# Small Engine & Outboard Motor Technology Student Learning Outcome Mapping

**Course (CLO), Program (PLO), Institutional (ILO)**

**Program Description**: This program is designed to provide students with technical knowledge, skills and proper work habits/attitudes necessary for employment in this field. The program prepares students to work and advance in their careers as mechanics, troubleshooters, parts counter salespersons, or operators of their own small engine service and repair shops.

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| **Program Learning Outcomes** | **Institutional Learning Outcomes** |
| 1. Students will be employable in the field of Small Engine and Outboard Marine Technology. 2. Students will demonstrate skills in diagram reading and testing. 3. Students will demonstrate skills in boat fitting and rigging. 4. Students will be able to manage and operate their own service shop. 5. Students will demonstrate skills in diagnosing and repairing small engines and outboard motors. | 1. **Critical Thinking and Problem Solving**: Analyze and solve problems by using informed judgment based on evidence, sound reasoning, and/or creativity to differentiate facts from opinions and to specify solutions and their consequences. 2. **Communication**: Effectively communicate, both orally and in writing, thoughts in a clear, well-organized manner to persuade, inform and/or convey ideas in academic, work, family and community settings. 3. **Quantitative and Technological Competence**: Use mathematical skills appropriate to our technological society by analyzing and solving problems that are quantitative in nature and use technology for informational, academic, personal and professional needs. 4. **Diversity**: Understand and appreciate differences in cultures and behaviors between the self and others by demonstrating respect, honesty, fairness, and ethical principles in both personal and professional life. 5. **Civic Responsibility**: Apply the principles of civility and morality to situations in the contexts of a healthy family, work, community, environment and world. 6. **Aesthetics**: Apply numerous means of inquiry to experience and appreciate the values of arts and nature. |

# PLO-ILO Mapping

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| **PLOs** | **ILOs** | | | | | |
| **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| **PLO 1** | **X** | **X** | **X** | **X** | **X** | **X** |
| **PLO 2** | **X** | **X** | **X** | **X** |  |  |
| **PLO 3** | **X** | **X** | **X** | **X** |  | **X** |
| **PLO 4** | **X** | **X** | **X** | **X** | **X** | **X** |
| **PLO 5** | **X** | **X** | **X** | **X** |  | **X** |

**CLO-PLO-ILO Mapping**

**SE 101 - Boat Operation**

This course is designed to familiarize students with safe operation of outboard motor boats including national safety measures, open water driving, boat and engine maintenance, proper approaches to water hazards and operator’s rules of driving.

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| **CLO**  Students will be able to: | **PLO** | | | | |  | **ILO** | | | | | |
| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Explain and apply Palau and  international boat safety precautions as they apply to small boats. | **X** |  |  |  |  |  | **X** | **X** | **X** |  | **X** |  |
| 2. Perform correct boat operation safety  driving techniques. | **X** |  |  |  |  |  | **X** |  | **X** |  | **X** |  |
| 3. Maintain boat engines and hulls in a safe working condition. | **X** |  |  | **X** |  |  | **X** | **X** | **X** |  | **X** |  |

# SE 112 - Basic Engine Principles

This course covers principles of theory and operation and skills relating to repair and maintenance of basic outboard marine engines.

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| **CLO**  Students will be able to: | **PLO** | | | | |  | **ILO** | | | | | |
| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Service and repair an outboard engine  powerhead. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Understand outboard lubrication points  and perform break-in procedures. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Revive a submerged engine. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 4. Understand and use service manuals and parts catalogues. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 113 - Two and Four-Cycle Engines

This course covers overhaul and repair of lawn, garden, and recreational engines under shop conditions according to manufacturers’ recommendations. It also includes rebuilding procedures on large, single, multi-cylinder and four cycle engines. Complete engine diagnosis and reconditioning practices are covered.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Recognize and name all major parts from  both two and four-stroke engines. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Recognize and explain differences between two and four-stroke engines. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Explain tune-up and trouble-shooting techniques for two and four-stroke  engines. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 122 - Outboard Engine Electrical System

This course covers the electrical system associated with marine engine including the charging circuit, starting circuit and ignition circuit. Theories of operation and maintenance/repair are discussed and applied.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Remove, install, service and, repair electrical systems and charging systems for outboard engines. | **X** | **X** |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Explain the operation of all outboard electrical components, including ignition systems and starting circuits, on outboard engines. | **X** | **X** |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Understand the purpose and operation of outboard computerized diagnostic equipment. | **X** | **X** |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 123 - Outboard Fuel & Carburetion Systems

This course covers functions, maintenance, service of fuel tanks, pumps, carburetors, intake manifolds, flame arresters, and filters, and fuel injection systems used in marine engines.

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| **CLO**  Students will be able to: | **PLO** | | | | |  | **ILO** | | | | | |
| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Identify and explain the operation of the  components of an outboard fuel system. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Remove service and reinstall all  components in an outboard fuel system. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Trouble-shoot and repair all aspects of  an outboard fuel system. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 124 - Outboard Cooling System

This course covers the principles of operation of outboard cooling system, troubleshooting of cooling systems and the service, maintenance, removal, repair and re-installation of all cooling system components.

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| **CLO**  Students will be able to: | **PLO** | | | | |  | **ILO** | | | | | |
| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Identify every part of an outboard  cooling system and explain how it works. | **X** |  |  |  | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Service, maintain and repair a faulty  cooling system. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 212 - Outboard Lower Unit System

This course covers principles of gear cases, power trim/tilt system, propellers and gear shifting system on a variety of outboard engines. The focus is on gear case designs, measurements, overhaul procedures and reconditioning of all parts in the modern outboard gear case. Students should be able to troubleshoot, service and rebuild outboard engine gear cases and power trim and tilt systems.

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| **CLO**  Students will be able to: | **PLO** | | | | |  | **ILO** | | | | | |
| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Carry out a full service of an outboard  gear box as well as repair or replace any damaged parts. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Demonstrate and explain how a power trim system works. | **X** |  |  |  | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Identify and describe various types of  propellers as well as remove and refit them. | **X** |  |  |  | **X** |  | **X** | **X** | **X** |  |  |  |
| 4. Troubleshoot, service and repair the  shifting systems for various outboards. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 213 - Outboard Power Head System

This course introduces power-head designs and functions on a variety of outboard makes and models. Topics include identifying complete outboard powerhead cylinder blocks, crank shafts, bearings, pistons and connecting rod assembly systems and techniques to test/troubleshoot power-head components. Students should be able to troubleshoot, test and rebuild powerhead systems with specific attention to parts identification, tolerance, inspection, assembly and installation.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Remove service and repair an outboard power head. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 2. Identify, inspect and check crankshafts,  bearings, pistons and cylinder blocks. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 221 – Advanced Maintenance and Repair

Advanced maintenance and repair skills are developed in all aspects of a real-life shop situation by applying skills from previously studied courses. It includes dealing with customer problems, shop practices and procedures, tune-up and troubleshooting techniques, and installing motors and accessories. Emphasis is placed on actual work situations.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Handle customer enquiries and successfully explain workshop practices and procedures, including stocking and inventory. | **X** |  |  | **X** |  |  | **X** | **X** | **X** | **X** | **X** | **X** |
| 2. Troubleshoot and repair engine problems, including tune-up, ignition, lubrication, and fuel problems. | **X** |  |  | **X** | **X** |  | **X** | **X** | **X** |  |  |  |
| 3. Demonstrate procedures for mounting outboard engines and engine accessories. | **X** |  | **X** | **X** | **X** |  | **X** | **X** | **X** |  |  |  |

# SE 222 - Diagram Reading and Testing

This is a continuation of SE 122. It covers small engine and outboard engine wiring diagrams and designs. It provides student with a practical approach to industrywide electrical testing, diagnostic and repair techniques using diagnostic charts, wiring diagrams, service manuals, and manufacturers repair procedures.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Explain, troubleshoot, service and repair all aspects of outboard and small gas engine wiring systems. |  | **X** | **X** |  | **X** |  | **X** | **X** | **X** | **X** | **X** | **X** |
| 2. Demonstrate the use of outboard wiring diagrams. |  | **X** | **X** |  | **X** |  | **X** | **X** | **X** | **X** | **X** | **X** |
| 3. Demonstrate the use of diagnostic equipment for outboard engines. |  | **X** | **X** |  | **X** |  | **X** | **X** | **X** | **X** | **X** | **X** |

# SE 223 – Internship

This course provides the student with practical training in outboard engine repair. With the assistance of an instructor-coordinator, the student is assigned to work under a supervisor in a governmental department or a private business in order to learn through actual work experience.

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| **PLO 1** | **PLO 2** | **PLO 3** | **PLO 4** | **PLO 5** |  | **ILO 1** | **ILO 2** | **ILO 3** | **ILO 4** | **ILO 5** | **ILO 6** |
| 1. Demonstrate proper employee’s  behavior and work habits. | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** | **X** | **X** | **X** |
| 2. Perform small engine and outboard motor repair tasks as assigned by a site  supervisor. | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** | **X** | **X** | **X** |