week/In Grade 12, 320 hours for one semester, 16 hours per week

**Schedule:** First/Second Semester

**QUARTER 1**

<b>CONTENT STANDARD</b>	The learners demonstrate understanding of maintaining the safe engineering watch through monitoring and controlling the operation of a main propulsion and auxiliary machineries; the correct water level and steam pressure of the boiler; emergency procedures and emergency equipment in machinery spaces especially in the engine room operation including communication relevant to engine watchkeeping and the safe working practices and use of electrical equipment	
<b>PERFORMANCE STANDARD</b>	The learners demonstrate the skills in engine room piping system based on the Maritime industry standard.	
<b>LEARNING COMPETENCIES</b>		<b>CONTENT</b>
1. Discuss the shipping industry and its career opportunities		History of Shipping Industry <ul style="list-style-type: none"> <li>• ancient seafaring</li> <li>• exploration and trade</li> <li>• Evolution of ships, navigation techniques and tools</li> </ul> Career Opportunities <ul style="list-style-type: none"> <li>• Ship building and repair</li> <li>• Ship operations and management</li> <li>• Port operations and management</li> </ul>

	<ul style="list-style-type: none"> <li>• Ship surveying and inspection</li> <li>• Offshore industry</li> <li>• Maritime education and training</li> <li>• Philippine Navy</li> <li>• Philippine Coast Guard</li> <li>• Maritime Police</li> </ul>
<p>2. Discuss the regulatory bodies and conventions in the shipping industry</p>	<p>Regulatory Bodies</p> <ul style="list-style-type: none"> <li>• International Maritime Organization (IMO)</li> <li>• International Labor Organization (ILO)</li> <li>• Maritime Industry Authority (MARINA)</li> </ul> <p>Four (4) Pillars of IMO Convention</p> <ul style="list-style-type: none"> <li>• International Convention of Safety of Life at Sea (SOLAS)</li> <li>• International Convention for the Prevention of Pollution from Ship (MARPOL)</li> <li>• Maritime Labour Convention (MLC) 2006</li> <li>• Standards of Training, Certification, and Watchkeeping (STCW) 1978, as amended</li> </ul>
<p>3. Discuss the stressors and emotional challenges of seafarers</p>	<p>Mental Health</p> <p>Importance of Mental Health</p> <p>Factors affecting the mental and emotional behaviors of seafarers.</p> <ul style="list-style-type: none"> <li>• Isolation</li> <li>• Fatigue</li> <li>• Homesickness</li> <li>• Seasickness</li> </ul> <p>Coping Strategies and Emotional Resilience</p> <ul style="list-style-type: none"> <li>• Stress management techniques (e.g., mindfulness, relaxation exercises)</li> </ul>

	<ul style="list-style-type: none"> <li>• Emotional regulation strategies to handle stressful situations</li> </ul>
<p>4. Discuss the shipboard organization and its functions according to the level of responsibility</p>	<p>Personal Well-being and Self-care</p> <p>Shipboard Organizational Structure</p> <ul style="list-style-type: none"> <li>• Deck Department</li> <li>• Engine Department</li> <li>• Galley Department</li> </ul> <p>Levels of Responsibility</p> <ul style="list-style-type: none"> <li>• Management</li> <li>• Operational</li> <li>• Support</li> </ul> <p>Seven (7) Functions onboard as per STCW</p> <ul style="list-style-type: none"> <li>• Navigation</li> <li>• Cargo handling and stowage</li> <li>• Controlling the operation of the ship and care for persons on board</li> <li>• Marine engineering</li> <li>• Electrical, electronic and control engineering</li> <li>• Maintenance and repair</li> <li>• Radio communications</li> </ul>
<p>5. Discuss the type of ships and operations, parts, dimensions and terminologies used in ships direction</p>	<p>Types of Ships</p> <ul style="list-style-type: none"> <li>• Tanker vessels</li> <li>• Oil tanker</li> <li>• Chemical tanker</li> <li>• Gas tanker</li> <li>• General cargo vessels</li> <li>• Bulk carrier ship</li> <li>• Container vessels</li> <li>• Reefer ship</li> <li>• Log ship</li> <li>• Car carrier</li> </ul>

- Roll-on/roll-off vessel
- Livestock carrier
- Offshore vessels
- Passenger ship
- Service ship

#### Parts of the Ship

- Hull
- Keel
- Bow
- Stern
- Deck
- Bulkheads
- Accommodation
- Bridge
- Cofferdams
- Cargo hold/tank
- Engine room spaces
- Steering gear room
- Rudder
- Propeller
- Anchor
- Funnel

#### Ship's Dimensions

- Length Overall (LOA)
- Forward Perpendicular (LBP)
- Amidship
- Extreme breadth
- Summer loadline
- Freeboard
- Draft
- Depth

	<p>Ship's Terminologies Use in Ship's Direction</p> <ul style="list-style-type: none"> <li>• Forward</li> <li>• Mid-ship</li> <li>• Aft</li> <li>• Port</li> <li>• Starboard</li> <li>• Abeam</li> <li>• Port quarter</li> <li>• Starboard quarter</li> <li>• Port bow</li> <li>• Starboard bow</li> </ul>
<p>6. Discuss the purpose charter party agreement in ship's trading services</p>	<p>Ship's Trading Services</p> <ul style="list-style-type: none"> <li>• Liner services</li> <li>• Tramping services</li> </ul> <p>Charter Party Agreement</p> <ul style="list-style-type: none"> <li>• Bareboat charter</li> <li>• Time charter</li> <li>• Voyage charter</li> <li>• Lump-sum contract charter</li> </ul>
<p>7. discuss the safety and security code for the protection of personnel, ship, cargo, and the environment</p>	<p>Ship's Safety and Security</p> <ul style="list-style-type: none"> <li>• International Safety Management (ISM) Code <ul style="list-style-type: none"> <li>○ Safety at sea</li> <li>○ Prevention of human injury</li> <li>○ Environmental protection</li> </ul> </li> <li>• International Ship and Port Facility Security (ISPS) Code <ul style="list-style-type: none"> <li>○ International cooperation</li> <li>○ Threat identification and prevention</li> <li>○ Roles and responsibilities</li> <li>○ Security assessments and plans</li> </ul> </li> </ul>



	<ul style="list-style-type: none"><li>- high temperature</li><li>- low temperature</li><li>○ seawater piping system<ul style="list-style-type: none"><li>- seawater cooling system</li><li>- seawater service system</li><li>- ballast piping system</li><li>- fire &amp; G.S system</li></ul></li><li>○ fuel oil piping system<ul style="list-style-type: none"><li>- fuel oil transfer system</li><li>- fuel oil purification system</li><li>- fuel oil service system</li><li>- main engine</li><li>- auxiliary engine</li><li>- boiler</li></ul></li><li>○ lube oil piping system<ul style="list-style-type: none"><li>- system oil<ul style="list-style-type: none"><li>■ lube oil transfer system</li><li>■ lube oil purification system</li></ul></li><li>- cylinder oil<ul style="list-style-type: none"><li>■ cylinder oil transfer and service system</li></ul></li></ul></li><li>○ compressed air piping system<ul style="list-style-type: none"><li>- starting air</li><li>- service air</li><li>- control air</li></ul></li><li>○ steam distribution piping system</li><li>○ bilge piping system</li><li>○ sludge piping system</li><li>○ sewage piping system</li></ul> <ul style="list-style-type: none"><li>● Pumps<ul style="list-style-type: none"><li>○ positive displacement</li><li>○ piston pumps</li><li>○ plunger pumps</li></ul></li></ul>
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	<ul style="list-style-type: none"> <li>○ screw</li> <li>○ gear</li> <li>○ diaphragm pump</li> <li>○ vane pump</li> <li>○ lobe pump</li> <li>○ dynamic pumps</li> <li>○ centrifugal pumps</li> <li>○ submersible pumps</li> </ul> <ul style="list-style-type: none"> <li>• Valves <ul style="list-style-type: none"> <li>○ gate valve</li> <li>○ globe valve</li> <li>○ butterfly valve</li> <li>○ ball valve</li> <li>○ check valve</li> <li>○ relief valve</li> <li>○ safety valve</li> </ul> </li> <li>• Heat exchanger <ul style="list-style-type: none"> <li>○ plate type</li> <li>○ tube type</li> </ul> </li> </ul>
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### QUARTER 2

<b>CONTENT STANDARD</b>	The learners demonstrate understanding of maintaining the correct water level and steam pressure of the boiler, emergency procedures in machinery spaces, operation of emergency equipment, safe engineering watch, communication relevant to engine watchkeeping, monitoring and controlling of an engine room watch, and understanding of the safe working practices and use of electrical equipment.	
<b>PERFORMANCE STANDARD</b>	The learners demonstrate the skills in maintaining a safe engineering watch and safe working practices on the different shipboard scenarios.	
<b>LEARNING COMPETENCIES</b>	<b>CONTENT</b>	

1. Use communication equipment relevant to engine room watchkeeping operations

#### Communication Relevant to Engine Watchkeeping

- Machinery spaces terminologies
  - SOLAS, Chapter II-1 Regulation 2 and 3
  
- Elements of effective communication
  - sender
  - message
  - channel
  - receiver
  - feedback
  
- Communication loops
  - open-loop communication
  - close-loop communication
  
- Internal communication systems
  - intercom/sound powered phone
  - VHF radio
  - engine/bridge telegraph
  
- Engine room alarm system
  - CO<sub>2</sub> alarm
  - fire detection alarm
    - smoke
    - heat
    - flame
  - engine operational alarms
  - shipboard emergency signal/alarm
    - general alarm
    - fire alarm
    - man overboard alarm
    - abandonship alarm
    - dead man alarm
    - oil spill alarm

<p>2. Demonstrate emergency duties in response to emergency situations onboard as stated in the station bill</p>	<p>Emergency Procedures in Machinery Spaces</p> <ul style="list-style-type: none"> <li>• Emergency duties and responsibilities <ul style="list-style-type: none"> <li>○ fire</li> <li>○ engine room flooding</li> <li>○ steering gear failure</li> <li>○ machinery failure</li> <li>○ engine room blackout</li> <li>○ abandonship</li> </ul> </li> <li>• Emergency Plans and Procedures <ul style="list-style-type: none"> <li>○ fire</li> <li>○ flooding</li> <li>○ blackout</li> <li>○ medical emergencies</li> </ul> </li> <li>• Emergency Escape Breathing Device <ul style="list-style-type: none"> <li>○ purpose</li> <li>○ donning procedure</li> <li>○ location in machinery spaces</li> </ul> </li> </ul>
<p>3. Perform the operations of emergency equipment in the engine room in accordance with the standard safety procedures</p>	<p>Emergency Equipment in the Engine Room</p> <ul style="list-style-type: none"> <li>• Types of emergency equipment <ul style="list-style-type: none"> <li>○ emergency bilge suction</li> <li>○ emergency generator</li> <li>○ emergency steering</li> </ul> </li> <li>• Firefighting equipment <ul style="list-style-type: none"> <li>○ fire pump</li> <li>○ emergency fire pump</li> <li>○ fixed water sprinkler system</li> <li>○ fixed CO<sub>2</sub> system</li> </ul> </li> <li>• Location of firefighting equipment</li> </ul>

<p>4. discuss watchkeeping duties for proper relief, maintenance, and handover of the watch</p>	<p>Safe Engineering Watch</p> <ul style="list-style-type: none"> <li>• Engine watchkeeping onboard <ul style="list-style-type: none"> <li>○ information required to maintain a safe watch <ul style="list-style-type: none"> <li>- machinery and systems</li> <li>- inspections and monitoring</li> <li>- safety procedures</li> <li>- emergency response</li> <li>- communication and documentation</li> <li>- personnel behavior</li> </ul> </li> </ul> </li> <li>• Engine-room watchkeeping procedures <ul style="list-style-type: none"> <li>○ un-manned engine room</li> <li>○ manned engine room</li> </ul> </li> <li>• Procedures for engine room watchkeeping: <ul style="list-style-type: none"> <li>○ relief</li> <li>○ maintenance</li> <li>○ handover of the watch</li> </ul> </li> </ul>
<p>5. Perform monitoring, maintaining, and recording the safe operating parameters of the marine steam boiler</p>	<p>Marine Steam Boiler Operation</p> <ul style="list-style-type: none"> <li>• Steam cycle (rankine cycle) <ul style="list-style-type: none"> <li>○ evaporation</li> <li>○ energy conversion</li> <li>○ condensation</li> </ul> </li> <li>• Steam consumers <ul style="list-style-type: none"> <li>○ fuel oil heating</li> <li>○ HVAC</li> <li>○ main propulsion</li> <li>○ auxiliary machines</li> </ul> </li> <li>• Types of marine steam boiler <ul style="list-style-type: none"> <li>○ water tube boiler</li> <li>○ fire tube boiler</li> </ul> </li> <li>• Safe operation of marine steam boiler <ul style="list-style-type: none"> <li>○ automatic operation</li> </ul> </li> </ul>

<p>6. Perform monitoring and controlling of an engine room watch.</p>	<ul style="list-style-type: none"> <li>○ manual operation</li> </ul> <p>Monitoring and Controlling of an Engine Room Watch</p> <ul style="list-style-type: none"> <li>• Main propulsion and auxiliary machineries. <ul style="list-style-type: none"> <li>○ functions and operations <ul style="list-style-type: none"> <li>- air system</li> <li>- bilge system</li> <li>- lube-oil (LO) and fuel-oil (FO) systems</li> <li>- refrigeration and air-conditioning plants</li> <li>- cooling system (sea and fresh water)</li> <li>- propulsion shafting and bearings</li> <li>- steering gear</li> <li>- freshwater generator</li> <li>- main steam turbine (steam vessel)</li> <li>- main diesel engine (motor vessel)</li> <li>- reverse osmosis plant</li> <li>- main gas-turbine engine (gas turbine vessel)</li> </ul> </li> <li>○ reporting of unsafe conditions or potential hazards</li> </ul> </li> <li>• Parameters <ul style="list-style-type: none"> <li>○ main and auxiliary machinery parameters <ul style="list-style-type: none"> <li>- pressure</li> <li>- temperature</li> <li>- levels</li> </ul> </li> <li>○ main propulsion and auxiliary operating parameters <ul style="list-style-type: none"> <li>- normal</li> <li>- critical</li> </ul> </li> <li>○ monitoring and controlling procedures</li> <li>○ appropriate recording of entries in the engine logbook</li> </ul> </li> </ul>
<p>7. Perform safe working practices in shipboard in accordance with Safety Management System (SMS) manual.</p>	<p>Occupational Health and Safety Procedures</p> <ul style="list-style-type: none"> <li>• Engine-room operational hazards <ul style="list-style-type: none"> <li>○ fire hazard</li> <li>○ electrical hazard</li> <li>○ mechanical hazard</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ noise hazard</li> <li>○ heat hazard</li> <li>○ confined space</li> <li>○ physical hazard</li> <li>○ chemical hazard</li>   <li>• Safe working practices and personal shipboard safety <ul style="list-style-type: none"> <li>○ electrical safety</li> <li>○ lockout/tag-out</li> <li>○ mechanical safety</li> <li>○ permit to work systems</li> <li>○ working aloft</li> <li>○ working in enclosed spaces</li> <li>○ lifting techniques and methods</li> <li>○ chemical and biohazard</li> <li>○ personal safety equipment</li> </ul> </li>   <li>• Permit to work <ul style="list-style-type: none"> <li>○ hot work permit</li> <li>○ cold work permit</li> <li>○ enclosed space permit</li> <li>○ working aloft permit</li> <li>○ electrical work permit</li> </ul> </li> </ul>
<p>8. Perform safe use of electrical equipment on shipboard maintenance and repair.</p>	<p>Safe Use of Electrical Equipment</p> <ul style="list-style-type: none"> <li>• Safe use and operation <ul style="list-style-type: none"> <li>○ safety precautions <ul style="list-style-type: none"> <li>- before commencing work</li> <li>- during repair</li> </ul> </li> <li>○ isolation procedures</li> <li>○ emergency procedures</li> <li>○ different voltages on board</li> </ul> </li> <li>• Recognizing and reporting electrical hazards</li> <li>• Electrical shock <ul style="list-style-type: none"> <li>○ causes and precautions</li> </ul> </li> </ul>

### QUARTER 3

<b>CONTENT STANDARD</b>	The learners demonstrate understanding of the shipboard maintenance and repair.	
<b>PERFORMANCE STANDARD</b>	The learners perform shipboard maintenance and repair.	
<b>LEARNING COMPETENCIES</b>	<b>CONTENT</b>	
1. Perform shipboard maintenance and repair of main and auxiliary machinery and equipment.	<p>Shipboard Maintenance and Repair</p> <ul style="list-style-type: none"> <li>• Shipboard routine maintenance and repair procedures <ul style="list-style-type: none"> <li>○ preventive maintenance</li> <li>○ corrective maintenance</li> <li>○ condition-based maintenance</li> <li>○ predictive maintenance</li> </ul> </li> <li>• Technical, safety and procedural specification <ul style="list-style-type: none"> <li>○ manufacturer's safety guidelines</li> <li>○ shipboard instructions</li> </ul> </li> <li>• Application, maintenance and use <ul style="list-style-type: none"> <li>○ hand tools <ul style="list-style-type: none"> <li>- hammer</li> <li>- chisel</li> <li>- screwdriver</li> <li>- pliers</li> <li>- wrenches</li> <li>- scissors</li> <li>- gasket punch table tool set</li> <li>- scrapers</li> <li>- steel brush</li> <li>- hacksaw</li> <li>- files</li> <li>- grease gun</li> <li>- oil gun</li> <li>- hand riveter</li> <li>- screw extractor</li> <li>- taps and dies</li> </ul> </li> </ul> </li> </ul>	

- measuring instruments
  - scales
  - calipers
  - protractors
  - square and straight edge
  - vernier calipers
  - depth gauges
  - micrometers
  - dial indicators
  - thickness gauges
  - radius gauges
  - screw pitch gauges
- power tools
  - angle grinder
  - bench grinder
  - portable Drill
- machine tools
  - welding machine
- surface preparation techniques
  - cleaning
  - degreasing
  - sanding
  - grinding
  - blasting
- metalwork
  - welding process
  - manual metal arc welding
  - gas welding (oxyacetylene)
  - gas cutting (oxyacetylene)
  - welding joint
    - butt joint
    - tee joint
    - lap joint
    - corner joint

- edge joint
- brazing
  - torch brazing
- gas cutting
- annealing
- riveting
- lathe practice
  - centering
  - turning
  - facing
  - boring
  - grooving
  - knurling
  - chamfering
  - drilling
  - parting
  - threading
- drilling
- grinding
- buffing
- tapping
- thread extraction
- Safe disposal of waste materials
  - identifying hazardous waste materials
  - regulations and compliance
  - waste minimization and recycling
  - safe handling and storage
  - disposal methods
- Materials and equipment
  - painting
    - paint
    - primer
    - paint brush
    - paint roller

	<ul style="list-style-type: none"> <li>- roller tray</li> <li>○ lubrication <ul style="list-style-type: none"> <li>- grease</li> <li>- oil</li> <li>- dry lubricants</li> <li>- grease gun</li> <li>- oil can</li> <li>- spray bottle</li> </ul> </li> <li>○ cleaning <ul style="list-style-type: none"> <li>- cleaning agents <ul style="list-style-type: none"> <li>■ detergents</li> <li>■ solvents</li> <li>■ chemicals</li> </ul> </li> <li>- broom</li> <li>- dustpan</li> <li>- mop</li> <li>- bucket</li> </ul> </li> </ul>
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#### QUARTER 4

<b>CONTENT STANDARD</b>	The learners demonstrate understanding of anti-pollution equipment, operation of equipment and machinery, fueling and oil transfer operations, operating procedures of bilge and ballast system transfer operations, and handling of stores	
<b>PERFORMANCE STANDARD</b>	The learners apply procedure in prevention of pollution, safe operation of equipment and machinery, fueling and oil transfer operations, bilge and ballast operations, and handling of stores	
<b>LEARNING COMPETENCIES</b>		<b>CONTENT</b>
1. Apply procedures in the prevention of pollution of the marine environment.		Prevention of Pollution of the Marine Environment <ul style="list-style-type: none"> <li>• Sources of operational pollution <ul style="list-style-type: none"> <li>○ oil</li> <li>○ noxious liquid substances</li> <li>○ packaged goods and non-liquid substances</li> <li>○ sewage</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ garbage</li> <li>○ marine debris</li> <li>○ air pollution</li> <li>• Different waste materials onboard</li> <li>• Safety precautions</li> <li>• MARPOL annexes about the basic environmental protection procedures</li> <li>• Approved methods for disposal of marine pollutants</li> <li>• Anti-pollution equipment <ul style="list-style-type: none"> <li>○ purpose</li> <li>○ procedures</li> <li>○ use and operation</li> </ul> </li> </ul>
<p>2. Perform safe operation of equipment and machinery in accordance of manufacturers manual.</p>	<p>Contribute to the Operation of Equipment and Machinery</p> <ul style="list-style-type: none"> <li>• Safe operation of equipment <ul style="list-style-type: none"> <li>○ valve and pumps</li> <li>○ hoists and lifting equipment</li> <li>○ hatches and watertight doors, ports, and related equipment</li> </ul> </li> <li>• Basic crane, winch, and hoist signals.</li> </ul>
<p>3. Perform fueling and oil transfer operations in accordance with standard safety procedures.</p>	<p>Contribute to Fueling and Oil Transfer Operations</p> <ul style="list-style-type: none"> <li>• Fuel system and oil transfer operation procedure <ul style="list-style-type: none"> <li>○ preparations for fuel transfer</li> <li>○ hose connections</li> <li>○ emergency procedure</li> <li>○ securing for fuel transfer</li> <li>○ tank level measurement and reporting</li> </ul> </li> <li>• Bunkering equipment <ul style="list-style-type: none"> <li>○ bunkering manifold</li> <li>○ bunker hose with flange</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ bunker valve</li> <li>○ sounding pipe</li> <li>○ sounding tape</li> <li>○ SOPEP materials <ul style="list-style-type: none"> <li>- oil boom</li> <li>- oil spill dispersant</li> <li>- absorbent pads</li> <li>- cotton rags</li> <li>- saw dust</li> <li>- plastic drums</li> <li>- shovel (non-spark)</li> <li>- scoops (non-spark)</li> <li>- brooms and brushes</li> <li>- non-asbestos flange gasket</li> <li>- sampling bottle</li> <li>- cubitainer</li> <li>- sampling flange</li> <li>- emergency stop button</li> <li>- two-way radio</li> <li>- pressure gauge</li> <li>- thermometer</li> <li>- portable class B fire extinguisher</li> </ul> </li> </ul>
<p>4. Perform bilge and ballast operations in accordance with standard safety procedures.</p>	<p>Contribute to Bilge and Ballast Operations</p> <ul style="list-style-type: none"> <li>● Bilge and ballast system <ul style="list-style-type: none"> <li>○ Operating procedures</li> <li>○ Safe function, operation and maintenance <ul style="list-style-type: none"> <li>- reporting incidents</li> <li>- tank level measurement and reporting</li> </ul> </li> </ul> </li> </ul>

5. Perform handling of stores in accordance with standard safety procedures.	<p>Handling of Stores</p> <ul style="list-style-type: none"> <li>• Safety Procedures for safe handling, stowage and securing of stores <ul style="list-style-type: none"> <li>○ correct lifting techniques</li> <li>○ proper stowing and securing <ul style="list-style-type: none"> <li>- heavy equipment</li> <li>- hazardous</li> <li>- harmful stores</li> </ul> </li> </ul> </li> </ul>
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## GLOSSARY

**Abeam** – At a right angle to the fore-and-aft line of the ship.

**Abandonship Alarm** – A specific sound signal alerting crew to prepare to leave the vessel.

**Auxiliary Machinery** – Equipment that supports main propulsion and ship operations such as generators, compressors, etc.

**Ballast System** – A system used to maintain stability and balance by taking in or discharging water.

**Bilge System** – A drainage system that collects water at the lowest part of the engine room.

**Boiler** – A device used to generate steam for propulsion and auxiliary services.

**Charter Party** – A contractual agreement between a shipowner and a charterer for the use of a vessel.

**Deadman Alarm** – A safety device that requires periodic user interaction to prevent automatic activation of an alarm.

**Engine Room** – Compartment where main and auxiliary machinery is installed.

**Engine Watchkeeping** – Continuous monitoring of machinery to ensure safe and efficient operation.

**Fixed CO<sub>2</sub> System** – A firefighting system using carbon dioxide to suppress fire in enclosed spaces.

**Freeboard** – Vertical distance from the waterline to the upper deck level.

**Hull** – The main body of a vessel excluding masts, superstructure, rigging, etc.

**ISM Code** – International Safety Management Code for the safe operation of ships and for pollution prevention.

**ISPS Code** – International Ship and Port Facility Security Code.

**Keel** – The central structural base of a ship running along the bottom.

**Lube Oil System** – Lubrication system that reduces friction between moving parts in engines.

**Main Engine** – The primary engine used for ship propulsion.

**MARPOL** – The main international convention covering prevention of marine pollution.

**Midship** – The middle part of the ship, both longitudinally and transversely.

**Oily Water Separator** – Equipment that removes oil from bilge water before discharge overboard.

**Port** – Left side of the ship when facing forward.

**Propeller** – A mechanical device with blades used to move the ship through water.

**PSI** – Pounds per Square Inch, a unit of pressure.

**Purifier** – A machine that separates water and solids from oil using centrifugal force.

**SOLAS** – International Convention for the Safety of Life at Sea.

**Sounding Tape** – Measuring tool used to check the level of liquid in a tank.

**Starboard** – Right side of the ship when facing forward.

**Steam Cycle (Rankine Cycle)** – A thermodynamic cycle that converts heat into mechanical energy.

**STCW** – Standards of Training, Certification, and Watchkeeping for Seafarers.

**Stern** – The rear part of the ship.

**Valve** – Device for controlling the passage of fluid through a pipe.

**Vernier Caliper** – A precision instrument for measuring internal and external dimensions.

**Watchkeeping** – The practice of maintaining continuous oversight of operations and safety onboard.

**Winch** – Mechanical device used to pull in or let out a rope or cable.

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### TOOLS, MATERIALS, AND EQUIPMENT

TOOLS	MATERIALS	EQUIPMENT
<b>Hand Tools</b>	<b>Maintenance and Repair Materials</b>	<b>Machinery and Systems (for simulation or actual use)</b>
Hammer (ball peen, sledge)	Paint (primer, top coat)	Marine diesel engine (cutaway or functional training model)
Chisel (flat, round)	Painting tools (brushes, rollers, trays)	Marine steam boiler (fire-tube or water-tube, simulation acceptable)
Screwdrivers (flat, Phillips, insulated)	Cleaning agents (detergents, solvents, degreasers)	Generator set (diesel-powered)
Pliers (needle-nose, slip-joint, locking)	Lubricants (grease, engine oil, hydraulic oil, dry lubes)	Air compressor
Adjustable and fixed-size wrenches	Cotton rags	Fresh water generator (distillation or RO type)
Hex key set (Allen keys)	Steel wool	Oily water separator unit
Scissors	Gaskets and gasket sheets	Oil purifier (centrifugal type)
Scrapers	Metal rods and sheets (for welding practice)	Air conditioning and refrigeration system
Gasket punch tool set	Welding electrodes, filler rods	Steering gear system
Steel wire brushes	Brazing rods and flux	Bilge and ballast system (training setup or simulator)
Hacksaw	Thread seal tape	Fuel and lube oil transfer systems
Files (flat, round, half-round)	Pipe fittings and spare valves	Firefighting equipment:
Grease gun	<b>SOPEP and Bunkering Materials</b>	Fire pump (main/emergency)
Oil gun	Oil spill response materials:	Fixed CO <sub>2</sub> system (simulation)
Hand riveter	Oil boom	Sprinkler system mock-up
Screw extractor	Absorbent pads	Portable extinguishers (Class A, B, C, D)
Taps and dies (metric and imperial)	Dispersants	Communication systems:
<b>Measuring Instruments</b>	Sawdust	Engine telegraph

Rulers and measuring tapes	Shovels, scoops (non-sparking)	Intercom/sound-powered phone
Vernier calipers	Sampling bottles and cubitainers	VHF radio
Depth gauges	Non-asbestos flange gaskets	Electrical panel with various voltages (110V, 220V, 440V AC/DC)
Micrometers (inside, outside, depth)	Bunker hose and valve models	Alarm panels (fire, bilge, CO <sub>2</sub> , general alarm)
Dial indicators	Emergency stop buttons and radios (demo units)	<b>Workshop Equipment</b>
Thickness gauges	<b>Safety Equipment</b>	Welding booth with ventilation
Radius gauges	PPE (hard hats, gloves, safety shoes, goggles, earplugs, coveralls)	Cutting and grinding station
Screw pitch gauges	Emergency Escape Breathing Device (EEBD)	Lifting hoist or gantry crane (manual/electric)
Protractors	Lockout/Tagout devices	Workbenches and vises
Squares and straight edges	Permits to work (hot work, enclosed space, etc.)	Tool cabinets
<b>Power Tools</b>	First aid kits	<b>Simulation and ICT Equipment</b>
Angle grinder	Fire blankets	Engine room simulator software (e.g., Kongsberg, Transas, TechSim)
Bench grinder		Watchkeeping and alarm system simulators
Portable electric drill		Boiler and control room simulators
Pneumatic tools (optional)		Safety and emergency procedure VR/AR tools (optional but beneficial)
<b>Machine Tools</b>		
Welding machine (arc, MIG, TIG)		
Oxyacetylene welding and cutting set		
Lathe machine with accessories		
Drill press		
Buffing machine		