Part A
Course Framework

■ Scope

This **Management Level Course for Marine Engineer Officers (Function 2)** covers the mandatory minimum requirement for approved education and training as provided for under Regulation III/2 of the STCW Convention, 1978, as amended for chief engineers and second engineers on ships powered by main propulsion machinery of 3,000 kW propulsion or more; and to meet the minimum standard of competence specified in Section A-III/2 of the STCW Code under Function: Electrical, Electronic and Control Engineering at the Management Level.

This course requires a total of **seventy-two (72)** instructional hours to cover the topics enumerated in Part B – Course Outline.

■ Training Outcomes

To meet the minimum standard of competence to undertake the tasks, duties, and responsibilities at the management level specified under Table A-III/2 (Function 2) in Section A-III/2 of the STCW Code.

Specifically, at the end of the course, the trainee must be able to:

- manage operation of electrical and electronic control equipment; and
- manage troubleshooting, restoration of electrical and electronic control equipment to operating condition.

■ Entry Standards

Entry to the course is open to Marine Engineer Officers who are holders of a Certificate of Competency (COC) under Regulation III/1 of the STCW Convention, 1978, as amended, and have an approved seagoing service as an Officer in Charge of an Engineering Watch on ships powered by main propulsion machinery of 750kW or more for not less than 12 months.

■ Course Certificate

Upon successful completion of the course, a Certificate of Completion shall be issued certifying a holder's compliance of the mandatory minimum requirements as specified in Regulation III/2 of the STCW Convention, 1978, as amended, and met the minimum standard of competence under Table A-III/2 Function 2 in Section A-III/2 of the STCW Code.

■ Course Intake Limitation

Course maximum intake limitation shall not exceed twenty-four (24) per class.

■ Staff Requirements

The course must have an Instructor and Assessor with a valid Certificate of Accreditation as Instructor and Assessor respectively for Function 2 of Management Level Course for Engineer Officers issued by the Administration.

Additionally, the Supervisor of training and assessment may be assumed by the training manager, training director or any person designated by the MTI. It shall be required that he/she has full understanding of the training program and the specific objectives for this training course, and has undergone IMO Model Course 6.09 and IMO Model Course 6.10. On the supervision in the conduct of assessment, he/she shall have full understanding of the assessment system, assessment methods and practice, and has undergone IMO Model Course 3.12.

■ Assessment

In determining the achievement of the required competence in Column 1 of Table A-III/2 under the Function: “Electrical, Electronic and Control Engineering at the Management Level”, the assigned assessor shall be guided by the Intended Learning Outcomes stipulated in the Course Syllabus and the assessment tasks enumerated in the Assessment Plan.

■ Teaching Facilities and Equipment

For the theoretical aspect of the course, lectures and demonstrations shall be held in a classroom with a set of functional audio-visual equipment. The classroom must have an area of at least 42 square meters (sqm) with no side less than 5 meters and no structural obstruction. If the classroom is less than 42 sqm, the number of trainees that can be accommodated will be computed based on the 1.75 sqm area per trainee requirement, provided that no side shall be less than 5 meters.

For the conduct of practical exercises and assessment, the following training facilities and equipment shall be available:

Items	Quantity
Facilities and Equipment	
• Full Mission Engine Room Simulator capable of the operation of mechanical engineering systems; preparation of control systems of propulsion and auxiliary machinery for operation; operating generators and distribution systems; isolation of switchboards and generators; performance test on monitoring systems, automatic control devices, and protective devices such as UVT/OVT, Preferential Trip, High/Low-Frequency Trip, Over-speed, Reverse Power	1 Full mission engine room simulator And 5 workstations

• Hydraulic and Pneumatic trainer **OR** Simulator capable of simulating hydraulic and Pneumatic Systems	4 units
• Electrical and electronic trainer	4 units
• Electrical trainer with motors	4 units
• High Voltage Simulator (A stand-alone or incorporated in the engine room simulator that could *operate and maintain power systems in excess of 1,000 volts*)	1 unit
• Marine High Voltage Detector capable of detecting voltages above 1,000 VAC	1 unit
• Lock-out Tag-out Equipment	4 sets
• Multimeter	6 units
• Personal Protective Equipment (PPE) for High Voltage: - Arc Flash Clothing minimum usage above 1,000VAC - Insulated Rubber Gloves minimum usage above 1,000VAC - Insulated Rubber Boots/Shoes minimum usage above 1,000VAC - Hard-Hat with Face shield minimum usage above 1,000VAC	1 set
• Personal Protective Equipment (PPE): - safety shoes - coverall - hard hat - ear-plugs - goggles - electrical hand gloves	12 sets
• Instructor's Console/station *Note: Shall be capable of controlling the simulators or computer sets.*	1 console/station
• A briefing/debriefing room equipped with playback system separate from the simulator room	1 room

Notes:

1. *Engine room simulator equipment shall be compliant with the performance standards as specified in Section A-I/12 Paragraph 1 and must be capable of simulating a main and auxiliary machinery system as specified under Section B-I/12 Paragraph 73.*
2. *The Electrical, electronic, hydraulic, and pneumatic trainer and other electrical laboratory equipment shall not be construed as the commercial trainer*

however the same must be capable of simulating the targeted intended learning outcome stated in Part C and Part D.

3. *The required number of workstations including the full mission engine is sufficient for the maximum intake of 24 trainees following the prescribed man-machine ratio of 1:6 for trainers and the workstation-to-trainee ratio of 1:4 for simulators.*
4. *All equipment must be labeled with MTI's name.*
5. *In addition to the required training equipment, the following must be available and permanently marked "**FOR EMERGENCY PURPOSES USE ONLY**" and must be placed in an accessible area:*
   - *First aid kit;*
   - *Stretcher;*
   - *Resuscitation kit with oxygen; and*
   - *Suction unit.*

■ Teaching Aids (A)

A1 Visual Presentations

A2 Training videos related to the topics

Note: When using videos and images from external sources, the MTI shall ensure that these are obtained from reliable sources, deliver accurate information, are of high-resolution quality, adhere to educational or industry standards, and in accordance with the approved criteria established by the Accreditation Division. Appropriate references/acknowledgements shall be indicated in the presentation slides.

A3 Sample Operating Manuals related to the topic

A4 Exercise Sheets

A4.1 Manage the operation of electrical and electronic equipment and system, and safety devices

A4. 2 Manage the operation of the automatic control equipment and safety devices for main engine, generator and distribution system, and steam boiler

A4.3 Carry out assessment and adjustment of the automatic control equipment and safety devices for main engine, generator and its distribution system, and steam boiler

A4.4 Manage the operation of control equipment system for electrical motors

A4.5 Assess the performance level of control equipment system for electrical motors

A4.6 Manage the operation of high-voltage installations

A4.7 Manage the operation of hydraulic and pneumatic control equipment

A4.8 Assess the performance level of hydraulic and pneumatic control equipment

A4.9 Manage the inspection, troubleshooting, and restoration activities for electrical and electronic control equipment
A4.10 Manage the function test of electrical, electronic control equipment and safety devices
A4.11 Manage the troubleshooting activities in monitoring systems
A4.12 Plan the maintenance of software
A4.13 Supervise the maintenance and installation activities for updated software version

■ IMO References (R)

R1 International Convention on Standards of Training, Certification and Watchkeeping (STCW) for Seafarers 1978, as amended, (Latest Edition)

R2 International Convention for the Safety of Life at Sea (SOLAS), as amended (Latest Edition)

Note: MTIs may use additional references as deemed necessary to meet the intended learning outcomes.

■ Bibliography (B)

B1 Reed's Volume 6: Basic Electrotechnology for Engineers; E. G. R. Kraal, Publisher: London: Thomas Reed Publications, [1985] ISBN: 0900335963

B2 Reed's Volume 7: Advanced Electrotechnology for Engineers. 2nd Ed.; Kraal, E.G.R. London, Adlard Coles Nautical,``1

B3 Reed's Volume 8: General Engineering Knowledge For Marine Engineers; Jackson & Morton; A & C Black Publishers Ltd (United Kingdom), 2006; ISBN: 9780713682649

B4 Reed's Volume 9: Steam Engineering Knowledge for Marine Engineers; by Thomas D. Morton; Publisher: London: Thomas Reed Publications, 1979; ISBN: 0900335580

B5 Reed's Volume 10: Instrumentation and Control Systems (Reed's Marine Engineering Series) Leslie Jackson; Publisher: Thomas Reed Publications; ISBN: 0947637869 Edition: Paperback; 2002-12-07

B6 General Engineering Knowledge; H D McGeorge; Butterworth-Heinemann; ISBN: 0750600063

B7 Practical Marine Electrical Knowledge; Dennis T. Hall; London, Witherby & Co., (ISBN 1 85609 182 1)

B8 The Running and Maintenance of Marine Machinery; Edited by J. Cowley; Publisher: London: Institute of Marine Engineers, 1992; ISBN: 0907206425 9

B9 Marine Electrical Equipment and Practice; H D McGeorge; Butterworth-Heinemann; ISBN: 978-0750616478

B10 Digital Electronics: Principles and Application; Roger l Tokheim; McGraw-Hill; ISBN: 978-0078309823

B11 Marine Control Practice; D. A. Taylor and Billis; Butterworth-Heinemann; ISBN: 978-0408013130

B12 Digital Electronics: Principles, Devices and Applications; Anil K. Maini; Wiley; ISBN: 978-0470032145

B13 Programmable Logic Controllers; W. Bolton; Newnes: ISBN: 978-0750681124

B14 Electrical Equipment Handbook: Troubleshooting and Maintenance; Philip Kiameh; McGraw-Hill Professional; ISBN: 978-0071396035

B15 Electric Circuits and Machines; Eugene Lister, Robert Rusch; McGraw-Hill; ISBN: 9780028018096

B16 Electrical Interference Handbook, Second edition, Norman Ellis, Publisher: Newnes, ISBN-10: 9780750635479

B17 Integrated Smart Sensors: Design and Calibration; Gert Van Der Horn, Johan H. Huijsing; Kulwer Academic Publishers, 3300 Aa Dordrecht, the Netherlands; ISBN 0-7923-8004-5

B18 The Microcontroller Idea Book: Circuits, Programs, & Applications featuring; Jan Axelson. Lakeview Research, USA; ISBN 0-9650819-0-7

Note: The MTI may choose books from the above bibliography, or they may use the latest edition of other references provided that their contents will address the required learning outcomes. Electronic publications may be accepted as alternatives to printed copies of the latest editions and must be sourced from authorized publishers.