Engineering Systems and Safety

Introduction to Engineering

Chapter 5 - Basic Thermodynamic Principles (Formerly Chapter 2 in Intro to Steam)

Force

Pressure

Energy

Mechanical Energy

Thermal Energy

Energy Transformations

Chapter 6 - Engineering Measurement (PNE Chapter 7)

Units and Principles of Measurement

Temperature and pressure measurement

Basic Instrumentation (Thermometers and Pressure Gauges)

Efficiency, Percent Error, and Deviation

Torque, Speed, and Power

Chapter 9 - Process and Instrumentation Diagrams (P&ID)

How to read diagrams

Valves and Pumps - What they do and symbols used

Open and Closed Systems

Basic Electricity

Heat Transfer

Marine Engineering

Engineering Machinery and Systems

Marine Propulsion Systems

Chapter 10 - Marine Propulsion Systems

Propellers, Thrusters, Pods, and Jets

Steam Turbines

Combustion Engines

Gas Turbines

Nuclear Propulsion

Electric Propulsion

Power Transmission and Gearing

Chapter 7 - Steam Generation (Formerly Intro to Steam Ch. 4)

Main Steam Cycle (Adapt and edit form Intro to Steam Ch. 1)

Construction

Operations

Chapter 8 - Internal Combustion Engines

Gas vs. Diesel Engines / Otto vs. Diesel Cycle

Engine Construction & Components

Two Stroke vs. Four Stroke

Auxiliary Machinery

Chapter 12 - Auxiliary Machinery

Overview of Pneumatics

Overview of Hydraulics

Overview of Distilling Systems

Overview of Valves

Overview of Pumps

Fuel oil systems

[OICEW-A4.1](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-A4.1) Characteristics of fuel oil systems

Lubrication oil systems

Cooling Systems

[OICEW-A4.1](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-A4.1) Characteristics of cooling systems

Chapter 13 - Electrical Power

Basic Electrical Principles

Electrical Symbols

Overview of Circuits

Electrical Distribution

Generators

Transformers

Motors

Variable Frequency Drives

Chapter 11 - Electrical Generation and Distribution

Electrical Power Generation

Switchgear

Overcurrent Protection

Safety Devices

Chapter 12 - Lubrication

Friction and Types of Lubrication

Rotating Machinery

Axial and Radial Bearings

Requirements of a Lubrication System

[OICEW-A4.1](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-A4.1) Characteristics of lubricating oil systems

TS Patriot State II

Vessel Particulars

Propulsion System

Main Engines

Propulsion Motor

Motor Drive

Auxiliary Systems

Electrical Power

Freshwater Genenration

Sewage Treatment

Chapter 14 - MMA Sea Term I

What to expect on the training cruise

Safety in the workplace and the marine environment

Safety

Hazards in the workplace

Slips, trips and falls

falling materials

working at heights

Mechanical Hazards

Rotating Machinery

Repair and Maintenance

[OICEW-C2.1](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-C2.1) Safety measures to be taken for repair and maintenance

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Lifting techniques and methods of preventing back injury

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Mechanical safety

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Mechanical safety

Electrical Hazards

[ABE-A9.2](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.2) Precautions to be observed to prevent shock

[ABE-A9.2](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.2) Knowledge of the causes of electric shock

[ABE-A9.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.1) Safe use and operation of electrical equipment

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Electrical safety

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Electrical safety

[ABE-A9.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.1) Electrical emergency procedures

Chemical Hazards

Chemical handling, safety, and storage

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Chemical and biohazard safety

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Chemical and biohazard safety

Fire

Hot work

Fire Prevention Measures

Fatigue

Causes of Fatigue

[PSSR-X6.3](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X6.3) Effects of physical stressors on seafarers

[PSSR-X6.4](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X6.4) Effects of environmental stressors in and outside the ship and their impact on seafarers

[PSSR-X6.2](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X6.2) Effects of sleep, schedules, and the circadian rhythm on fatigue

[PSSR-X6.5](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X6.5) Effects of schedule changes on seafarer fatigue

[PSSR-X6.1](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X6.1) Importance of obtaining the necessary rest

Enclosed Spaces

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Working in enclosed spaces

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Working in enclosed spaces

Enclosed Space entry

[PSSR-X3.3](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X3.3) Precautions to be taken prior to entering enclosed spaces

Hazard Mitigation

[OICEW-C1.5](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-C1.5) Safety measures to be taken to ensure a safe working environment

[RFPEW-A1.3](https://weh.maritime.edu/stcw/2023/tables/34.html#RFPEW-A1.3) Safe working practices as related to engine-room operations

Good Housekeeping

Job Hazard Analysis

Lock out - Tag out

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Lockout/tag-out

Permit to work systems

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Permit to work systems

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Permit to work systems

[ABE-A9.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.1) Safety precautions before commencing work or repair

[OICEW-C2.1](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-C2.1) Safe isolation of shipboard machinery and equipment before personnel are permitted to work

[ABE-A9.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-A9.1) Electrical isolation procedures

Safety Management System

Components of a Safety Management System

Management and Safety of Marine Engineering Operations (Modern Marine Engineers Manual Ch. 13)

ISM Code

SOLAS

OSHA & 29CFR

Personal Protective Equipment (formerly Chapter 9)

[ABE-C3.1](https://weh.maritime.edu/stcw/2023/tables/35.html#ABE-C3.1) Personal safety equipment

[TOPS-X3.2](https://weh.maritime.edu/stcw/2023/tables/5111.html#TOPS-X3.2) Protective clothing and equipment

Head Protection

Hand and Foot Protection

Eye Protection

Hearing Protection

Respiratory Protection

Personal survival equipment?

[PSSR-X3.2](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X3.2) Safety and protective devices available to protect against potential hazards aboard ship

Personal Safety

[OICEW-D8.4](https://weh.maritime.edu/stcw/2023/tables/31.html#OICEW-D8.4) Knowledge of personal safety

[OICNW-C8.4](https://weh.maritime.edu/stcw/2023/tables/21.html#OICNW-C8.4) Knowledge of personal safety

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Personal safety equipment

[ABD-C2.1](https://weh.maritime.edu/stcw/2023/tables/25.html#ABD-C2.1) Lifting techniques and methods of preventing back injury

Know the hazards, weigh risks vs benefits, don’t take unnecessary risks, maintain situational awareness

[PSSR-X3.1](https://weh.maritime.edu/stcw/2023/tables/614.html#PSSR-X3.1) Importance of adhering to safe working practices at all times

[RFPEW-A3.2](https://weh.maritime.edu/stcw/2023/tables/34.html#RFPEW-A3.2) Know escape routes from machinery spaces

Appendix