Maryland CTE Programs of Study

Marine Maintenance and Repair III (2025)

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INTRODUCTION 2

A Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions. 2.A

B The Supply Chain & Transportation Career Cluster encompasses the transfer, coordination, and management of goods from production to consumption, ensuring efficient movement across various modes of transportation including air, ground, and water, as well as maintenance of the respective transport modes. This Cluster integrates logistics and distribution networks to facilitate the seamless flow of materials and products, playing a crucial role in global commerce, economic development, and community health. 2.B

C The Marine Maintenance and Repair program is a comprehensive four course sequence that prepares students for careers in marine service and boat building. Through hands-on experience with industry-standard tools and equipment, students develop essential skills in boat construction, electrical systems installation, engine and propulsion system service, and advanced marine system repair. The program integrates fundamental construction techniques with complex systems integration, teaching students to build, maintain, and repair modern vessels aligned to American Boat and Yacht Council standards. Students learn to work with diverse materials including composites, marine-grade woods, and metals while mastering electrical system design, engine installation, and advanced diagnostics. Upon completion, graduates are prepared for entry-level positions in marine service, boat building, or yacht repair facilities, and are equipped with the knowledge needed to successfully complete the ABYC Marine Service Technician Certification examination. 2.C

D The Marine Maintenance and Repair III course deepens students' understanding of marine power systems with a focused study of diesel engine theory, drive systems, and integrated propulsion components. Students develop essential diagnostic and maintenance skills across both diesel and gasoline fuel systems

Skip to main content

while mastering drive system principles including shaft alignment, propeller theory, and stern drive maintenance. Through hands-on experience with cooling systems, steering components, and control mechanisms, students learn to perform comprehensive system maintenance, troubleshooting, and seasonal servicing. The course emphasizes ABYC standards compliance while teaching students to integrate various propulsion-related systems, perform precise measurements, and maintain detailed service documentation. Students gain proficiency in engine and drive system theory while developing practical skills in system testing, diagnostic procedures, and safe maintenance practices that align directly with industry certification requirements. 2.D

E **Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.** 2.E

F **Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.** 2.F

KNOWLEDGE AND SKILLS 3

A **The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:** 3.A

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2
3. Employ effective reading, writing, and technical documentation skills. 3.A.3
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4
5. Demonstrate leadership skills and collaborate effectively as a team member. 3.A.5
6. Implement safety procedures, including proper handling of hardware and following OSHA guidelines. 3.A.6
7. Exhibit an understanding of legal and ethical responsibilities in the Marine Maintenance and Repair field, following applicable laws and best practices for safety. 3.A.7
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting. 3.A.8

B **The student identifies various career pathways in the Marine Maintenance and Repair field. The student is expected to:** 3.B

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles as a technician or in the Marine Maintenance and Repair field. 3.B.1

Skip to main content

2 Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations. 3.B.2

3 Demonstrate effective interview skills for roles in the Marine Maintenance and Repair field. 3.B.3

C The student identifies the issues associated with Marine Maintenance and Repair hazards found on a jobsite. The student is expected to: 3.C

1 Demonstrate safe working procedures in a lab/shop environment. 3.C.1

2 Explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job. 3.C.2

3 Identify Marine Maintenance and Repair related workplace hazards and how to avoid or minimize them. 3.C.3

4 Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, automotive lift safety, and other equipment related safety protocols. 3.C.4

D The student integrates core academic skills into Marine Maintenance and Repair practices. The student is expected to: 3.D

1 Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards. 3.D.1

2 Complete compression ratio calculations, fuel consumption rates, shaft angle geometry, propeller pitch calculations, and measurement conversions for alignment specifications. Additional mathematical applications include calculating fuel flow rates, interpreting diagnostic measurements, and determining proper clearances for shaft installations. 3.D.2

3 Understand scientific principles including diesel engine thermodynamics, combustion chemistry, Pascal's law in hydraulic systems, principles of mechanical advantage in drive systems, fluid dynamics in cooling systems, and metallurgical principles in shaft and propeller design. Additional scientific concepts include understanding chemical properties of different fuel types, principles of electromechanical systems in engine controls, and physics of torque transfer through drive systems. 3.D.3

E The student comprehends diesel engine theory and maintenance principles. The student is expected to: 3.E

1 Demonstrate comprehensive knowledge of diesel engine theory by explaining operational principles, identifying key components, and describing system relationships. 3.E.1

2 Perform basic diesel fuel system maintenance by servicing filters, bleeding fuel systems, and maintaining injection equipment according to manufacturer specifications. 3.E.2

3 Execute proper safety procedures when working around diesel engines by implementing appropriate protocols and identifying specific hazards. 3.E.3

Skip to main content

4 Plan maintenance schedules by developing comprehensive service timelines and documenting maintenance procedures according to manufacturer requirements. 3.E.4

5 Analyze engine performance by conducting diagnostic tests, interpreting results, and recommending appropriate service actions. 3.E.5

F The student performs drive system operations and maintenance. The student is expected to: 3.F

1 Demonstrate knowledge of drive system theory by explaining operational principles of conventional shaft drives, stern drives, and propulsion systems. 3.F.1

2 Define and address key service concerns for conventional shaft drives by identifying common issues, performing inspections, and implementing maintenance procedures. 3.F.2

3 Execute engine and shaft alignment procedures by using appropriate measurement tools, making precise adjustments, and documenting specifications. 3.F.3

4 Demonstrate comprehensive knowledge of propeller theory and operation by explaining propeller characteristics, selecting appropriate propellers, and diagnosing propeller-related issues. 3.F.4

5 Perform drive system maintenance by following manufacturer specifications, using appropriate tools, and documenting service procedures. 3.F.5

G The student implements fuel system service procedures. The student is expected to: 3.G

1 Service gasoline fuel systems by performing maintenance tasks, diagnosing issues, and ensuring compliance with safety regulations. 3.G.1

2 Service diesel fuel systems by conducting maintenance procedures, testing fuel quality, and maintaining system integrity. 3.G.2

3 Perform fuel system testing by using appropriate diagnostic equipment, interpreting results, and documenting findings. 3.G.3

4 Implement fuel system safety procedures by following ABYC standards, applying environmental protection measures, and maintaining proper documentation. 3.G.4

5 Execute fuel system repairs by diagnosing problems, replacing components, and verifying proper operation. 3.G.5

H The student performs integrated system maintenance. The student is expected to: 3.H

1 Maintain engine cooling systems by servicing components, testing operation, and ensuring proper flow rates. 3.H.1

2 Service batteries and electrical systems by performing tests, maintaining connections, and ensuring proper charging. 3.H.2

Skip to main content

3 Conduct steering and control system maintenance by inspecting components, lubricating moving parts, and verifying proper operation. 3.H.3

4 Execute winterizing and commissioning procedures by following manufacturer protocols, documenting procedures, and ensuring proper seasonal preparation. 3.H.4

5 Perform comprehensive system troubleshooting by analyzing symptoms, diagnosing causes, and implementing appropriate repairs. 3.H.5