

## ENGINE DEPARTMENT

RECOMMENDED MINIMUM EQUIPMENT, MATERIALS, CHEMICALS AND TEACHING AIDS GOVERNING THE OPERATION OF THE BACHELOR OF SCIENCE IN MARINE ENGINEERING PROGRAM. HOWEVER, THE EXACT NUMBER SHOULD CONFORM TO THE CARRYING CAPACITY OF THE INSTITUTION. THE TASK MAINTENANCE REPAIR COLUMN ARE USED FOR HANDS ON EXERCISES AND FAMILIARIZATION OF EQUIPMENT, WHEREAS THE SYSTEM INTEGRATION, OPERATION AND FAULT FINDING COLUMN ARE EQUIPMENT NECESSARY TO ADDRESS THE DEFINED INTENDED LEARNING OUTCOMES OF COURSES.

| Course                        | Task Maintenance and Repair   |                              | System Integration, Operation and Fault Finding |
|-------------------------------|---|------------------------------|---|
|                               | Key Area Equipment  | Quantity Required            |   |
| 1. Mach 1<br>Mach 2<br>Mach 3 | Mechanical Workshop   |                              |   |
|                               | 1.1. Work benches fitted with vise on each end                                | 6 sets                       |   |
|                               | 1.2. Gas welding equipment , accessories and PPE                              | 6 sets<br>1 torch /cubicle   |   |
|                               | 1.3. Electric, arc welding equipment, accessories and PPE                     | 6 sets<br>1 machine /cubicle |   |
|                               | 1.4. Pedestal grinder   | 3 units                      |   |
|                               | 1.5. drilling machine (approx. 35 mm min. Diameter drill capacity)            | 3 units                      |   |
|                               | 1.6. Electric power hand drill with at least 10 mm diameter drilling capacity | 6 units                      |   |
|                               | 1.7. Electric power hand grinder/cutter                                       | 4 units                      |   |
|                               | 1.8. Metal cutting shear (snip)   | 6 sets                       |   |
|                               | 1.9. Anvil  | 6 pcs                        |   |
|                               | 1.10. Inside and outside steel vernier caliper                                | 6 pcs                        |   |
|                               | 1.11. Inside and outside micrometers  | 6 pcs                        |   |
|                               | 1.12. Depth gauge caliper   | 6 pcs                        |   |
|                               | 1.13. Dial micrometer with magnetic base                                      | 4 sets                       |   |
|                               | 1.14. Steel ruler   | 6 pcs                        |   |

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|        | Key Area Equipment  | Quantity Required |   |
|        | 1.15. Flat Chisel   | 12 pcs            |   |
|        | 1.16. Cross-out chisel  | 12 pcs            |   |
|        | 1.17. Diamond point chisel  | 12 pcs            |   |
|        | 1.18. Round nose chisel   | 12 pcs            |   |
|        | 1.19. Center punch, 60 mm   | 12 pcs            |   |
|        | 1.20. Center punch, 90mm  | 12 pcs            |   |
|        | 1.21. Hacksaw   | 6 pcs             |   |
|        | 1.22. Tap and dies  | 6 pcs             |   |
|        | 1.23. Die nuts  | 6 pcs             |   |
|        | 1.24. Wrench, socket type, 10mm to 24mm                           | 6 sets            |   |
|        | 1.25. Wrench, open type (metric), 10 mm to 24mm                   | 6 sets            |   |
|        | 1.26. Combination Wrench, open-close type (metric), 10 mm to 24mm | 6 sets            |   |
|        | 1.27. Double-cut rough files                                      | 12 pcs            |   |
|        | 1.28. Second-cut smooth files                                     | 12 pcs            |   |
|        | 1.29. Single-cut smooth files                                     | 12 pcs            |   |
|        | 1.30. Second cut files  | 12 pcs            |   |
|        | 1.30. Second cut files  | 12 pcs            |   |
|        | 1.31. Machinist's combination set                                 | 12 pcs            |   |
|        | 1.32. Try square (steel)  | 12 pcs            |   |
|        | 1.33. Protractor (steel)  | 12 pcs            |   |
|        | 1.34. Dividers (steel)  | 12 pcs            |   |
|        | 1.35. Sledge hammer (various sizes, steel/wooden)                 | 6 pcs             |   |
|        | 1.36. Ball peen hammer  | 12 pcs            |   |
|        | 1.37. Straight peen hammer (various sizes)                        | 12 pcs            |   |
|        | 1.38. Tongs (various sizes)                                       | 12 pcs            |   |
|        | 1.39. Pliers, mechanical (various sizes)                          | 12 pcs            |   |
|        | 1.40. Screw driver, Philips, various sizes                        | 12 pcs            |   |
|        | 1.41. Screw driver, flat, various sizes                           | 12 pcs            |   |
|        | 1.42. Vise grip   | 6 pcs             |   |
|        | 1.43. Feeler gauge (metric/inches)                                | 6 pcs             |   |

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|        | Key Area Equipment   | Quantity Required  |   |
|        | 1.44. Pitch gauge  | 6 pcs              |   |
|        | 1.45. Drill bit, 13-25 mm, tapered shank   | 6 pcs              |   |
|        | 1.46. Drill bit, 15-30 mm, cylinder shank  | 3 pcs              |   |
|        | 1.47. Drift punch  | 6 pcs              |   |
|        | 1.48. Lockers for storing personal belongings  |                    |   |
|        | 1.49. Washing facility   |                    |   |
|        | 1.50. Scrap disposal containers  | 1 in workshop area |   |
|        | 1.51. 150 mm swing lathe machine with accessories  | 6 sets             |   |
|        | 1.52 Shaper (350mm travel) with accessories  | 1 set              |   |
|        | 1.53. Milling machine (horizontal, vertical or universal) with cutting tools and accessories | 1 set              |   |
|        | 1.74. Hydraulic pipe bender with accessories   | 1 set              |   |
|        | 1.75. Pipe wrench various sizes  | 2 sets             |   |
|        | 1.76. Grease gun   | 2 sets             |   |
|        | 1.77. Oil applicator   | 2 sets             |   |
|        | 1.78. Wire gauge   | 2 sets             |   |
|        | 1.79. Surface gauge  | 2 sets             |   |
|        | 1.80. Blow torch   | 2 sets             |   |
|        | 1.81. Reamer handset, assorted   | 2 sets             |   |
|        | 1.82. Torque wrench  | 2 sets             |   |
|        | 1.83. Pipe cutter and threading tools  | 2 sets             |   |

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|                        | Key Area Equipment   | Quantity Required |  |
| 2. Marine Diesel       | 2.1 Marine Diesel engine-complete for dismantling with the following components: <ul style="list-style-type: none"> <li>• Cylinder liner</li> <li>• Fuel valve/injector</li> <li>• Cylinder relief valve</li> <li>• Air-starting valve/starting mechanism (not all have ASV)</li> <li>• Crankcase relief valve</li> <li>• Jerk fuel valve pump</li> <li>• Cylinder head</li> <li>• Turbocharger</li> <li>• Bearing shells</li> <li>• Piston and connecting rod</li> <li>• Engine governor</li> <li>• Starting system</li> <li>• Fuel and lube oil filters</li> </ul> | 1 set             | Marine Diesel Engine (operational ) with auxiliaries or ERS Category 3.  |
| 3. Auxiliary Machinery | 3.1. Reciprocating displacement pump   | 1 set             | All items in item 3 should be operational or an ERS Category 3 that can be used for the student to learn and demonstrate its operation |
|                        | 3.2. Gear pump   | 1 set             |  |
|                        | 3.3. Rotary vane pump  | 1 set             |  |
|                        | 3.4. Screw displacement pump   | 1 set             |  |
|                        | 3.5. Centrifugal pump  | 1 set             |  |
|                        | 3.6. Reciprocating air driven pump   | 1 set             |  |

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|--------------------------------|--|-------------------|---|
|                                | Key Area Equipment   | Quantity Required |   |
|                                | 3.7. Other parts/components: <ul style="list-style-type: none"> <li>• Gland</li> <li>• Mechanical Seal</li> <li>• Drain Cock</li> <li>• globe valve</li> <li>• gate valve</li> <li>• relief valve</li> <li>• quick closing valve</li> <li>• change-over valve chest</li> <li>• mud box (strainer)</li> <li>• steam trap</li> <li>• shell and tube cooler</li> <li>• plate-type cooler</li> </ul> | 1 set each        |   |
|                                | 3.8. Reciprocating air compressor (2 stage or higher) with the following components <ul style="list-style-type: none"> <li>• Cylinder cover</li> <li>• Piston</li> <li>• relief valve</li> <li>• fusible plug</li> <li>• suction and delivering valve</li> <li>• water-space safety valve</li> <li>• bursting disc</li> </ul>  | 1 set             |   |
|                                | 3.9. Centrifugal separator/Purifier  | 1 set             |   |
| 4. Power Plant 2 - Steam Plant | 4.1. Boiler for demonstration only   | 1 set             | Operational Boiler or ERS Category 3  |
|                                | 4.2. Boiler water test kit   | 1 set             |   |
|                                | 4.3. Boiler safety valves (for dismantling)  | 1 set             |   |
| 5. Refrigeration               | 5.1 Marine Refrigeration with main components  | 1 set             | Working model or training module to demonstrate the refrigeration processes |

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|                      | Key Area Equipment                                    | Quantity Required |  |
|                      |   |                   | and operation  |
|                      | 5.2. Expansion Valves                                 | 4 sets            |  |
|                      | 5.3. Open Type Refrigerating Compressor (Complete)    | 1 set             |  |
|                      | 5.4. Oil Separator                                    | 1 set             |  |
|                      | 5.5. Thermostat                                       | 4 sets            |  |
|                      | 5.6. Pressure switch                                  |                   |  |
|                      | 5.7. Vacuum pump with service manifold (Gas Analyzer) | 1 set             |  |
| 6. Electrotechnology | 6.1. Test Measuring Instruments                       |                   | 1.Electrical Training Module<br>2.Electronic Training Module<br>3.Motor Control Module<br>4.Operation al 3 phase alternator with synchronizing equipment of main switchboard or ERS Category 3 |
|                      | a. Digital Multi-tester                               | 1 set             |  |
|                      | b. Analog Multi-tester                                | 1 set             |  |
|                      | c. Insulation Tester                                  | 1 set             |  |
|                      | d. Analog Clamp Meter                                 | 1 set             |  |
|                      | e. Digital Clamp Meter                                | 1 set             |  |
|                      | f. Live Line Tester                                   | 1 set             |  |

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|               | Key Area Equipment   | Quantity Required |   |
| 7. Automation | 7.1 Sample of sensors and other instruments as defined in the curriculum |                   | Process Simulator that contains process to be controlled, process transmitter/sensor, controller (PID, PI, PD), correcting elements/ final control elements |
|               | 7.2. Differential Pressure Switch  | 1 set             |   |
|               | 7.3. Pressostat  | 1 set             |   |
|               | 7.4. Thermistor  | 1 pc              |   |
|               | 7.5. Thermocouple  | 1 pc              |   |
|               | 7.6. 100Ω Resistance Bulb  | 1 pc              |   |
|               | 7.7. U-Tube Manometer  | 1 pc              |   |
|               | 7.8. Transmitters (Pneumatic & Electric)                                 | 1 set each        |   |

### Classification of Machinery Simulators

|            |                        |  |
|------------|------------------------|--|
| Category 1 | Full Mission Simulator | A full mission simulator capable of simulating all machinery operations in engine control room and machinery spaces, by the use of operational panels in machinery spaces.             |
| Category 2 | Multi Task Simulator   | A multi task simulator capable of simulating several machinery operations in engine control room and machinery spaces, but with limited use of operational panels in machinery spaces. |

|            |                        |  |
|------------|------------------------|--|
| Category 3 | Limited Task Simulator | A limited task simulator capable of simulating some machinery operations in engine control room for procedural training.                             |
| Category 4 | Special Task Simulator | A special task simulator capable of simulating operation and/or maintenance of particular machinery equipment, and/or defined engineering scenarios. |

Competencies addressed by the Engine Room Simulator

| STCW Reference   | Competence  | Category |   |   |   |
|------------------|---|----------|---|---|---|
|                  |   | 1        | 2 | 3 | 4 |
| Table A-III/1.1  | Maintain safe engineering watch   | ✓        | ✓ |   | ✓ |
| Table A-III/1.3  | Use internal communications systems   | ✓        | ✓ |   | ✓ |
| Table A-III/1.4  | Operate main and auxiliary machinery and associated controls                                | ✓        | ✓ | ✓ | ✓ |
| Table A-III/1.5  | Operate fuel, lubrication, ballast and other pumping systems and associated control systems | ✓        | ✓ | ✓ | ✓ |
| Table A-III/1.6  | Operate electrical, electronic and control systems  | ✓        | ✓ | ✓ | ✓ |
| Table A-III/1.7  | Maintenance and repair of electrical and electronic equipment                               |          |   |   | ✓ |
| Table A-III/1.11 | Maintain seaworthiness of the ship  | ✓        | ✓ |   | ✓ |