

Bridging Course for Transition from Electro-Technical Officer (ETO) to Marine Engineer Officer Class-IV

Course Duration

The Bridging Course shall be Three Months (12 Weeks) comprising 60 Working Days with 360 Contact Hours. The course shall be conducted through classroom instruction supported by multimedia presentations, machinery operation videos, technical animations, case studies, engineering calculations, tutorials and interactive discussions. The Engine Room Simulator (Operational Level) Course shall not form part of this Bridging Course.

S. No.	Subject / Topics	Hours
1	Marine Engineering Practice	30
2	Marine Machinery Systems	45
3	Thermodynamics and Heat Engines	35
4	Applied Mechanics and Fluid Mechanics	30
5	Engineering Drawing	20
6	Auxiliary Machinery	35
7	Marine Boilers and Steam Systems	25
8	Refrigeration and Air Conditioning	20
9	Naval Architecture and Ship Construction	20
10	Engineering Watchkeeping Duties	25
11	Planned Maintenance Systems	20
12	Marine Legislation and Safety Management	15
13	Marine Environmental Protection, SOLAS, MARPOL and Occupational Safety	15
14	Engine-room Resource Management	10
15	Workshop Skills through Videos, Case Studies and Practical Demonstrations	35
Total →		360

1. Marine Engineering Practice (30 Hours)

This subject shall introduce the candidates to the organization and operation of a modern engine room. The syllabus shall include engine-room layout, propulsion arrangements, machinery spaces, shafting systems, bearings, couplings, propellers, stern tube arrangements, piping systems, engineering terminology, machinery nomenclature, engineering materials, fasteners, seals, gaskets, maintenance philosophy, machinery documentation, manufacturer's manuals, and engineering calculations. Classroom instruction shall be supplemented by videos demonstrating engine-room layouts, machinery arrangements, and maintenance procedures.

2. Marine Machinery Systems (45 Hours)

This subject shall cover the construction, operation, maintenance and troubleshooting of marine propulsion machinery. Instruction shall include two-stroke and four-stroke marine diesel engines, fuel injection systems, combustion, scavenging, turbochargers, starting air systems, reversing arrangements, crankshaft systems, bearings, pistons, cylinder liners, lubrication systems, cooling systems, exhaust systems, shaft generators, reduction gears and propulsion shafting. Video demonstrations shall include engine overhauls, piston withdrawal, bearing inspection, turbocharger maintenance and machinery troubleshooting.

3. Thermodynamics and Heat Engines (35 Hours)

The syllabus shall include gas laws, properties of steam, thermodynamic processes, First and Second Laws of Thermodynamics, Diesel Cycle, Otto Cycle, Dual Cycle, Rankine Cycle, heat transfer, combustion, heat exchangers, condensers, evaporators, steam generation, thermal efficiency and marine applications. Video demonstrations shall illustrate combustion processes, heat transfer equipment and steam plant operation.

4. Applied Mechanics and Fluid Mechanics (30 Hours)

This subject shall include engineering mechanics, statics, dynamics, stress, strain, torsion, bending moments, vibration, balancing, bearings, shaft alignment, hydraulic principles, Bernoulli's equation, fluid flow, cavitation, centrifugal pumps, positive displacement pumps, valves, piping systems, bilge systems, ballast systems and hydraulic machinery. Classroom exercises shall include engineering calculations and problem-solving.

5. Engineering Drawing (20 Hours)

Instructions shall include engineering drawing principles, orthographic projection, sectional drawings, assembly drawings, piping diagrams, hydraulic schematics, machinery drawings, interpretation of manufacturers' drawings, engineering symbols, tolerances and reading of marine engineering plans. Practical exercises shall involve interpretation of machinery drawings and piping layouts.

6. Auxiliary Machinery (35 Hours)

The syllabus shall cover pumps, compressors, air bottles, purifiers, freshwater generators, oily water separators, sewage treatment plants, incinerators, steering gear, hydraulic systems, deck machinery, windlasses, mooring winches, heat exchangers and associated piping systems. Video

demonstrations shall illustrate dismantling, overhaul, inspection and testing procedures.

7. Marine Boilers and Steam Systems (25 Hours)

Instructions shall include auxiliary boilers, exhaust gas boilers, steam generation, boiler mountings, boiler water treatment, combustion control, steam distribution systems, condensate systems, feed water systems, steam traps, safety devices, boiler surveys and routine maintenance. Videos shall demonstrate boiler lighting-up, steam raising, water testing, soot blowing, shutdown procedures and boiler inspections.

8. Refrigeration and Air Conditioning (20 Hours)

The syllabus shall include refrigeration principles, refrigerants, refrigeration compressors, condensers, evaporators, thermostatic controls, provision plants, air-conditioning systems, ventilation systems, humidity control and fault diagnosis. Video demonstrations shall illustrate compressor overhaul, leak detection, charging procedures and routine maintenance.

9. Naval Architecture and Ship Construction (20 Hours)

Instructions shall include ship terminology, ship dimensions, hydrostatics, stability principles, trim, subdivision, watertight integrity, ship construction, framing systems, bulkheads, double bottom construction, shaft tunnel arrangements, rudders, propellers, dry docking, corrosion and structural maintenance. Classroom discussions shall be supported by animations and ship construction videos.

10. Engineering Watchkeeping Duties (25 Hours)

This subject shall cover the duties and responsibilities of an Officer in Charge of an Engineering Watch in accordance with STCW Regulation III/1. Topics shall include watchkeeping principles, unattended machinery spaces (UMS), machinery monitoring, engine-room rounds, logbook entries, alarm management, machinery isolation, emergency procedures, communication, watch handover and operational reporting. Videos shall demonstrate normal and emergency watchkeeping situations.

11. Planned Maintenance Systems (20 Hours)

Instructions shall include planned maintenance philosophy, maintenance scheduling, condition monitoring, machinery history records, spare parts management, maintenance documentation, vibration monitoring, lubrication management, dry-docking preparations, machinery surveys and defect reporting. Candidates shall be introduced to computerized Planned Maintenance Systems (PMS) commonly used onboard ships.

12. Marine Legislation and Safety Management (15 Hours)

The syllabus shall cover the Merchant Shipping Act, STCW Convention, ISM Code, ISPS Code, MLC, 2006, statutory surveys and certification, flag State requirements, classification society requirements, accident reporting, safety management systems, permit-to-work procedures, risk assessment, enclosed space entry and emergency preparedness.

13. Marine Environmental Protection, SOLAS, MARPOL and Occupational Safety (15 Hours)

Instructions shall include SOLAS requirements relating to machinery spaces, MARPOL Annexes I to VI, Ballast Water Management Convention, Anti-Fouling Systems Convention, pollution prevention equipment, Oil Record Book, garbage management, sewage management, emission control, energy efficiency, occupational health and safety, personal protective equipment, permit-to-work systems, lock-out/tag-out procedures and accident prevention. Videos of machinery accidents and environmental incidents shall be used for discussion and analysis.

14. Engine-room Resource Management (10 Hours)

This subject shall include principles of Engine-room Resource Management (ERM), leadership, communication, teamwork, situational awareness, workload management, decision making, fatigue management, human factors, emergency coordination and bridge-engine room communication. Case studies based on marine casualties shall be discussed.

15. Workshop Skills through Videos, Case Studies and Practical Demonstrations (35 Hours)

Since the Bridging Course is classroom-based, workshop training shall be imparted through high-definition instructional videos, three-dimensional animations, manufacturer maintenance videos and technical demonstrations. The module shall cover bench fitting, use of measuring instruments, shaft alignment, bearing inspection, valve overhaul, pump maintenance, gasket making, pipe fitting, mechanical seals, coupling alignment, welding awareness, machinery dismantling and assembly procedures, turbocharger overhaul, purifier maintenance, boiler maintenance and machinery troubleshooting. The module shall also include accident investigation reports, machinery failure analysis and discussion of best maintenance practices. Candidates shall be required to analyse maintenance procedures and engineering case studies as part of classroom exercises.

Assessment

Assessment shall comprise written examinations, tutorials, assignments, engineering calculations, case study analysis and viva-voce. Continuous internal assessment shall be conducted throughout the course. A candidate shall obtain a minimum of 60% marks in the written examination and 60% aggregate marks overall to successfully complete the Bridging Course and become eligible for further onboard Training and Assessment as specified in the TAR Book.