

Course Title: Outboard Marine Service 1
Course Number: 9504210
Course Credit: 1

Course Description:

Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of workplace safety and organization, trailer service, various boat materials, 2-stroke cycle outboard engines, and fuel systems on boats.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate an understanding of workplace safety and workplace organization--The student will be able to:		
04.01 Identify safety requirements for manual, electrical-powered, and pneumatic tools.		
04.02 Demonstrate, apply, and provide evidence of safely using manual, electrical-powered, and pneumatic tools.		
04.03 Identify safety requirements for operation of automated machines and equipment.		
04.04 Demonstrate, apply, and provide evidence of safely operating automated machines and equipment.		
04.05 Set up and use precision measurement tools.	MAFS.912.N-Q.1.3	
04.06 Drill and remove broken fasteners and install helicoils.		
04.07 Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.L.3.4 MAFS.912.N-Q.1.3	
04.08 Demonstrate appropriate heating techniques and skills.		SC.912.P.10.5
04.09 Read, interpret, and apply service manuals.		
04.10 Identify the safe use of paints, chemicals, fiberglass, and compounds		
04.11 Demonstrate, apply, and provide evidence of safely using paints, chemicals, fiberglass, and compounds.		
04.12 Identify the safe use of electrical connectors and cords.		
04.13 Demonstrate, apply, and provide evidence of safely using electrical connectors and cords.		
04.14 Identify, demonstrate, apply, and provide evidence of understanding of shop safety rules on an ongoing basis.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.15 Research and identify class A, B, and C type fires.		
04.16 Demonstrate and apply the proper procedures for extinguishing class A, B, and C type fires.		
04.17 Identify various workplace injuries related to the marine industry.		
04.18 Demonstrate and practice knowledge of first aid and first response procedures appropriate for this course.		
04.19 Identify and apply safety procedures in case of smoke or chemical inhalation.		
04.20 Demonstrate and apply material handling techniques to safely move materials.		
04.21 Demonstrate and apply proper techniques for lifting loads.		
04.22 Research and identify Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.		
04.23 Demonstrate, apply, and provide evidence of understanding Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.		
04.24 Demonstrate knowledge of safety requirements for material handling equipment such as rigging, ladders, and scaffolds related to the marine industry.		
04.25 Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.		
04.26 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)		
04.27 Locate Material Safety Data Sheets (MSDS).		
04.28 Demonstrate understanding and knowledge of using and applying the information located on Material Safety Data Sheets (MSDS).		
04.29 Proactively respond to a safety concern and then document occurrences.		
04.30 Identify and report unsafe conditions.		
04.31 Determine the appropriate corrective action after an unsafe condition is identified.		
04.32 Demonstrate knowledge of various emergency alarms and procedures.		
04.33 Demonstrate knowledge and apply clean-up procedures for spills.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.34 Identify and apply procedures for handling hazardous material.		
04.35 Perform safety and environmental inspections.		
04.36 Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.		
04.37 Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations.		
04.38 Demonstrate and apply proper equipment shutdown procedures.		
04.39 Identify, select, and use personal protective equipment (PPE).		
04.40 Identify, demonstrate, and apply ergonomic work techniques.		
04.41 Train other students to use and apply safety skills outlined in this standard.		
05.0 Adjust and repair trailers--The student will be able to:		
05.01 Make boat to trailer adjustments.	MAFS.912.N-Q.1.3	
05.02 Remove and replace lighting systems.		
05.03 Remove, inspect, repack, and replace wheel bearings and springs.		
05.04 Remove and replace brakes.		
05.05 Check lug nuts on trailer for correct torque.		
06.0 Use marine woods, metals, and fiberglass--The student will be able to:		
06.01 Explain the hazards of a marine environment to woods, metals and fiberglass.	LAFS.910.W.1.2 LAFS.910.SL.2.4 LAFS.910.L.1.1	SC.912.L.17.2, 3
06.02 Explain a galvanic series.	LAFS.910.W.1.2 LAFS.910.SL.2.4 LAFS.910.L.1.1	SC.912.P.10.14
06.03 Explain the theory for using given materials in boat repair activities.	LAFS.910.SL.2.4 LAFS.910.W.3.9 LAFS.910.RI.1.3 LAFS.910.L.1.1	SC.912.P.12.12
07.0 Maintain and repair basic two-stroke cycle outboard engines--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.01 Explain the basic principles of the operation of two-stroke cycle internal combustion engines.	LAFS.910.W.1.2 LAFS.910.RI.2.4 LAFS.910.SL.2.4	SC.912.P.10.1, 15; 12.2, 3, 11
07.02 Identify types of two-stroke cycle engines.	LAFS.910.W.1.2 LAFS.910.RI.2.4 LAFS.910.SL.2.4	
07.03 Locate engine serial and model numbers.		
07.04 Identify engine assemblies and systems.	LAFS.910.W.1.2 LAFS.910.SL.2.4	
07.05 Disassemble engines and inspect parts.		
07.06 Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads.	MAFS.912.N-Q.1.3	
07.07 Diagnose powerhead problems by use of the visual inspection method.		
07.08 Diagnose powerhead problems by use of the compression tester method.		SC.912.P.10.1; 12.10, 11
07.09 Diagnose powerhead problems by use of the stethoscope method.		
07.10 Remove, clean and inspect piston and rod assemblies.		
07.11 Measure out-of-round of pistons and cylinders.	MAFS.912.N-Q.1.3	
07.12 Hone cylinders.	MAFS.912.N-Q.1.3	SC.912.P.12.3
07.13 Check the total bearing surface of connecting rod bearings.		
07.14 Measure piston skirts and ring grooves.	MAFS.912.N-Q.1.3	
07.15 Measure the piston ring gap in cylinder bores.	MAFS.912.N-Q.1.3	
07.16 Install piston pins according to manufacturer's specifications.		
07.17 Check rod and piston assembly alignment.		
07.18 Install rings on pistons.		
07.19 Install piston rod assemblies.		
07.20 Measure and check crankshafts with a micrometer.	MAFS.912.N-Q.1.3	
07.21 Check needle bearings.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.22 Inspect crankshafts and install seal.		
07.23 Inspect, clean and/or replace reed valves.		
07.24 Reassemble engines.		
08.0 Maintain and repair fuel systems on boats--The student will be able to:		
08.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).	LAFS.910.W.1.2 LAFS.910.SL.2.4	
08.02 Sketch and label the parts of total fuel systems.	LAFS.910.W.1.2	
08.03 Service fuel lines and primer bulbs (vacuum test).		SC.912.P.12.10, 11
08.04 Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.		
08.05 Locate and identify fuel pumps and test the vacuum and pressure.		
08.06 Determine and make appropriate fuel oil mixtures.		

Course Title: Outboard Marine Service 2
Course Number: 9504220
Course Credit: 1

Course Description:

Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of marine electrical systems, procedures for preparing boats to customers, capacitor discharge ignition systems, outboard engine fuel systems, and proper use of computer systems related to parts specialization.

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
09.0 Maintain and repair electrical systems--The student will be able to:		
09.01 Locate and match electrical units by their symbols on a wiring diagram.		
09.02 Set up and use voltmeters, ammeters and ohmmeters.		SC.912.P.10.13, 14, 15
09.03 Locate and identify electrical circuit components.	LAFS.910.W.1.2	
09.04 Sketch a typical circuit using a single wire system.		
09.05 Test storage batteries using proper industry recognized battery testing equipment.		SC.912.P.10.13
09.06 Charge storage batteries.		
09.07 Remove and replace batteries and service battery boxes.		
09.08 Repair damaged wire and electrical harnesses.		
09.09 Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop.		
09.10 Sketch and label typical fuel gage systems.	LAFS.910.W.1.2	
09.11 Remove and replace ammeters or indicating lights.		
09.12 Remove and replace fuel gages.		
09.13 Remove and replace fuel-sending units.		
09.14 Diagnose gages and accessory system troubles using voltmeters, ammeters or detached sending units.		
09.15 Sketch typical circuits such as those for auto bilge pumps or navigation lights.	LAFS.910.W.1.2	
09.16 Locate opens, shorts and grounds.		SC.912.P.10.2

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
09.17 Demonstrate proficiency in applying industry standard wire terminal practices.		SC.912.P.8.2; 10.4
09.18 Demonstrate proper installation of 2 position and 3 position battery switches.		
09.19 Demonstrate correct procedure for connecting batteries in series and parallel.		
09.20 Check alternator output voltage with engine running compare with specifications.		
10.0 Prepare delivery checklist--The student will be able to:		
10.01 Make center line measurements for transom drilling and motor installation	MAFS.912.N-Q.1.3 MAFS.912.G-CO.1.1; 4.12	
10.02 Locate manufacturers' I.D. plates.		
10.03 Mount control boxes at the helm.	MAFS.912.N-Q.1.3	
10.04 Place wiring and cables in a neat and orderly manner.		
10.05 Adjust the control cables from the engine to the control box.		
10.06 Center the steering cable to the engine.		
10.07 Find suitable locations for accessories and mount them to the boat.	MAFS.912.N-Q.1.3	
10.08 Lubricate shafts, install propellers and fasten both securely.		
10.09 Check for proper levels.		
10.10 Check manufacturers' specifications.	LAFS.910.RI.2.4, 5 LAFS.910.L.2.3	
10.11 Describe how to or test-run boats.		
10.12 Recheck work completed.		
10.13 Check manufacturers' installation procedures for stern drive units.		
10.14 Demonstrate proper procedures for checking oil level capacity.		
10.15 Install or connect drain plugs, petcocks, hose clamps, hoses, etc.		
10.16 Remove and replace running lights.		
10.17 Troubleshoot lighting systems and accessories.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.18 Check and adjust throttles, cables, horns, lights and tachometers.		
10.19 Check steering system for proper operation.		
11.0 Maintain and repair outboard capacitor discharge ignition systems--The student will be able to:		
11.01 Sketch and label electrical symbols.	LAFS.910.W.1.2 LAFS.910.L.1.2	SC.912.P.10.13, 14, 15
11.02 Set up and use ohmmeters.		SC.912.P.10.13, 14, 15
11.03 Set up and use a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
11.04 Set up and use spark testers.		SC.912.P.10.13, 14, 15
11.05 Set up and use neon test lights.		SC.912.P.10.13, 14, 15
11.06 Set up and use low/high ammeters.		SC.912.P.10.13, 14, 15
11.07 Set up and use voltmeters.		SC.912.P.10.13, 14, 15
11.08 Locate and identify parts of capacitor discharge ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2	SC.912.P.10.13, 14, 15
11.09 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.910.RI.2.4 LAFS.910.W.4.10	SC.912.P.10.13, 14, 15
11.10 Sketch and label complete C/D ignition systems.	LAFS.910.W.1.2; 2.4,5, 6; 3.7, 8, 9; 4.10 LAFS. 910.L.1.2	SC.912.P.10.13, 14, 15
11.11 Check coil resistance, shorts and grounds with an ohmmeter.		SC.912.P.10.13, 14, 15
11.12 Check stator windings with an ohmmeter.		SC.912.P.10.13, 14, 15
11.13 Check sensor coils, charge coils, ignition coils and shorts to ground with a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
11.14 Check power packs with an ohmmeter and a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
12.0 Maintain and repair outboard fuel systems--The student will be able to:		
12.01 Identify the major types of carburetors.	LAFS.910.W.2.4 LAFS.910.SL.2.4, 6	SC.912.P.12.3, 10, 11
12.02 Check and adjust throttle.		
12.03 Identify and understand different types of Vapor Separator Tank (VST) systems.		
12.04 Remove, service, and replace air cleaners.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.05 Identify basic carburetor circuits (chokes, floats, fuel inlets; idle, intermediate and high speeds; mains, etc.)		
12.06 Diagnose carburetor problems.		
12.07 Remove, clean, overhaul, replace and make final adjustments to carburetors.		
12.08 Diagnose exhaust problems such as back pressure and scavenging.		
12.09 Remove, service, and replace flame arrestors.		
13.0 Parts specialist and computer skills to industry standards--The student will be able to:		
13.01 Identify the skills needed to be a service writer.	LAFS.910.W.1.2 LAFS.910.L.1.1, 2	
13.02 Identify the skills needed to be a parts specialist.	LAFS.910.W.1.2 LAFS.910.L.1.1, 2	
13.03 Demonstrate appropriate computer skills.		
13.04 Demonstrate knowledge of different parts and accessories.	LAFS.910.SL.2.4 LAFS.910.W.3.8	

Course Title: Outboard Marine Service 3
Course Number: 9504230
Course Credit: 1

Course Description:

Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of outboard 4-stroke cycle engines, charging systems, battery ignition systems, and cranking systems.

CTE Standards and Benchmarks		FS-M/LA	NGSS-Sci
17.0	Maintain and repair basic four-stroke cycle outboard engines--The student will be able to:		
17.01	Explain the basic principles of the operation of four-stroke cycle internal combustion engines.	LAFS.1112.SL.2.4 LAFS.1112.W.1.2 LAFS.1112.RI.2.4	SC.912.P.10.1, 5; 12.2, 3
17.02	Identify types of four-stroke cycle engines.	LAFS.1112.SL.2.4	
17.03	Locate engine serial and model numbers.	LAFS.1112.SL.2.4	
17.04	Identify engine assemblies and systems.	LAFS.1112.W.1.2 LAFS.1112.SL.2.4	
17.05	Diagnose valve and head problems by use of the visual inspection method.		
17.06	Diagnose valve and head problems by use of the compression tester and Leak Down tester method.		SC.912.P.10.1; 12.10, 11
17.07	Disassemble engines and inspect parts.		
17.08	Clean and inspect heads for cracks, warpage and damaged spark plug threads.	MAFS.912.N-Q.1.1, 3	
17.09	Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.		
17.10	Adjust valves.	MAFS.912.N-Q.1.3	
17.11	Remove and inspect camshafts and lifters.		
17.12	Clean and inspect lifters for wear.		
17.13	Time valve drive assemblies.		
17.14	Remove pistons from rod assemblies.		
17.15	Measure out-of-round and cylinder taper with a dial bore gage or micrometer.	MAFS.912.N-Q.1.3	

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
17.16 Check piston pins and bosses for wear.	MAFS.912.N-Q.1.3	
17.17 Measure piston ring lands width, out-of-round and taper.	MAFS.912.N-Q.1.3	
17.18 Measure the piston ring gap in cylinder bores.	MAFS.912.N-Q.1.3	
17.19 Install and fit piston pins.	MAFS.912.N-Q.1.3	
17.20 Check rod and piston assembly alignment.		
17.21 Remove and replace rod bearings.		
17.22 Hone and clean cylinders.	MAFS.912.N-Q.1.3	SC.912.P.12.3
17.23 Install rings on pistons.		
17.24 Measure and check crankshafts with a micrometer.	MAFS.912.N-Q.1.3	
17.25 Check for end play.	MAFS.912.N-Q.1.3	
17.26 Check bearing bores with a telescoping gage.	MAFS.912.N-Q.1.3	
17.27 Reassemble engines.		
17.28 Install oil seals.		
17.29 Inspect/replace timing belt/chain.		
17.30 After rebuild, final Compression Test and Lead Down Test.		
18.0 Maintain and repair outboard charging systems--The student will be able to:		
18.01 Sketch and label the units of complete charging circuits.	LAFS.1112.W.1.2 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
18.02 Disassemble charging systems and identify the components.		SC.912.P.10.13, 14, 15
18.03 Perform stator and rectifier testing on charging systems.		SC.912.P.10.13, 14, 15
18.04 Reassemble and test charging systems.		SC.912.P.10.13, 14, 15
18.05 Set up and use ohmmeters.		SC.912.P.10.13, 14, 15
18.06 Reassemble and test complete units.		SC.912.P.10.13, 14, 15
19.0 Maintain and repair outboard battery ignition systems--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
19.01 Locate and identify parts of battery ignition systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
19.02 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.1112.RI.2.4 LAFS.1112.W.4.10	SC.912.P.10.13
19.03 Sketch and label complete battery ignition systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
19.04 Check coil resistance with an ohmmeter.		SC.912.P.10.13, 14, 15
19.05 Set up and use test equipment.		
19.06 Set timing using timing light.		
19.07 Clean and regap spark plugs.		
20.0 Maintain and repair outboard cranking systems--The student will be able to:		
20.01 Disassemble recoil starters.		
20.02 Inspect components of recoil starters.		
20.03 Reassemble recoil starters.		
20.04 Identify components of electrical starting systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2; 2.4	SC.912.P.10.13, 14, 15
20.05 Bench test switches.		SC.912.P.10.13, 14, 15
20.06 Troubleshoot starting systems using multimeter.		SC.912.P.10.13, 14, 15
20.07 Locate opens, short and grounds.		SC.912.P.10.13, 14, 15

Course Title: Outboard Marine Service 4
Course Number: 9504240
Course Credit: 1

Course Description:

Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of outboard engine lubrication systems, cooling systems, lower gear cases, lower units and housing assemblies, employability, and entrepreneurship.

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
21.0 Maintain and repair outboard lubrication systems--The student will be able to:		
21.01 Identify the types and functions of lubrication systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
21.02 Explain the principles of lubrication systems.		SC.912.P.10.5
21.03 Identify and locate components of lubrication systems.	LAFS.1112.SL.2.4, 6	
21.04 Check engines for oil leaks.		
21.05 Change engine oil and filters.		
21.06 Check engine oil pressure and level.		
21.07 Recognize and use only recommended oil.		
21.08 Inspect and service oil metering systems.		
22.0 Maintain and repair outboard cooling systems--The student will be able to:		
22.01 Explain the principles of cooling systems.	LAFS.1112.SL.2.4 LAFS.1112.W.1.2	SC.912.P.10.5, 7, 20
22.02 Trace water flow through cooling systems.		
22.03 Disassemble, examine for problems and reassemble water pumps.		
22.04 Remove, check and replace thermostats		SC.912.P.12.3
22.05 Service poppet valves.		
22.06 Service or replace thermostat and thermostat housings.		
23.0 Maintain and repair outboard lower gear cases--The student will be able to:		
23.01 Remove and replace lower gear cases.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.02 Identify the components of lower gear case.	MAFS.912.N-Q.1.1, 3	
23.03 Refill lower gear cases with specified oil.		
23.04 Determine propeller pitch diameter and hub type.	LAFS.1112.L.3.4	SC.912.P.10.6 SC.912.P.12.5, 6
24.0 Assemble and maintain outboard lower units and housing assemblies--The student will be able to:		
24.01 Disassemble and reassemble steering handle groups.		
24.02 Disassemble and assemble exhaust housings and water tube assemblies.		
24.03 Replace motor mounts and shock absorbers.		
24.04 Lubricate all fittings.		
24.05 Pressure and vacuum test gear cases.		SC.912.P.12.10, 11
24.06 Remove and service cylinders and rams.		SC.912.P.10.2; 12.10
24.07 Adjust the trim and tilt.		
24.08 Determine the differences between mechanical, electrical and hydraulic shifting units.	LAFS.1112.RI.2.4	SC.912.P.10.1; 12.3
24.09 Explain the shifting theory of the lower unit.	LAFS.1112.W.1.2; 4.10 LAFS.1112.L.1.1, 2	SC.912.P.10.1; 12.3
24.10 Perform correct procedure for filling trim and tilt with hydraulic oil.		
25.0 Demonstrate employability skills--The student will be able to:		
25.01 Conduct a job search using periodicals and the internet.		
25.02 Secure information about a job.		
25.03 Identify documents that may be required when applying for a job interview.		
25.04 Complete a job application form correctly.		
25.05 Demonstrate competence in job interview techniques.		
25.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.		
25.07 Identify acceptable work habits.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
25.08 Demonstrate knowledge of how to make appropriate job changes.		
25.09 Demonstrate acceptable employee health habits.		
25.10 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).		
26.0 Demonstrate an understanding of entrepreneurship--The student will be able to:		
26.01 Define entrepreneurship.		
26.02 Describe the importance of entrepreneurship to the American economy.		
26.03 List the advantages and disadvantages of business ownership.		
26.04 Identify and explain the risks involved in ownership of a business.		
26.05 Identify and explain the necessary personal characteristics of a successful entrepreneur.		
26.06 Identify and explain the business skills needed to operate a small business efficiently and effectively.		
26.07 Identify and explain the various types of business structures, e.g. sole proprietor, S-Corporation, etc.		

Course Title: **Advanced Marine Technology 1**
Course Number: **9504250**
Course Credit: **1**

Course Description:

Students will learn advanced-level skills for the marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student an understanding of basic four-stroke cycle engines, fuel systems, cooling systems, lubrication systems, ignition systems, and capacitor discharge ignition systems.

CTE Standards and Benchmarks		FS-M/LA	NGSS-Sci
27.0	Maintain and repair basic four-stroke cycle inboard gas engines--The student will be able to:		
27.01	Diagnose valve and head problems by use of the visual inspection method.		
27.02	Diagnose valve and head problems by use of the compression tester and Leak Down tester method.		
27.03	Disassemble engines and inspect parts.		
27.04	Clean and inspect heads for cracks, warpage and damaged spark plug threads.	MAFS.912.N-Q.1.3	
27.05	Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.		
27.06	Adjust valves.		
27.07	Remove and inspect camshafts and lifters.	MAFS.912.N-Q.1.3	
27.08	Clean and inspect lifters for wear.		
27.09	Time valve drive assemblies.		
27.10	Remove pistons from rod assemblies.		
27.11	Measure out-of-round and cylinder taper with a dial bore gage or micrometer.		
27.12	Check piston pins and bosses for wear.		
28.0	Maintain and repair inboard fuel systems--The student will be able to:		
28.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).		
28.02	Sketch and label the parts of total fuel systems.		
28.03	Service fuel lines.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
28.04 Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.		
28.05 Vacuum test fuel system.		SC.912.P.12.10
28.06 Remove, replace service and check the pressure of fuel pumps.		SC.912.P.12.10
29.0 Maintain and repair inboard gas cooling systems--The student will be able to:		
29.01 Explain the principles of cooling systems, including fresh water cooling systems.		SC.912.P.12.3, 11
29.02 Trace water flow through cooling systems.		SC.912.P.12.10, 11
29.03 Disassemble and reassemble water pumps.		
30.0 Maintain and repair inboard gas lubrication systems--The student will be able to:		
30.01 Identify the types and functions of lubrication systems.		SC.912.P.12.10, 11
30.02 Explain the principles of lubrication systems.		SC.912.P.12.10, 11
30.03 Identify and locate components of lubrication systems.		SC.912.P.12.10, 11
31.0 Maintain and repair battery ignition systems--The student will be able to:		
31.01 Locate and match electrical units by their symbols on a wiring diagram.		SC.912.P.10.13
31.02 Sketch and label complete battery ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2 LAFS.1112.W.1.2 LAFS.1112.L.1.2	
32.0 Maintain and repair capacitor discharge ignition systems--The student will be able to:		
32.01 Sketch and label electrical symbols.	LAFS.910.W.1.2 LAFS.910.L.1.2 LAFS.1112.W.1.2 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
32.02 Set up and use ohmmeters.		SC.912.P.10.13, 14, 15
32.03 Set up and use appropriate test equipment.		SC.912.P.10.13, 14, 15
32.04 Set up and use spark testers.		SC.912.P.10.13, 14, 15; 12.7
32.05 Set up and use neon test lights.		SC.912.P.10.13, 14, 15

Course Title: **Advanced Marine Technology 2**
Course Number: **9504260**
Course Credit: **1**

Course Description:

Students will continue to learn advanced-level skills for the marine service industry. Additional hands-on training combined with laboratory and classroom experiences gives the student a full understanding of basic four-stroke cycle engines, fuel systems, cooling systems, lubrication systems, ignition systems, and capacitor discharge ignition systems.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
27.0	Maintain and repair basic four-stroke cycle inboard gas engines--The student will be able to:		
27.13	Measure piston ring lands width, out-of-round and taper.	MAFS.912.N-Q.1.3	
27.14	Measure the piston ring gap in cylinder bores.	MAFS.912.N-Q.1.3	
27.15	Install and fit piston pins.	MAFS.912.N-Q.1.3	
27.16	Check rod and piston assembly alignment.		
27.17	Remove and replace rod bearings.		
27.18	Hone and clean cylinders.	MAFS.912.N-Q.1.3	SC.912.P.12.3
27.19	Install rings on pistons.		
27.20	Measure and check crankshafts with a micrometer.	MAFS.912.N-Q.1.3	
27.21	Check for end play.	MAFS.912.N-Q.1.3	
27.22	Check bearing bores with a telescoping gage.	MAFS.912.N-Q.1.3	
27.23	Reassemble engines.		
27.24	Install oil seals.		
27.25	Inspect/replace timing belt/chain.		
28.0	Maintain and repair inboard fuel systems--The student will be able to:		
28.07	Remove, clean and replace in-line filters.		SC.912.P.8.1
28.08	Identify the major types of carburetors.		SC.912.P.12.10
28.09	Check and adjust throttle linkages.		

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
28.10 Identify and service different types of EFI systems.		
28.11 Identify and understand different types of Vapor Separator Tank (VST) systems.		
28.12 Remove, service, and replace flame arrestors.		
29.0 Maintain and repair inboard gas cooling systems--The student will be able to:		
29.04 Remove, check and replace thermostats.		
29.05 Check thermostat pressure relief systems.		
29.06 Service manifolds, risers and thermostat housings.		
30.0 Maintain and repair inboard gas lubrication systems--The student will be able to:		
30.04 Check engines for oil leaks.		
30.05 Change engine oil and filters.		
30.06 Check engine oil pressure and level.		SC.912.P.12.10, 11
30.07 Recognize and use only recommended oil.		SC.912.P.12.10, 11
31.0 Maintain and repair battery ignition systems--The student will be able to:		
31.03 Set up and use test equipment.		SC.912.P.10.13, 14, 15
31.04 Set timing using a timing light		
32.0 Maintain and repair capacitor discharge ignition systems--The student will be able to:		
32.06 Set up and use low/high ammeters.		SC.912.P.10.13, 14, 15
32.07 Set up and use voltmeters.		SC.912.P.10.13, 14, 15
32.08 Locate and identify parts of capacitor discharge ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2 LAFS.1112.W1.2 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
32.09 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.910.RI.2.4, LAFS.910.W.1.2; 4.10 LAFS.910.L.1.2 LAFS.1112.RI.2.4 LAFS.1112.W.1.2; 4.10 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15

CTE Standards and Benchmarks	FS-M/LA	NGSS-Sci
32.10 Check coil resistance, shorts and grounds with an ohmmeter.		SC.912.P.10.13, 14, 15
32.11 Check sensor coils, charge coils, ignition coils and shorts to ground with appropriate test equipment.		SC.912.P.10.13, 14, 15

Course Title: Outboard Marine Service Capstone
Course Number: 9504270
Course Credit: 1

Course Description:

This course provides students with extended content and skills essential to the planning, design, creation, and presentation of an outboard marine technology capstone project.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
33.0 Conceive, design, and present a marine project(s) that encompass all the skills learned in the Outboard Marine Service Technology program--The student will be able to:		
33.01 Create and produce an original working drawing using outboard marine nomenclature.		
33.02 Compose a well written design proposal and present to instructor for approval.		
33.03 Incorporate principles and practices of outboard marine technology into the project.		
34.0 Plan, organize, and carry out a project plan--The student will be able to:		
34.01 Determine the scope of a project.		
34.02 Organize tasks.		
34.03 Determine project priorities.		
34.04 Identify required resources.		
34.05 Record project progress in a process journal.		
34.06 Record and account for budget expenses during the life of the project.		
34.07 Carry out the project plan to successful completion and delivery.		
35.0 Formulate strategies to properly manage resources--The student will be able to:		
35.01 Identify required resources and associated costs for each stage of the project plan.		
35.02 Create a project budget based on the identified resources.		
35.03 Determine the methods needed to acquire needed resources.		
35.04 Demonstrate good judgment in the use of resources.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
35.05 Recycle and reuse resources where appropriate.		
35.06 Demonstrate an understanding of proper legal and ethical waste disposal.		
36.0 Use tools, materials, and processes in an appropriate and safe manner--The student will be able to:		
36.01 Identify and use the proper tool for a given job.		
36.02 Use tools and machines in a safe manner.		
36.03 Adhere to laboratory safety rules and procedures.		
36.04 Identify the application of processes appropriate to the task at hand.		
36.05 Identify materials appropriate to their application.		
37.0 Create a project portfolio describing the marine project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results--The student will be able to:		
37.01 Create a Design Portfolio documenting project timeline, drawings, and specifications.		
37.02 Create a Bill of Material (BOM) for your project.		
37.03 Create and deliver a presentation to communicate project results to other teams.		