

Florida Department of Education  
CURRICULUM FRAMEWORK

**Program Title:** Marine Service Technology  
**Occupational Area:** Industrial Education

	<u>Secondary</u>	<u>PSAV</u>
<b>Program Numbers</b>	<b>8751000</b>	<b>I490306</b>
CIP Number	0649.030600	0649.030600
Grade Level	9-12, 30, 31	30,31
Length	9 credits	1350 hours
Certification	DIESEL MECH @7 G GASENG RPR @7 G	DIESEL MECH @7 G GASENG RPR @7 G

- I. **MAJOR CONCEPTS/CONTENT:** The purpose of this program is to prepare students for employment as machinery mechanics; marine engines (85116626), or outboard motor mechanics (625.131-010).

The course content will include the following: service, repair and overhaul of four-stroke and two-stroke cycle engines and outboard motors; and service and repair of boating accessories. With regard to the above, course content will include electrical systems, fuel systems, power transfer systems, ignition systems, cooling systems, lubrication systems, drive systems and boat and trailer rigging.

The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

Occupational Completion Points may be reached before the end of a secondary course. All outcomes must be completed to receive credit for a Occupational Completion Point (OCP). Listed below are the courses that comprise this program when offered at the secondary level:

- 8751010 - **MARINE SERV 1** (150 HRS)
- 8751020 - **MARINE SERV 2** (150 HRS) [300] **OCP A - MARINE RIGGER**
- 8751030 - **MARINE SERV 3** (150 HRS) [100] **OCP B - SERV WRITER/PARTS**
- 8751040 - **MARINE SERV 4** (150 HRS)
- 8751050 - **MARINE SERV 5** (150 HRS)
- 8751060 - **MARINE SERV 6** (150 HRS)
- 8751070 - **MARINE SERV 7** (150 HRS) [650] **OCP C - OUTBOARD ENGINE TECH**
- 8751080 - **MARINE SERV 8** (150 HRS) [100] **OCP D - STERN DRIVE TECH**  
(150 HRS) [100] **OCP E - INBOARD GAS TECH**
- 8751090 - **MARINE SERV 9** (150 HRS) [100] **OCP F - INBOARD DIESEL**

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Marine Service industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

- II. **LABORATORY ACTIVITIES:** Shop or laboratory activities are an integral part of this program. These activities provide instruction in the use of tools, equipment, materials and

processes found in the industry. Students are also instructed in the following: tools, test equipment, welding procedures, current model outboard motors, inboard-outdrive motors, location and installation of accessories, boat trailers, and operational testing.

- III. **SPECIAL NOTE: SkillsUSA-VICA, Inc.** is the appropriate Career and Technical Student Organization (CTSO) for providing leadership training and for reinforcing specific career and technical skills. Career and Technical Student Organizations, when provided, shall be an integral part of the career and technical instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Rule 6A-10.040, FAC, the minimum basic-skills grade levels required for adult vocational students to complete this program are: Mathematics 9.0, Language 9.0, Reading 9.0. These grade-level numbers correspond to grade-equivalent scores obtained on one of the state-designated basic-skills examinations. If a student does not meet the basic-skills level required for completion of the program, remediation should be provided concurrently through Vocational Preparatory Instruction (VPI). Please refer to the Rule for exemptions.

When a secondary student with a disability is enrolled in a vocational class with modifications to the curriculum framework, the particular outcomes and student performance standards, which the student must master to earn credit, must be specified on an individual basis. The job or jobs for which the student is being trained should be reflected in the student's desired postschool outcome statement on the Transition Individual Educational Plan (Transition IEP).

SCANS Competencies: To accomplish the Secretary's Commission on Achieving Necessary Skills (SCANS) competencies, instructional strategies for this cluster must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate methods to improve students' personal qualities and higher-order thinking skills.

To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not

preclude institutions from developing specific program or course articulation agreements with each other.

This program may be offered in courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 230.643, F.S.

The standard length of this program is 1350 hours.

- IV. **INTENDED OUTCOMES:** After successfully completing the program, the student will be able to:

**OCCUPATIONAL COMPLETION POINT - DATA CODE - A (300 Hours)**

MARINE RIGGER - INDUSTRY TITLE

MARINE SERVICE 1

- 01.0 Perform shop practices to industry standards.
- 02.0 Maintain and repair basic four-stroke cycle engines.
- 03.0 Maintain and repair basic two-stroke cycle engines.
- 04.0 Maintain and repair electrical systems.

MARINE SERVICE 2

- 05.0 Maintain and repair fuel systems.
- 06.0 Maintain and repair two-stroke cycle carburetors.
- 07.0 Use marine woods, metals and fiberglass.
- 08.0 Adjust and repair trailers.
- 09.0 Prepare and deliver sales merchandise.
- 10.0 Demonstrate appropriate communication skills.
- 11.0 Demonstrate appropriate math skills.
- 12.0 Demonstrate appropriate understanding of basic science.
- 13.0 Demonstrate employability skills.
- 14.0 Demonstrate and understanding of entrepreneurship.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - B (100 Hours)**

SERVICE WRITER/PARTS TECHNICIAN - INDUSTRY TITLE

MARINE SERVICE 3

- 15.0 Parts specialist and computer skills to industry standards.
- 16.0 Maintain and repair cooling systems.
- 17.0 Maintain and repair lubrication systems.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - C (650 Hours)**

OUTBOARD ENGINE TECHNICIAN - INDUSTRY TITLE

- 18.0 Perform gasket/seal operations and electronic test skills to industry standards.

MARINE SERVICE 4

- 19.0 Maintain and repair basic two stroke cycle outboard engines.
- 20.0 Maintain and repair outboard fuel systems.
- 21.0 Maintain and repair outboard cooling systems.

MARINE SERVICE 5

- 22.0 Maintain and repair outboard lubrication systems.
- 23.0 Maintain and repair outboard lower cases.

- 24.0 Maintain and repair outboard cranking systems.
- 25.0 Maintain and repair outboard magneto systems.

MARINE SERVICE 6

- 26.0 Maintain and repair outboard battery ignition systems.
- 27.0 Maintain and repair outboard capacitor discharge ignition systems.
- 28.0 Maintain and repair outboard charging systems.

MARINE SERVICE 7

- 29.0 Perform outboard upper to lower gear case maintenance.
- 30.0 Assemble and maintain outboard lower units and housing assemblies.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - D (100 Hours)**

STERN DRIVE TECHNICIAN

MARINE SERVICE 8

- 31.0 Maintain and repair basic four-stroke cycle stern drive engines.
- 32.0 Maintain and repair stern drive fuel systems.
- 33.0 Maintain and repair stern drive cooling systems.
- 34.0 Maintain and repair stern drive lubrication systems.
- 35.0 Maintain and repair stern drive upper gear case.
- 36.0 Maintain and repair stern drive lower gear case.
- 37.0 Maintain and repair stern drive battery ignition.
- 38.0 Maintain and repair stern drive; capacitor discharge ignition system.
- 39.0 Maintain and repair stern drive intermediate housing.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - E (100 Hours)**

INBOARD GAS TECHNICIAN - Industry Title

- 40.0 Perform parts manual activities to industry standards.
- 41.0 Maintain and repair basic four-stroke cycle inboard gas engine.

MARINE SERVICE 9

- 42.0 Maintain and repair inboard fuel systems.
- 43.0 Maintain and repair inboard gas cooling systems.
- 44.0 Maintain and repair inboard gas lubrication systems.
- 45.0 Maintain and repair inboard gas fuel systems.
- 46.0 Maintain and repair inboard gas transmissions.

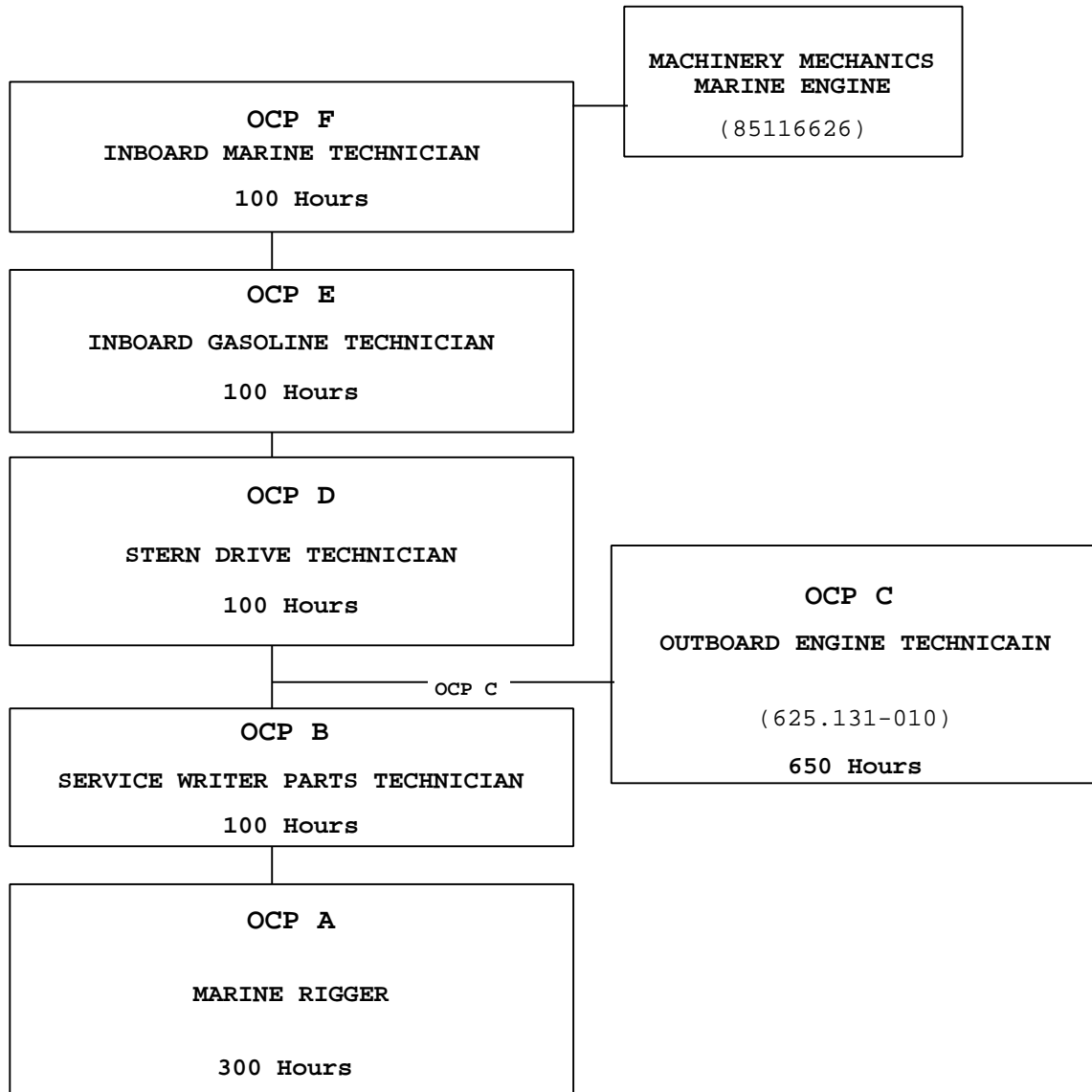
**OCCUPATIONAL COMPLETION POINT - DATA CODE - F (100 Hours)**

INBOARD DIESEL TECHNICIAN - INDUSTRY TITLE

- 47.0 Maintain and repair inboard diesel fuel systems.
- 48.0 Maintain and repair inboard diesel cooling systems.
- 49.0 Maintain and repair inboard diesel lubrication systems.
- 50.0 Maintain and repair inboard diesel charging systems.

The following diagram illustrates OCP and program progress:

**MARINE SERVICE TECHNOLOGY**



**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

Program Title: Marine Service Technology  
 Secondary Number: 8751000  
 Postsecondary Number: I490306

**OCCUPATIONAL COMPLETION POINT - DATA CODE - A (300 Hours)**

MARINE RIGGER - INDUSTRY TITLE

01.0 PERFORM SHOP PRACTICES TO INDUSTRY STANDARDS--The student will be able to:

- 01.01 Comply with safety rules and regulations.
- 01.02 Use hand tools safely and properly.
- 01.03 Set up and use power tools safely and properly.
- 01.04 Set up and use precision measuring tools.
- 01.05 Drill and remove broken studs and install helicoils.
- 01.06 Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
- 01.07 Read, interpret and apply service manuals.
- 01.08 Locate and match electrical units by their symbols on a wiring diagram.
- 01.09 Demonstrate appropriate heating, cutting, and welding skills.

02.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE ENGINES--The student will be able to:

- 02.01 Explain the basic principles of the operation of four-stroke cycle internal combustion engines.
- 02.02 Identify types of four-stroke cycle engines.
- 02.03 Locate engine serial and model numbers.
- 02.04 Identify engine assemblies and systems.

03.0 MAINTAIN AND REPAIR BASIC TWO-STROKE CYCLE ENGINES--The student will be able to:

- 03.01 Explain the basic principles of the operation of two-stroke cycle internal combustion engines.
- 03.02 Identify types of engines.
- 03.03 Locate engine serial and model numbers.
- 03.04 Identify engine assemblies and systems.

04.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS--The student will be able to:

- 04.01 Set up and use voltmeters, ammeters and ohmmeters.
- 04.02 Locate and identify electrical circuit components.
- 04.03 Sketch a typical circuit using a single wire system.
- 04.04 Test storage batteries using a hydrometer.
- 04.05 Test storage batteries using a light and load test.
- 04.06 Charge storage batteries.
- 04.07 Remove and replace batteries and service battery boxes.
- 04.08 Repair damaged wire and electrical harnesses.
- 04.09 Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop.
- 04.10 Sketch and label typical fuel gage systems.

- 04.11 Remove and replace ammeters or indicating lights.
  - 04.12 Remove and replace fuel gages.
  - 04.13 Remove and replace fuel-sending units.
  - 04.14 Diagnose gages and accessory system troubles using test lights, voltmeters, ammeters or detached sending units.
  - 04.15 Sketch typical circuits such as those for auto bilge pumps or navigation lights.
  - 04.16 Locate opens, shorts and grounds.
  - 04.17 Demonstrate proficiency in soldering/splicing skills.
- 05.0 MAINTAIN AND REPAIR FUEL SYSTEMS--The student will be able to:
- 05.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
  - 05.02 Sketch and label the parts of total fuel systems.
  - 05.03 Service fuel lines and primer bulbs (vacuum test).
  - 05.04 Remove, clean, inspect and install fuel tanks.
  - 05.05 Identify basic carburetor circuits (chokes, floats, fuel inlets; idle, intermediate and high speeds; mains, etc.)
  - 05.06 Identify and locate fuel pumps.
  - 05.07 Determine and make appropriate fuel oil mixtures.
- 06.0 MAINTAIN AND REPAIR TWO-STROKE CYCLE CARBURETORS--The student will be able to:
- 06.01 Remove, clean, overhaul, replace and make final adjustments to carburetors.
  - 06.02 Diagnose exhaust problems such as back pressure and scavenging.
- 07.0 USE MARINE WOODS, METALS, AND FIBERGLASS--The student will be able to:
- 07.01 Explain the hazards of a marine environment to woods, metals and fiberglass.
  - 07.02 Explain a galvanic series.
  - 07.03 Explain the theory for using given materials in boat repair activities.
- 08.0 ADJUST AND REPAIR TRAILERS--The student will be able to:
- 08.01 Make boat to trailer adjustments.
  - 08.02 Remove and replace lighting systems.
  - 08.03 Remove and replace wheel bearings and springs.
  - 08.04 Remove and replace brakes.
  - 08.05 Service and install trim and tilt systems.
  - 08.06 Remove and test cylinder rams.
  - 08.07 Adjust reverse locks.
  - 08.08 Adjust the trim and tilt.
- 09.0 PREPARE AND DELIVER SALES MERCHANDISE--The student will be able to:
- 09.01 Make center line measurements for outboard motor installation.
  - 09.02 Center the plate height.
  - 09.03 Locate manufacturers' I.D. plates.
  - 09.04 Mount control boxes at the helm.
  - 09.05 Place wiring and cables in a neat and orderly manner.



- 09.06 Adjust the control cables from the engine to the control box.
  - 09.07 Center the steering cable to the engine.
  - 09.08 Find suitable locations for accessories and mount them to the boat.
  - 09.09 Lubricate shafts, install propellers and fasten both securely.
  - 09.10 Check for proper levels.
  - 09.11 Check manufacturers' specifications.
  - 09.12 Test-run boats.
  - 09.13 Recheck work completed.
  - 09.14 Check manufacturers' installation procedures for stern drive units.
  - 09.15 Lubricate shafts and install propellers securely.
  - 09.16 Obtain maximum oil level capacity.
  - 09.17 Install or connect drain plugs, petcocks, hose clamps, hoses, etc.
  - 09.18 Find a suitable mount location and mount the engine securely in the boat.
  - 09.19 Set engines to manufacturers' specifications.
  - 09.20 Set, adjust and test engines to manufacturers' specifications.
  - 09.21 Remove and replace running lights.
  - 09.22 Troubleshoot lighting systems and accessories.
  - 09.23 Check and adjust throttles, cables, horns, lights and tachometers.
- 10.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:
- 10.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
  - 10.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
  - 10.03 Read and follow written and oral instructions.
  - 10.04 Answer and ask questions coherently and concisely.
  - 10.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
  - 10.06 Demonstrate appropriate telephone/communication skills.
- 11.0 DEMONSTRATE APPROPRIATE MATH SKILLS--The student will be able to:
- 11.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
  - 11.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
  - 11.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
  - 11.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
  - 11.05 Demonstrate an understanding of federal, state and local taxes and their computation.
- 12.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC SCIENCE--The student will be able to:
- 12.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.

- 12.02 Draw conclusions or make inferences from data.
  - 12.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
  - 12.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
- 13.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:
- 13.01 Conduct a job search.
  - 13.02 Secure information about a job.
  - 13.03 Identify documents that may be required when applying for a job.
  - 13.04 Complete a job application form correctly.
  - 13.05 Demonstrate competence in job interview techniques.
  - 13.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
  - 13.07 Identify acceptable work habits.
  - 13.08 Demonstrate knowledge of how to make appropriate job changes.
  - 13.09 Demonstrate acceptable employee health habits.
  - 13.10 Demonstrate knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442.
- 14.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:
- 14.01 Define entrepreneurship.
  - 14.02 Describe the importance of entrepreneurship to the American economy.
  - 14.03 List the advantages and disadvantages of business ownership.
  - 14.04 Identify the risks involved in ownership of a business.
  - 14.05 Identify the necessary personal characteristics of a successful entrepreneur.
  - 14.06 Identify the business skills needed to operate a small business efficiently and effectively.
- OCCUPATIONAL COMPLETION POINT - DATA CODE - B (100 Hours)**  
**SERVICE WRITER/PARTS TECHNICIAN - INDUSTRY TITLE**
- 15.0 PARTS SPECIALIST AND COMPUTER SKILLS TO INDUSTRY STANDARDS--The student will be able to:
- 15.01 Identify the skills needed to be a service writer.
  - 15.02 Identify the skills needed to be a parts specialist.
  - 15.03 Demonstrate appropriate computer skills.
  - 15.04 Identify gaskets and seals.
  - 15.05 Demonstrate knowledge of different parts and accessories.
- 16.0 MAINTAIN AND REPAIR COOLING SYSTEMS--The student will be able to:
- 16.01 Explain the principles of cooling systems, including fresh water cooling systems.
  - 16.02 Trace water flow through cooling systems.
- 17.0 MAINTAIN AND REPAIR LUBRICATION SYSTEMS--The student will be able to:

- 17.01 Identify the types and functions of lubrication systems.
- 17.02 Explain the principles of lubrication systems.
- 17.03 Identify and locate components of lubrication systems.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - C (650 Hours)**

**OUTBOARD ENGINE TECHNICIAN - INDUSTRY TITLE**

- 18.0 PERFORM GASKET/SEAL OPERATIONS AND ELECTRONIC TEST EQUIPMENT SKILLS TO INDUSTRY STANDARDS--The student will be able to:
- 18.01 Identify and make gaskets and seals.
  - 18.02 Demonstrate appropriate skills in computerized test equipment.
- 19.0 MAINTAIN AND REPAIR BASIC TWO-STROKE CYCLE OUTBOARD ENGINES--The student will be able to:
- 19.01 Disassemble engines.
  - 19.02 Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads.
  - 19.03 Diagnose head problems by use of the visual inspection method.
  - 19.04 Diagnose head problems by use of the compression tester method.
  - 19.05 Diagnose head problems by use of cylinder air pressure method.
  - 19.06 Diagnose head problems by use of the stethoscope method.
  - 19.07 Remove, clean and inspect piston rods and assemblies.
  - 19.08 Measure out-of-round of pistons and cylinders.
  - 19.09 Hone cylinders.
  - 19.10 Check the total bearing surface of connecting rod bearings.
  - 19.11 Measure piston skirts and ring grooves.
  - 19.12 Measure the piston ring gap in cylinder bores.
  - 19.13 Install piston pins according to manufacturer's specifications.
  - 19.14 Check rod and piston assembly alignment.
  - 19.15 Install rings on pistons.
  - 19.16 Install piston rod assemblies.
  - 19.17 Measure and check crankshafts with a micrometer.
  - 19.18 Check needle bearings.
  - 19.19 Inspect crankshafts and install seal.
  - 19.20 Inspect, clean and/or replace reed valves.
  - 19.21 Reassemble engines.
- 20.0 MAINTAIN AND REPAIR OUTBOARD FUEL SYSTEMS--The student will be able to:
- 20.01 Identify the major types of carburetors.
  - 20.02 Check and adjust throttle and governor linkages.
  - 20.03 Identify and service different types of EFI systems.
  - 20.04 Remove, service and replace air cleaners.
  - 20.05 Diagnose carburetor problems.
- 21.0 MAINTAIN AND REPAIR OUTBOARD COOLING SYSTEMS--The student will be able to:
- 21.01 Disassemble and reassemble water pumps.
  - 21.02 Remove, check and replace thermostats.
  - 21.03 Use thermostat pressure relief systems.
  - 21.04 Service manifolds and thermostat housings.

- 22.0 MAINTAIN AND REPAIR OUTBOARD LUBRICATION SYSTEMS--The student will be able to:
- 22.01 Check engines for oil leaks.
  - 22.02 Change engine oil and filters.
  - 22.03 Check engine oil pressure and level.
  - 22.04 Recognize and use only recommended oil.
  - 22.05 Inspect and service oil-metering systems.
- 23.0 MAINTAIN AND REPAIR OUTBOARD LOWER GEAR CASES--The student will be able to:
- 23.01 Remove and replace lower gear cases.
  - 23.02 Reshim lower gear cases.
  - 23.03 Refill lower gear cases with specified oil.
  - 23.04 Determine propeller pitch diameter and hub type.
- 24.0 MAINTAIN AND REPAIR OUTBOARD CRANKING SYSTEMS--The student will be able to:
- 24.01 Disassemble recoil starters.
  - 24.02 Inspect components of recoil starters.
  - 24.03 Reassemble recoil starters.
  - 24.04 Identify components of electrical starting systems.
  - 24.05 Disassemble different types of starting motors.
  - 24.06 Bench test armatures.
  - 24.07 Bench test field coils.
  - 24.08 Bench test drive units.
  - 24.09 Bench test switches.
  - 24.10 Bench test minor parts of starting motor components.
  - 24.12 Install, reassemble and test new starter parts.
  - 24.13 Troubleshoot starting systems using battery starter testers.
  - 24.14 Set up and use battery starter (load) testers.
  - 24.15 Locate opens, short and grounds.
- 25.0 MAINTAIN AND REPAIR OUTBOARD MAGNETO IGNITION SYSTEMS--The student will be able to:
- 25.01 Sketch and label electrical symbols.
  - 25.02 Set up and use ohmmeters.
  - 25.03 Set up and use voltmeters.
  - 25.04 Set up and use ignition testers.
  - 25.05 Set up and use ignition analyzers.
  - 25.06 Locate and identify parts of magneto ignitions.
  - 25.07 Locate and match electrical units by their symbols on a wiring diagram.
  - 25.08 Sketch and label complete magneto ignition systems.
  - 25.09 Check coil resistance with an ohmmeter.
  - 25.10 Check points for continuity and resistance.
  - 25.11 Check condensers for capacity, leaks and shorts.
  - 25.12 Clean and regap spark plugs.
- 26.0 MAINTAIN AND REPAIR OUTBOARD BATTERY IGNITION SYSTEMS--The student will be able to:
- 26.01 Locate and identify parts of battery ignition systems.
  - 26.02 Locate and match electrical units by their symbols on a wiring diagram.
  - 26.03 Sketch and label complete battery ignition systems.

- 26.04 Check coil resistance with an ohmmeter.
  - 26.05 Check points for continuity and resistance.
  - 26.06 Check condensers for capacity, leaks and shorts.
  - 26.07 Set up and use test equipment.
  - 26.08 Set timing using timing light.
- 27.0 MAINTAIN AND REPAIR OUTBOARD CAPACITOR DISCHARGE IGNITION SYSTEMS-  
-The student will be able to:
- 27.01 Sketch and label electrical symbols.
  - 27.02 Set up and use ohmmeters.
  - 27.03 Set up and use a CD-77 or equivalent.
  - 27.04 Set up and use spark testers.
  - 27.05 Set up and use neon test lights.
  - 27.06 Set up and use low/high ammeters.
  - 27.07 Set up and use voltmeters.
  - 27.08 Locate and identify parts of capacitor discharge ignition systems.
  - 27.09 Locate and match electrical units by their symbols on a wiring diagram.
  - 27.10 Sketch and label complete C/D ignition systems.
  - 27.11 Check coil resistance, shorts and grounds with an ohmmeter.
  - 27.12 Check stator windings with an ohmmeter.
  - 27.13 Check sensor coils, charge coils, ignition coils and shorts to ground with a CD-77 or equivalent.
  - 27.14 Check power packs with an ohmmeter and a CD-77 equivalent.
- 28.0 MAINTAIN AND REPAIR OUTBOARD CHARGING SYSTEMS--The student will be able to:
- 28.01 Sketch and label the units of complete charging circuits.
  - 28.02 Disassemble charging systems and identify the components.
  - 28.03 Perform stator and rectifier testing on charging systems.
  - 28.04 Reassemble and test charging systems.
  - 28.05 Set up and use ohmmeters.
  - 28.06 Test regulators.
  - 28.07 Reassemble and test complete units.
- 29.0 PERFORM OUTBOARD UPPER TO LOWER GEAR CASE MAINTENANCE--The student will be able to:
- 29.01 Disassemble exhaust housings.
  - 29.02 Inspect seals, "O" rings, shafts and bearings.
  - 29.03 Reassemble exhaust housings.
- 30.0 ASSEMBLE AND MAINTAIN OUTBOARD LOWER UNITS AND HOUSING ASSEMBLIES-  
-The student will be able to:
- 30.01 Disassemble and reassemble steering handle groups.
  - 30.02 Disassemble and assemble exhaust housings and water tube assemblies.
  - 30.03 Replace motor mounts and shock absorbers.
  - 30.04 Lubricate all fittings.
  - 30.05 Pressure and vacuum test gear cases.
  - 30.06 Remove and test cylinders and rams.
  - 30.07 Adjust reverse locks.
  - 30.08 Adjust the trim and tilt.
  - 30.09 Determine the differences between mechanical, electrical and hydraulic shifting units.
  - 30.10 Explain the shifting theory of the lower unit.

- 30.11 Disassemble and reassemble mechanical shifting units.
- 30.12 Disassemble and reassemble electrical shifting units.
- 30.13 Disassemble and reassemble hydraulic shifting units.
- 30.14 Inspect all parts for wear.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - D (100 Hours)**  
**STERN DRIVE TECHNICIAN**

**31.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE STERN DRIVE ENGINES--**  
 The student will be able to:

- 31.01 Diagnose valve and head problems by use of the visual inspection method.
- 31.02 Diagnose valve and head problems by use of the compression tester method.
- 31.03 Diagnose valve and head problems by use of the cylinder air pressure method.
- 31.04 Disassemble engines and inspect parts.
- 31.05 Clean and inspect heads for cracks, warpage and damaged spark plug threads.
- 31.06 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
- 31.07 Grind valve seats and reface valves.
- 31.08 Check and inspect springs for free height, distortion and installed height.
- 31.09 Adjust valve lash.
- 31.10 Move and inspect camshafts and lifters.
- 31.11 Measure camshafts.
- 31.12 Clean and inspect lifters for wear.
- 31.13 Time valve drive assemblies.
- 31.14 Remove pistons from rod assemblies.
- 31.15 Measure out-of-round and cylinder taper with a dial bore gage or micrometer.
- 31.16 Check piston pins and bosses for wear.
- 31.17 Measure piston ring lands width, out-of-round and taper.
- 31.18 Measure the piston ring gap in cylinder bores.
- 31.19 Install and fit piston pins.
- 31.20 Check rod and piston assembly alignment.
- 31.21 Remove and replace rod bearings.
- 31.22 Hone and clean cylinders.
- 31.23 Install rings on pistons.
- 31.24 Measure and check crankshafts with a micrometer.
- 31.25 Check for end play.
- 31.26 Check bearing bores with a telescoping gage.
- 31.27 Reassemble engines.
- 31.28 Install oil seals.

**32.0 MAINTAIN AND REPAIR STERN DRIVE FUEL SYSTEMS--**The student will be able to:

- 32.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
- 32.02 Sketch and label the parts of total fuel systems.
- 32.03 Service fuel lines.
- 32.04 Remove, clean and install fuel tanks.
- 32.05 Identify and locate fuel pump vacuums.

- 32.06 Remove, replace service and check the pressure of fuel pumps.
  - 32.07 Remove, clean and replace in-line filters.
  - 32.08 Identify the major types of carburetors.
  - 32.09 Check and adjust throttle and governor linkages.
  - 32.10 Identify and service different types of EFI systems.
  - 32.11 Identify and understand different types of evaporative control systems.
- 33.0 MAINTAIN AND REPAIR STERN DRIVE COOLING SYSTEMS--The student will be able to:
- 33.01 Explain the principles of cooling systems, including fresh water cooling systems.
  - 33.02 Trace water flow through cooling systems.
  - 33.03 Disassemble and reassemble water pumps.
  - 33.04 Remove, check and replace thermostats.
  - 33.05 Use thermostat pressure relief systems.
  - 33.06 Service manifolds, risers and thermostat housings.
  - 33.07 Service water-cooling systems for gas inboard.
- 34.0 MAINTAIN AND REPAIR STERN DRIVE LUBRICATION SYSTEMS--The student will be able to:
- 34.01 Identify the types and functions of lubrication systems.
  - 34.02 Explain the principles of lubrication systems.
  - 34.03 Identify and locate components of lubrication systems.
  - 34.04 Check engines for oil leaks.
  - 34.05 Change engine oil and filters.
  - 34.06 Check engine oil pressure and level.
  - 34.07 Recognize and use only recommended oil.
- 35.0 MAINTAIN AND REPAIR STERN DRIVE UPPER GEAR CASE--The student will be able to:
- 35.01 Determine the differences between mechanical, electrical and hydraulic shifting units.
  - 35.02 Disassemble and reassemble each type of shifting unit.
  - 35.03 Reshim units to manufacturers' specifications.
  - 35.04 Use the proper oil to refill upper and lower gear cases.
- 36.0 MAINTAIN AND REPAIR STERN DRIVE LOWER GEAR CASES--The student will be able to:
- 36.01 Determine the differences between mechanical, electrical and hydraulic shifting.
  - 36.02 Remove and replace lower gear cases.
  - 36.03 Reshim lower gear cases.
  - 36.04 Refill lower gear cases with specified oil.
  - 36.05 Determine propeller pitch, diameter and hub type.
- 37.0 MAINTAIN AND REPAIR STERN DRIVE BATTERY IGNITION SYSTEMS--The student will be able to:
- 37.01 Locate and match electrical units by their symbols on a wiring diagram.
  - 37.02 Sketch and label complete battery ignition systems.
  - 37.03 Set up and use test equipment.
  - 37.04 Set timing using a timing light



- 38.0 MAINTAIN AND REPAIR STERN DRIVE CAPACITOR DISCHARGE IGNITION SYSTEMS--The student will be able to:
- 38.01 Sketch and label electrical symbols.
  - 38.02 Set up and use ohmmeters.
  - 38.03 Set up and use appropriate test equipment.
  - 38.04 Set up and use spark testers.
  - 38.05 Set up and use neon test lights.
  - 38.06 Set up and use low/high ammeters.
  - 38.07 Set up and use voltmeters.
  - 38.08 Locate and identify parts of capacitor discharge ignition systems.
  - 38.09 Locate and match electrical units by their symbols on a wiring diagram.
  - 38.10 Sketch and label complete C/D ignition systems.
  - 38.11 Check coil resistance, shorts and grounds with an ohmmeter.
  - 38.12 Check stator windings with an ohmmeter.
  - 38.13 Check sensor coils, charge coils, ignition coils and shorts to ground with appropriate test equipment.
  - 38.14 Check power packs with an ohmmeter and appropriate test equipment.
- 39.0 MAINTAIN AND REPAIR STERN DRIVE INTERMEDIATE HOUSINGS--The student will be able to:
- 39.01 Disassemble main drive shafts.
  - 39.02 Shim drive shafts to intermediate housings.
  - 39.03 Remove and replace clutch assemblies.
  - 39.04 Check electrical components with proper test equipment.
  - 39.05 Remove and replace "U" joints.
  - 39.06 Disassemble outer transom plates.
  - 39.07 Adjust trim and limit switches.
  - 39.08 Disassemble cylinder rams.
- OCCUPATIONAL COMPLETION POINT - DATA CODE - E (100 Hours)**  
 INBOARD GAS TECHNICIAN - Industry Title
- 40.0 PERFORM PARTS MANUAL ACTIVITIES TO INDUSTRY STANDARDS--The student will be able to:
- 40.01 Read and use parts manuals.
- 41.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE INBOARD GAS ENGINES--The student will be able to:
- 41.01 Diagnose valve and head problems by use of the visual inspection method.
  - 41.02 Diagnose valve and head problems by use of the compression tester method.
  - 41.03 Diagnose valve and head problems by use of the cylinder air pressure method.
  - 41.04 Disassemble engines and inspect parts.
  - 41.05 Clean and inspect heads for cracks, warpage and damaged spark plug threads.
  - 41.06 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
  - 41.07 Grind valve seats and reface valves.
  - 41.08 Check and inspect springs for free height, distortion and installed height.

- 41.09 Adjust valve lash.
  - 41.10 Remove and inspect camshafts and lifters.
  - 41.11 Measure camshafts.
  - 41.12 Clean and inspect lifters for wear.
  - 41.13 Time valve drive assemblies.
  - 41.14 Remove pistons from rod assemblies.
  - 41.15 Measure out-of-round and cylinder taper with a dial bore gage or micrometer.
  - 41.16 Check piston pins and bosses for wear.
  - 41.17 Measure piston ring lands width, out-of-round and taper.
  - 41.18 Measure the piston ring gap in cylinder bores.
  - 41.19 Install and fit piston pins.
  - 41.20 Check rod and piston assembly alignment.
  - 41.21 Remove and replace rod bearings.
  - 41.22 Hone and clean cylinders.
  - 41.23 Install rings on pistons.
  - 41.24 Measure and check crankshafts with a micrometer.
  - 41.25 Check for end play.
  - 41.26 Check bearing bores with a telescoping gage.
  - 41.27 Reassemble engines.
  - 41.28 Install oil seals.
- 42.0 MAINTAIN AND REPAIR INBOARD FUEL SYSTEMS--The student will be able to:
- 42.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
  - 42.02 Sketch and label the parts of total fuel systems.
  - 42.03 Service fuel lines.
  - 42.04 Remove, clean and install fuel tanks.
  - 42.05 Identify and locate fuel pump vacuums.
  - 42.06 Remove, replace service and check the pressure of fuel pumps.
  - 42.07 Remove, clean and replace in-line filters.
  - 42.08 Identify the major types of carburetors.
  - 42.09 Check and adjust throttle and governor linkages.
  - 42.10 Identify and service different types of EFI systems.
  - 42.11 Identify and understand different types of evaporative control systems.
- 43.0 MAINTAIN AND REPAIR INBOARD GAS COOLING SYSTEMS--The student will be able to:
- 43.01 Explain the principles of cooling systems, including fresh water cooling systems.
  - 43.02 Trace water flow through cooling systems.
  - 43.03 Disassemble and reassemble water pumps.
  - 43.04 Remove, check and replace thermostats.
  - 43.05 Use thermostat pressure relief systems.
  - 43.06 Service manifolds, risers and thermostat housings.
  - 43.07 Service water-cooling systems for gas inboard, gas outboard and diesel engines.
- 44.0 MAINTAIN AND REPAIR INBOARD GAS LUBRICATION SYSTEMS--The student will be able to:
- 44.01 Identify the types and functions of lubrication systems.
  - 44.02 Explain the principles of lubrication systems.
  - 44.03 Identify and locate components of lubrication systems.
  - 44.04 Check engines for oil leaks.

- 44.05 Change engine oil and filters.
- 44.06 Check engine oil pressure and level.
- 44.07 Recognize and use only recommended oil.

45.0 MAINTAIN AND REPAIR INBOARD GAS FUEL SYSTEMS--The student will be able to:

- 45.01 Remove, service and replace carburetor air cleaners/flame arrestors.
- 45.02 Identify and locate fuel system components (fuel pumps, carburetors and air filters, linkages and intake manifolds).
- 45.03 Remove, clean, overhaul, replace and make final adjustments to carburetors.

46.0 MAINTAIN AND REPAIR TRANSMISSIONS--The student will be able to:

- 46.01 Inspect planetary clutch plate air coupling assemblies
- 46.02 Remove and replace transmissions.
- 46.03 Use proper service tools in shimming, reassembly and testing.
- 46.04 Drain transmissions.
- 46.05 Determine capacity using the transmission service manuals.
- 46.06 Refill transmissions according to manufacturers' specifications.

**OCCUPATIONAL COMPLETION POINT - DATA CODE - F (100 Hours)**

INBOARD DIESEL TECHNICIAN - INDUSTRY TITLE

47.0 MAINTAIN AND REPAIR INBOARD DIESEL FUEL SYSTEMS--The student will be able to:

- 47.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
- 47.02 Sketch and label the parts of total fuel systems.
- 47.03 Service fuel lines.
- 47.04 Remove, clean and install fuel tanks.
- 47.05 Identify and locate fuel control devices.
- 47.06 Remove, replace service and check the pressure of fuel pumps.
- 47.07 Remove, clean and replace in-line filters.
- 47.09 Check and adjust throttle and governor linkages.
- 47.07 Check fuel systems for leaks.
- 47.08 Bleed systems for starting.
- 47.09 Adjust nozzle pressure to manufacturer's specifications.
- 47.10 Set the injection pump angle (timing).
- 47.12 Check or replace glow plugs.
- 47.13 Check; stop solenoids.

48.0 MAINTAIN AND REPAIR INBOARD DIESEL COOLING SYSTEMS--The student will be able to:

- 48.01 Disassemble and reassemble water pumps.
- 48.02 Remove, check and replace thermostats.
- 48.03 Use thermostat pressure relief systems.
- 48.04 Service manifolds, risers and thermostat housings.
- 48.05 Service water-cooling systems for diesel engines.

49.0 MAINTAIN AND REPAIR INBOARD DIESEL LUBRICATION SYSTEMS--The student will be able to:

- 49.01 Identify the types and functions of lubrication systems.
- 49.02 Explain the principles of lubrication systems.
- 49.03 Identify and locate components of lubrication systems.
- 49.04 Check engines for oil leaks.
- 49.05 Change engine oil and filters.
- 49.06 Check engine oil pressure and level.
- 49.07 Recognize and use only recommended oil.

50.0 MAINTAIN AND REPAIR INBOARD DIESEL CHARGING SYSTEMS --The student will be able to:

50.01 Inspect, remove and replace alternator belts.

50.02 Check the output of charging systems.

50.03 Analyze malfunctions.

50.04 Test and overhaul alternators.

50.05 Remove and replace regulators.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Course Title: Marine Mechanics 1  
Course Number: 8751010  
Course Credit: 1

01.0 PERFORM SHOP PRACTICES TO INDUSTRY STANDARDS--The student will be able to:

- 01.01 Comply with safety rules and regulations. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (AT.8.1.4.1), (AT.8.1.4.3)
- 01.02 Use hand tools safely and properly.
- 01.03 Set up and use power tools safely and properly.
- 01.04 Set up and use precision measuring tools. (LA.A.2.4.7), (LA.A.2.4.4), (MA.B.1.4.2), (MA.B.4.4.1), (MA.B.4.4.2)
- 01.05 Drill and remove broken studs and install helicoils.
- 01.06 Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility. (MA.A.1.4.4)
- 01.07 Read, interpret and apply service manuals. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.D.2.4.1)
- 01.08 Locate and match electrical units by their symbols on a wiring diagram. (SC.B.1.4.4)
- 01.09 Demonstrate appropriate heating, cutting, and welding skills. (LA.C.3.4.2), (SC.B.1.4.3)

02.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE ENGINES--The student will be able to:

- 02.01 Explain the basic principles of the operation of four-stroke cycle internal combustion engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.2)
- 02.02 Identify types of four-stroke cycle engines.
- 02.03 Locate engine serial and model numbers.
- 02.04 Identify engine assemblies and systems.

03.0 MAINTAIN AND REPAIR BASIC TWO-STROKE CYCLE ENGINES--The student will be able to:

- 03.01 Explain the basic principles of the operation of two-stroke cycle internal combustion engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.2)
- 03.02 Identify types of engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)(LA.A.2.4.7)
- 03.03 Locate engine serial and model numbers.
- 03.04 Identify engine assemblies and systems.

04.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS--The student will be able to:

- 04.01 Set up and use voltmeters, ammeters and ohmmeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.3), (SC.C.2.4.2), (SC.C.2.4.3), (MA.B.4.4.2)
- 04.02 Locate and identify electrical circuit components. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

- 04.03 Sketch a typical circuit using a single wire system.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2),  
(LA.B.2.4.4)
- 04.04 Test storage batteries using a hydrometer. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2), (MA.B.3.4.1),  
(MA.B.3.4.1.3.3)
- 04.05 Test storage batteries using a light and load test  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1.3.4)
- 04.06 Charge storage batteries. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8)
- 04.07 Remove and replace batteries and service battery boxes.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 04.08 Repair damaged wire and electrical harnesses. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 04.09 Diagnose circuit troubles using continuity or a test light  
and low reading voltmeters to record voltage drop.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8),  
(MA.A.3.4.3), (MA.A.3.4.3.3.4)
- 04.10 Sketch and label typical fuel gage systems. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 04.11 Remove and replace ammeters or indicating lights.  
(LA.A.2.4.6), (LA.A.2.4.6), (LA.A.2.4.8)
- 04.12 Remove and replace fuel gages. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8)
- 04.13 Remove and replace fuel sending units. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 04.14 Diagnose gages and accessory system troubles using test  
lights, voltmeters, ammeters or detached sending units.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 04.15 Sketch typical circuits such as those for auto bilge pumps  
or navigation lights. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 04.16 Locate opens, shorts and grounds. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 04.17 Demonstrate proficiency in soldering/splicing skills.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.C.3.4.2)

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Course Title:** Marine Mechanics 2  
**Course Number:** 8751020  
**Course Credit:** 1

- 05.0 MAINTAIN AND REPAIR FUEL SYSTEMS--The student will be able to:
- 05.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 05.02 Sketch and label the parts of total fuel systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
  - 05.03 Service fuel lines and primer bulbs (vacuum test). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 05.04 Remove, clean, inspect and install fuel tanks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 05.05 Identify basic carburetor circuits (chokes, floats, fuel inlets; idle, intermediate and high speeds; mains, etc.) (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 05.06 Identify and locate fuel pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 05.07 Determine and make appropriate fuel oil mixtures. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 06.0 MAINTAIN AND REPAIR TWO-STROKE CYCLE CARBURETORS--The student will be able to:
- 06.01 Remove, clean, overhaul, replace and make final adjustments to carburetors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1)
  - 06.02 Diagnose exhaust problems such as back pressure and scavenging. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 07.0 USE MARINE WOODS, METALS, AND FIBERGLASS--The student will be able to:
- 07.01 Explain the hazards of a marine environment to woods, metals and fiberglass.
  - 07.02 Explain a galvanic series. (SC.C.2.4.2), (SC.C.2.4.30)
  - 07.03 Explain the theory for using given materials in boat repair activities.
- 08.0 ADJUST AND REPAIR TRAILERS--The student will be able to:
- 08.01 Make boat to trailer adjustments. (MA.B.4.4.2)
  - 08.02 Remove and replace lighting systems.
  - 08.03 Remove and replace wheel bearings and springs.
  - 08.04 Remove and replace brakes.
  - 08.05 Service and install trim and tilt systems.
  - 08.06 Remove and test cylinder rams.
  - 08.07 Adjust reverse locks.
  - 08.08 Adjust the trim and tilt.



- 09.0 PREPARE AND DELIVER SALES MERCHANDISE--The student will be able to:
- 09.01 Make center line measurements for outboard motor installation. (LA.A.2.4.7), (LA.A.2.4.4), (MA.C.2.4.1), (MA.C.2.4.1.3.3)
  - 09.02 Center the plate height.
  - 09.03 Locate manufacturers' I.D. plates. (LA.A.2.4.7)
  - 09.04 Mount control boxes at the helm. (MA.C.2.4.1)
  - 09.05 Place wiring and cables in a neat and orderly manner.
  - 09.06 Adjust the control cables from the engine to the control box. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 09.07 Center the steering cable to the engine. (MA.C.2.4.1)
  - 09.08 Find suitable locations for accessories and mount them to the boat.
  - 09.09 Lubricate shafts, install propellers and fasten both securely.
  - 09.10 Check for proper levels.
  - 09.11 Check manufacturers' specifications. (LA.A.2.4.7)
  - 09.12 Test-run boats. (MA.B.2.4.2)
  - 09.13 Recheck work completed. (MA.E.1.4.1)
  - 09.14 Check manufacturers' installation procedures for stern drive units. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 09.15 Lubricate shafts and install propellers securely.
  - 09.16 Obtain maximum oil level capacity.
  - 09.17 Install or connect drain plugs, petcocks, hose clamps, hoses, etc.
  - 09.18 Find a suitable mount location and mount the engine securely in the boat.
  - 09.19 Set engines to manufacturers' specifications. (LA.A.2.4.7)
  - 09.20 Set, adjust and test engines to manufacturers' specifications. (LA.A.2.4.7), (MA.D.1.4.1)
  - 09.21 Remove and replace running lights.
  - 09.22 Troubleshoot lighting systems and accessories. (LA.A.2.4.6), (LA.A.2.4.8), (LA.A.2.4.8)
  - 09.23 Check and adjust throttles, cables, horns, lights and tachometers.
- 10.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:
- 10.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry. (LA.B.1.4.3), (LA.A.3.4.4)
  - 10.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area. (LA.A.2.4.4.), (LA.A.2.4.6), (MA.D.2.4.1), (MA.E.4.1)
  - 10.03 Read and follow written and oral instructions. (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.C.1.4.1)
  - 10.04 Answer and ask questions coherently and concisely. (LA.C.3.4.1), (LA.C.3.4.2)
  - 10.05 Read critically by recognizing assumptions and implications and by evaluating ideas. (LA.A.2.4.4), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (
  - 10.06 Demonstrate appropriate telephone/communication skills. (LA.C.1.4.1), (LA.C.1.4.3)

11.0 DEMONSTRATE APPROPRIATE MATH SKILLS--The student will be able to:

- 11.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders. (LA.C.3.4.2), (LA.A.2.4.7), (LA.A.2.4.4), (MA.B.1.4.2), (MA.B.1.4.1)
- 11.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
- 11.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers. (MA.A.1.4.4), (MA.A.3.4.3)
- 11.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items. (MA.A.2.4.2)
- 11.05 Demonstrate an understanding of federal, state and local taxes and their computation. (MA.A.2.4.2)

12.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC SCIENCE--The student will be able to:

- 12.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content. (SC.A.1.4.4), (SC.A.2.4.2), (MA.B.1.4.3), (LA.B.2.4.1), (LA.B.2.4.4), (LA.C.3.4.2)
- 12.02 Draw conclusions or make inferences from data. (LA.C.3.4.2), (MA.E.3.4.1), (SC.C.1.4.2)
- 12.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials. (LA.C.3.4.2), (LA.C.3.4.2), (AT.8.1.4.3),
- 12.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A. (LA.A.2.4.7), (LA.A.2.4.4), (MA.B.3.4.1), (SC.A.1.4.4)

13.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

- 13.01 Conduct a job search. (AT.1.1.4.1), (LA.A.2.4.4), (LA.A.2.4.6), (LA.C.1.4.1), (LA.B.1.4.3)
- 13.02 Secure information about a job. (AT.1.1.4.1), (LA.A.2.4.4), (LA.A.2.4.6), (LA.C.1.4.1), (LA.B.1.4.3)
- 13.03 Identify documents that may be required when applying for a job. , (LA.C.1.4.1), (LA.B.1.4.3)
- 13.04 Complete a job application form correctly. , (LA.C.1.4.1), (LA.B.1.4.3)
- 13.05 Demonstrate competence in job interview techniques. , (LA.C.1.4.1), (LA.B.1.4.3)
- 13.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons. (AT.9.1.4.1), (LA.B.2.4.1)
- 13.07 Identify acceptable work habits. (AT.9.1.4.1), (HE.B.1.4.1)
- 13.08 Demonstrate knowledge of how to make appropriate job changes. (AT.9.1.4.1), (HE.B.1.4.1), (LA.C.1.4.1), (LA.B.1.4.3), (LA.C.3.4.2)
- 13.09 Demonstrate acceptable employee health habits. (AT.9.1.4.1), (HE.A.1.4.1)
- 13.10 Demonstrate knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442. (AT.8.1.4.3), (LA.A.2.4.4), (LA.A.2.4.6), (LA.C.3.4.2)



14.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

- 14.01 Define entrepreneurship. (LA.C.3.4.2), (SS.D.2.4)
- 14.02 Describe the importance of entrepreneurship to the American economy. (AT.1.4.3.1), (MA.A.1.4.3.8), (MA.A.1.4.3.8), (MA.A.1.4.3), (MA.A.1.4), (SS.D.2.4)
- 14.03 List the advantages and disadvantages of business ownership. (SS.D.1.4)
- 14.04 Identify the risks involved in ownership of a business. (SS.B.2.4)
- 14.05 Identify the necessary personal characteristics of a successful entrepreneur. (SS.C.2.4)
- 14.06 Identify the business skills needed to operate a small business efficiently and effectively. (MA.A.5.4), (MA.A.4.4.1), (MA.A.4.4.2), (MA.A.4.4.3.3)

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

**Course Title:** Marine Mechanics 3  
**Course Number:** 8751030  
**Course Credit:** 1

15.0 PARTS SPECIALIST AND COMPUTER SKILLS TO INDUSTRY STANDARDS--The student will be able to:

- 15.01 Identify the skills needed to be a service writer.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1),  
(MA.B.3.4.1.3.4)
- 15.02 Identify the skills needed to be a parts specialist.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1),  
(MA.B.3.4.1.3)
- 15.03 Demonstrate appropriate computer skills. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1.3.3),  
(MA.B.3.4.1.3.4), (MA.B.3.4.1.3.9)
- 15.04 Identify gaskets and seals. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8)
- 15.05 Demonstrate knowledge of different parts and accessories.  
(LA.C.3.4.2), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

16.0 MAINTAIN AND REPAIR COOLING SYSTEMS--The student will be able to:

- 16.01 Explain the principles of cooling systems, including fresh water cooling systems. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (SC.B.1.4.3)
- 16.02 Trace water flow through cooling systems. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)

17.0 MAINTAIN AND REPAIR LUBRICATION SYSTEMS--The student will be able to:

- 17.01 Identify the types and functions of lubrication systems.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 17.02 Explain the principles of lubrication systems.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.3)
- 17.03 Identify and locate components of lubrication systems.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

18.0 PERFORM GASKET/SEAL OPERATIONS AND ELECTRONIC TEST EQUIPMENT SKILLS TO INDUSTRY STANDARDS--The student will be able to:

- 18.01 Identify and make gaskets and seals. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 18.02 Demonstrate appropriate skills in computerized test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8),  
(LA.C.3.4.2)

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Course Title:** Marine Mechanics 4  
**Course Number:** 8751040  
**Course Credit:** 1

19.0 MAINTAIN AND REPAIR BASIC TWO-STROKE CYCLE OUTBOARD ENGINES--The student will be able to:

- 19.01 Disassemble engines. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.A.2.4.1)
- 19.02 Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads. (LA.A.2.4.6), (LA.A.2.4.6), (LA.A.2.4.8)
- 19.03 Diagnose head problems by use of the visual inspection method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 19.04 Diagnose head problems by use of the compression tester method. (LA.A.2.4.8), (MA.B.3.4.1)
- 19.05 Diagnose head problems by use of cylinder air pressure method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.8.3.3)
- 19.06 Diagnose head problems by use of the stethoscope method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 19.07 Remove, clean and inspect piston rods and assemblies.
- 19.08 Measure out-of-round of pistons and cylinders. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 19.09 Hone cylinders.
- 19.10 Check the total bearing surface of connecting rod bearings. (MA.B.3.4.1), (MA.B.3.4.1.3), (LA.A.2.4.6), (LA.A.2.4.7), (LA.1.4.8)
- 19.11 Measure piston skirts and ring grooves. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 19.12 Measure the piston ring gap in cylinder bores. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 19.13 Install piston pins according to manufacturer's specifications. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 19.14 Check rod and piston assembly alignment. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 19.15 Install rings on pistons.
- 19.16 Install piston rod assemblies.
- 19.17 Measure and check crankshafts with a micrometer. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 19.18 Check needle bearings.
- 19.19 Inspect crankshafts and install seal.
- 19.20 Inspect, clean and/or replace reed valves.
- 19.21 Reassemble engines.

20.0 MAINTAIN AND REPAIR OUTBOARD FUEL SYSTEMS--The student will be able to:

- 20.01 Identify the major types of carburetors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 20.02 Check and adjust throttle and governor linkages. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), MZ.B.4.4.1), (LA.B.4.4.1.3.3)
  - 20.03 Identify and service different types of EFI systems.
  - 20.04 Remove, service and replace air cleaners.
  - 20.05 Diagnose carburetor problems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 21.0 MAINTAIN AND REPAIR OUTBOARD COOLING SYSTEMS--The student will be able to:
- 21.01 Disassemble and reassemble water pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
  - 21.02 Remove, check and replace thermostats. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), LA.B.2.4.1)
  - 21.03 Use thermostat pressure relief systems.
  - 21.04 Service manifolds and thermostat housings.

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Course Title:** Marine Mechanics 5  
**Course Number:** 8751050  
**Course Credit:** 1

22.0 MAINTAIN AND REPAIR OUTBOARD LUBRICATION SYSTEMS--The student will be able to:

- 22.01 Check engines for oil leaks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 22.02 Change engine oil and filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 22.03 Check engine oil pressure and level. (LOA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 22.04 Recognize and use only recommended oil. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.E.3.4.1), (MA.E.3.4.1.3.1)
- 22.05 Inspect and service oil metering systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

23.0 MAINTAIN AND REPAIR OUTBOARD LOWER GEAR CASES--The student will be able to:

- 23.01 Remove and replace lower gear cases. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 23.02 Reshim lower gear cases. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.1), (MA.A.3.4.3.4)
- 23.03 Refill lower gear cases with specified oil. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 23.04 Determine propeller pitch diameter and hub type. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.1.4.2), (SC.S.2..6), (MA.C.2.4.1), (MA.C.2.4.1.3.3)

24.0 MAINTAIN AND REPAIR OUTBOARD CRANKING SYSTEMS--The student will be able to:

- 24.01 Disassemble recoil starters. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 24.02 Inspect components of recoil starters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.A.2.4.1)
- 24.03 Reassemble recoil starters.
- 24.04 Identify components of electrical starting systems.
- 24.05 Disassemble different types of starting motors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 24.06 Bench test armatures.M (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.3), (SC.C.2.4.6), (MA.A.3.4.2), (LA.A.3.4.3.4)
- 24.07 Bench test field coils. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.3), (SC.C.2.4.6), (MA.A.3.4.2), (MA.A.3.4.3.4)
- 24.08 Bench test-drive units. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.2), (MA.A.3.4.3.4)
- 24.09 Bench test switches. (LA.A.2.4.6), (LA.A.2.4.6), (LA.A.2.4.8), (MA.A.3.4.2), (MA.A.3.4.3.4)



- 24.10 Bench test minor parts of starting motor components.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.2),  
(LA.A.3.4.3.4)
  - 24.11 Install, reassemble and test new starter parts.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 24.12 Troubleshoot starting systems using battery starter testers.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 24.13 Set up and use battery starter (load) testers.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 24.14 Locate opens, short and grounds.
- 25.0 MAINTAIN AND REPAIR OUTBOARD MAGNETO IGNITION SYSTEMS--The student will be able to:
- 25.01 Sketch and label electrical symbols. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
  - 25.02 Set up and use ohmmeters. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.2)
  - 25.03 Set up and use voltmeters. LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.2)
  - 25.04 Set up and use ignition testers. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 25.05 Set up and use ignition analyzers. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 25.06 Locate and identify parts of magneto ignitions.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 25.07 Locate and match electrical units by their symbols on a  
wiring diagram. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8),  
LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2),  
(LA.A.2.4.4)
  - 25.08 Sketch and label complete magneto ignition systems.
  - 25.09 Check coil resistance with an ohmmeter. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 25.10 Check points for continuity and resistance. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 25.11 Check condensers for capacity, leaks and shorts.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
  - 25.12 Clean and regap spark plugs. LA.A.2.4.6), (LLA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.2)

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Course Title:** Marine Mechanics 6  
**Course Number:** 8751060  
**Course Credit:** 1

**26.0 MAINTAIN AND REPAIR OUTBOARD BATTERY IGNITION SYSTEMS--The student will be able to:**

- 26.01 Locate and identify parts of battery ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8),
- 26.02 Locate and match electrical units by their symbols on a wiring diagram. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 26.03 Sketch and label complete battery ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 26.04 Check coil resistance with an ohmmeter. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 26.05 Check points for continuity and resistance. LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 26.06 Check condensers for capacity, leaks and shorts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 26.07 Set up and use test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 26.08 Set timing using timing light. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)

**27.0 MAINTAIN AND REPAIR OUTBOARD CAPACITOR DISCHARGE IGNITION SYSTEMS--The student will be able to:**

- 27.01 Sketch and label electrical symbols. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 27.02 Set up and use ohmmeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 27.03 Set up and use a CD-77 or equivalent. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 27.04 Set up and use spark testers. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 27.05 Set up and use neon test lights. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 27.06 Set up and use low/high ammeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 27.07 Set up and use voltmeters. (LA.A.2.4.6), (\*LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 27.08 Locate and identify parts of capacitor discharge ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 27.09 Locate and match electrical units by their symbols on a wiring diagram. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 27.10 Sketch and label complete C/D ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 27.11 Check coil resistance, shorts and grounds with an ohmmeter. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.2)

- 27.12 Check stator windings with an ohmmeter. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.2)
- 27.13 Check sensor coils, charge coils, ignition coils and shorts to ground with a CD-77 or equivalent. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.2)
- 27.14 Check power packs with an ohmmeter and a CD-77 equivalent. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.2)

28.0 MAINTAIN AND REPAIR OUTBOARD CHARGING SYSTEMS--The student will be able to:

- 28.01 Sketch and label the units of complete charging circuits. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 28.02 Disassemble charging systems and identify the components. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 28.03 Perform stator and rectifier testing on charging systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 28.04 Reassemble and test charging systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 28.05 Set up and use ohmmeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 28.06 Test regulators. (LA.A.2.4.6), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.2)
- 28.07 Reassemble and test complete units. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

**Course Title:** Marine Service 7  
**Course Number:** 8751070  
**Course Credit:** 1

29.0 PERFORM OUTBOARD UPPER TO LOWER GEAR CASE MAINTENANCE--The student will be able to:

- 29.01 Disassemble exhaust housings. (LA.A.1.4.4), (LA.B.2.4.1)
- 29.02 Inspect seals, "O" rings, shafts and bearings.
- 29.03 Reassemble exhaust housings.

30.0 ASSEMBLE AND MAINTAIN OUTBOARD LOWER UNITS AND HOUSING ASSEMBLIES--The student will be able to:

- 30.01 Disassemble and reassemble steering handle groups.  
(LA.A.1.4.4), (LA.B.2.4.1)
- 30.02 Disassemble and assemble exhaust housings and water tube assemblies. (LA.A.1.4.4), (LA.B.2.4.1)
- 30.03 Replace motor mounts and shock absorbers. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.04 Lubricate all fittings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.05 Pressure and vacuum test gear cases. (MA.B.1.4.3)
- 30.06 Remove and test cylinders and rams. (SC.C.2.4.6)
- 30.07 Adjust reverse locks.
- 30.08 Adjust the trim and tilt. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.09 Determine the differences between mechanical, electrical and hydraulic shifting units. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.10 Explain the shifting theory of the lower unit. (SC.C.2.4.6)
- 30.11 Disassemble and reassemble mechanical shifting units.  
(LA.A.1.4.4), (LA.B.2.4.1), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.12 Disassemble and reassemble electrical shifting units.  
(LA.A.1.4.4), (LA.B.2.4.1), (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 30.13 Disassemble and reassemble hydraulic shifting units.  
(LA.A.1.4.4), (LA.B.2.4.1)
- 30.14 Inspect all parts for wear.

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Course Title:** Marine Service 8  
**Course Number:** 8751080  
**Course Credit:** 1

**31.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE STERN DRIVE ENGINES--**  
 The student will be able to:

- 31.01 Diagnose valve and head problems by use of the visual inspection method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 31.02 Diagnose valve and head problems by use of the compression tester method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.6), (MA.B.1.4.3)
- 31.03 Diagnose valve and head problems by use of the cylinder air pressure method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.6), (MA.B.1.4.3)
- 31.04 Disassemble engines and inspect parts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 31.05 Clean and inspect heads for cracks, warpage and damaged spark plug threads. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 31.06 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 31.07 Grind valve seats and reface valves. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.2), (MA.B.1.4.2.3.4)
- 31.08 Check and inspect springs for free height, distortion and installed height. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.2), (MA.B.1.4.2.3.4)
- 31.09 Adjust valve lash. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.2), (MA.B.1.4.2.3.4)
- 31.10 Move and inspect camshafts and lifters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 31.11 Measure camshafts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4)
- 31.12 Clean and inspect lifters for wear.
- 31.13 Time valve drive assemblies. (LA.A.2.4.6), (LA.A.2.4.,7), (LA.A.2.4.8)
- 31.14 Remove pistons from rod assemblies.
- 31.15 Measure out-of-round and cylinder taper with a dial bore gage or micrometer. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4)
- 31.16 Check piston pins and bosses for wear. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 31.17 Measure piston ring lands width, out-of-round and taper. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3), (LA.A.2.4.4)
- 31.18 Measure the piston ring gap in cylinder bores. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 31.19 Install and fit piston pins. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 31.20 Check rod and piston assembly alignment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 31.21 Remove and replace rod bearings. (LA.A.2.4.6), (LA.2.4.7), (LA.A.2.4.8)

- 31.22 Hone and clean cylinders. (LA.A.2.4.6), (LA.2.4.7), (LA.A.2.4.8)
  - 31.23 Install rings on pistons. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 31.24 Measure and check crankshafts with a micrometer. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
  - 31.25 Check for end play. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
  - 31.26 Check bearing bores with a telescoping gage. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
  - 31.27 Reassemble engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 31.28 Install oil seals. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 32.0 MAINTAIN AND REPAIR STERN DRIVE FUEL SYSTEMS--The student will be able to:
- 32.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.02 Sketch and label the parts of total fuel systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
  - 32.03 Service fuel lines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
  - 32.04 Remove, clean and install fuel tanks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.05 Identify and locate fuel pump vacuums. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.06 Remove, replace service and check the pressure of fuel pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.6)
  - 32.07 Remove, clean and replace in-line filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.08 Identify the major types of carburetors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.09 Check and adjust throttle and governor linkages. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.10 Identify and service different types of EFI systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 32.11 Identify and understand different types of evaporative control systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 33.0 MAINTAIN AND REPAIR STERN DRIVE COOLING SYSTEMS--The student will be able to:
- 33.01 Explain the principles of cooling systems, including fresh water cooling systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.6)
  - 33.02 Trace water flow through cooling systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 33.03 Disassemble and reassemble water pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
  - 33.04 Remove, check and replace thermostats. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 33.05 Use thermostat pressure relief systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 33.06 Service manifolds, risers and thermostat housings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

33.07 Service water-cooling systems for gas inboard.  
(LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

- 34.0 MAINTAIN AND REPAIR STERN DRIVE LUBRICATION SYSTEMS--The student will be able to:
- 34.01 Identify the types and functions of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.02 Explain the principles of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.03 Identify and locate components of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.04 Check engines for oil leaks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.05 Change engine oil and filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.06 Check engine oil pressure and level. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 34.07 Recognize and use only recommended oil. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 35.0 MAINTAIN AND REPAIR STERN DRIVE UPPER GEAR CASE--The student will be able to:
- 35.01 Determine the differences between mechanical, electrical and hydraulic shifting units. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 35.02 Disassemble and reassemble each type of shifting unit. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
  - 35.03 Reshim units to manufacturers' specifications. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.3)
  - 35.04 Use the proper oil to refill upper and lower gear cases. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 36.0 MAINTAIN AND REPAIR STERN DRIVE LOWER GEAR CASES--The student will be able to:
- 36.01 Determine the differences between mechanical, electrical and hydraulic shifting. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 36.02 Remove and replace lower gear cases. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 36.03 Reshim lower gear cases. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.1), (MA.A.3.4.3.4)
  - 36.04 Refill lower gear cases with specified oil. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.1), (MA.A.3.4.3.4)
  - 36.05 Determine propeller pitch, diameter and hub type. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.A.3.4.1), (MA.A.3.4.3.4)
- 37.0 MAINTAIN AND REPAIR STERN DRIVE BATTERY IGNITION SYSTEMS--The student will be able to:
- 37.01 Locate and match electrical units by their symbols on a wiring diagram. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 37.02 Sketch and label complete battery ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
  - 37.03 Set up and use test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)



- 37.04 Set timing using timing light. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.0 MAINTAIN AND REPAIR STERN DRIVE CAPACITOR DISCHARGE IGNITION SYSTEMS--The student will be able to:
- 38.01 Sketch and label electrical symbols. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), LA.B.2.4.4)
- 38.02 Set up and use ohmmeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.03 Set up and use appropriate test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.04 Set up and use spark testers. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.05 Set up and use neon test lights. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.06 Set up and use low/high ammeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.07 Set up and use voltmeters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.08 Locate and identify parts of capacitor discharge ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.09 Locate and match electrical units by their symbols on a wiring diagram. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.10 Sketch and label complete C/D ignition systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 38.11 Check coil resistance, shorts and grounds with an ohmmeter. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.12 Check stator windings with an ohmmeter. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.13 Check sensor coils, charge coils, ignition coils and shorts to ground with appropriate test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 38.14 Check power packs with an ohmmeter and appropriate test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.0 MAINTAIN AND REPAIR STERN DRIVE INTERMEDIATE HOUSINGS--The student will be able to:
- 39.01 Disassemble main drive shafts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 39.02 Shim drive shafts to intermediate housings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.03 Remove and replace clutch assemblies. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.04 Check electrical components with proper test equipment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.05 Remove and replace "U" joints. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.06 Disassemble outer transom plates. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 39.07 Adjust trim and limit switches. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 39.08 Disassemble cylinder rams. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)

40.0 PERFORM PARTS MANUAL ACTIVITIES TO INDUSTRY STANDARDS--The student will be able to:

40.01 Read and use parts manuals. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

41.0 MAINTAIN AND REPAIR BASIC FOUR-STROKE CYCLE INBOARD GAS ENGINES--The student will be able to:

- 41.01 Diagnose valve and head problems by use of the visual inspection method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.02 Diagnose valve and head problems by use of the compression tester method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.03 Diagnose valve and head problems by use of the cylinder air pressure method. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.04 Disassemble engines and inspect parts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 41.05 Clean and inspect heads for cracks, warpage and damaged spark plug threads. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.06 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.07 Grind valve seats and reface valves. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.08 Check and inspect springs for free height, distortion and installed height. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.09 Adjust valve lash. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.10 Remove and inspect camshafts and lifters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.11 Measure camshafts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.12 Clean and inspect lifters for wear. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4)
- 41.13 Time valve drive assemblies. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.14 Remove pistons from rod assemblies. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.15 Measure out-of-round and cylinder taper with a dial bore gage or micrometer. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 41.16 Check piston pins and bosses for wear. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3), (LA.A.2.4.4)
- 41.17 Measure piston ring lands width, out-of-round and taper. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 41.18 Measure the piston ring gap in cylinder bores. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4)
- 41.19 Install and fit piston pins. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.2.4.4)
- 41.20 Check rod and piston assembly alignment. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.21 Remove and replace rod bearings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.22 Hone and clean cylinders. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.23 Install rings on pistons.
- 41.24 Measure and check crankshafts with a micrometer. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.1.4.1), (MA.B.1.4.1.3.3)

- 41.25 Check for end play. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (LA.A.2.4.4)  
(MA.B.1.4.1), (MA.B.1.4.1.3.3)
- 41.26 Check bearing bores with a telescoping gage. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 41.27 Reassemble engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 41.28 Install oil seals. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

**Course Title:** Marine Service 9  
**Course Number:** 8751090  
**Course Credit:** 1

42.0 MAINTAIN AND REPAIR INBOARD FUEL SYSTEMS--The student will be able to:

- 42.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.02 Sketch and label the parts of total fuel systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
- 42.03 Service fuel lines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.04 Remove, clean and install fuel tanks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.05 Identify and locate fuel pump vacuums. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.06 Remove, replace service and check the pressure of fuel pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.6)
- 42.07 Remove, clean and replace in-line filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.08 Identify the major types of carburetors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.09 Check and adjust throttle and governor linkages. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.10 Identify and service different types of EFI systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 42.11 Identify and understand different types of evaporative control systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

43.0 MAINTAIN AND REPAIR INBOARD GAS COOLING SYSTEMS--The student will be able to:

- 43.01 Explain the principles of cooling systems, including fresh water cooling systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.6)
- 43.02 Trace water flow through cooling systems. ((LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 43.03 Disassemble and reassemble water pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
- 43.04 Remove, check and replace thermostats. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 43.05 Use thermostat pressure relief systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 43.06 Service manifolds, risers and thermostat housings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 43.07 Service water-cooling systems for gas inboard, gas outboard and diesel engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

- 44.0 MAINTAIN AND REPAIR INBOARD GAS LUBRICATION SYSTEMS--The student will be able to:
- 44.01 Identify the types and functions of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.02 Explain the principles of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.03 Identify and locate components of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.04 Check engines for oil leaks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.05 Change engine oil and filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.06 Check engine oil pressure and level. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 44.07 Recognize and use only recommended oil. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 45.0 MAINTAIN AND REPAIR INBOARD GAS FUEL SYSTEMS--The student will be able to:
- 45.01 Remove, service and replace carburetor air cleaners/flame arrestors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 45.02 Identify and locate fuel system components (fuel pumps, carburetors and air filters, linkages and intake manifolds). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 45.03 Remove, clean, overhaul, replace and make final adjustments to carburetors. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 46.0 MAINTAIN AND REPAIR TRANSMISSIONS--The student will be able to:
- 46.01 Inspect planetary clutch plate air coupling assemblies. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 46.02 Remove and replace transmissions. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 46.03 Use proper service tools in shimming, reassembly and testing. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 46.04 Drain transmissions. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 46.05 Determine capacity using the transmission service manuals. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
  - 46.06 Refill transmissions according to manufacturers' specifications. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.3.4.1), (MA.B.3.4.1.3.3)
- 47.0 MAINTAIN AND REPAIR INBOARD DIESEL FUEL SYSTEMS--The student will be able to:
- 47.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.02 Sketch and label the parts of total fuel systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.2), (LA.B.2.4.4)
  - 47.03 Service fuel lines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.04 Remove, clean and install fuel tanks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

- 47.05 Identify and locate fuel control devices. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.06 Remove, replace service and check the pressure of fuel pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.C.2.4.6)
  - 47.07 Remove, clean and replace in-line filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.08 Check and adjust throttle and governor linkages. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.09 Check fuel systems for leaks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.10 Bleed systems for starting.
  - 47.11 Adjust nozzle pressure to manufacturer's specifications. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.2.4.1), (MA.B.2.4.1.3.3)
  - 47.12 Set the injection pump angle (timing). (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (MA.B.2.4.1), (MA.B.2.4.1.3.3)
  - 47.13 Check or replace glow plugs. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 47.14 Check; stop solenoids. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 48.0 MAINTAIN AND REPAIR INBOARD DIESEL COOLING SYSTEMS--The student will be able to:
- 48.01 Disassemble and reassemble water pumps. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (LA.A.1.4.4), (LA.B.2.4.1)
  - 48.02 Remove, check and replace thermostats. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 48.03 Use thermostat pressure relief systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 48.04 Service manifolds, risers and thermostat housings. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 48.05 Service water-cooling systems for diesel engines. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 49.0 MAINTAIN AND REPAIR INBOARD DIESEL LUBRICATION SYSTEMS--The student will be able to:
- 49.01 Identify the types and functions of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 49.02 Explain the principles of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8), (SC.B.1.4.6)
  - 49.03 Identify and locate components of lubrication systems. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 49.04 Check engines for oil leaks. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 49.05 Change engine oil and filters. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 49.06 Check engine oil pressure and level. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
  - 49.07 Recognize and use only recommended oil. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)
- 50.0 MAINTAIN AND REPAIR INBOARD DIESEL CHARGING SYSTEMS --The student will be able to:
- 50.01 Inspect, remove and replace alternator belts. (LA.A.2.4.6), (LA.A.2.4.7), (LA.A.2.4.8)

- 50.02 Check the output of charging systems. (LA.A.2.4.6),  
(LA.A.2.4.7), (LA.A.2.4.8)
- 50.03 Analyze malfunctions. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1), (MA.B.4.4.1.3.3)
- 50.04 Test and overhaul alternators. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.3)
- 50.05 Remove and replace regulators. (LA.A.2.4.6), (LA.A.2.4.7),  
(LA.A.2.4.8), (MA.B.4.4.1), (MA.B.4.4.1.3.3)

JULY 2001

SHOP EQUIPMENT LIST

1. Basic Hand Tools, Industrial Tool Set or Equivalent
2. Precision measuring tools required for marine service.
3. Torque wrenches
4. Air tools as necessary
5. Battery charger
6. Battery load tester/hyprometer
7. Analog and digital volt OHM Amp meters
8. Spark testers
9. Growler
10. Tool cabinets
11. Work benches/with vises
12. Outboard engine stands
13. Inboard engine stands
14. Engines - current
15. Engines with support equipment
16. Dynamometer
17. Lap top computers
18. Television with VCR
19. Computers with marine service software
20. Engine hoist 4,000 lb capacity
21. A frame 4 ton capacity
22. Valve grinder
23. Cylinder hones
24. Electric drills
25. Appropriate shim tool
26. Gear case holding fixtures
27. Outboard engine hydraulic lift
28. Trailer dolly
29. Parts washer
30. Sand blasting cabinet
31. Tap and die sets metric and standard
32. Appropriate EFI test equipment
33. Oxygen/acetylene torch set
34. Drill press
35. Pedestal grinder
36. Hydraulic press
37. Microfiche machine
38. Test tanks outboard
39. Appropriate test wheels
40. Compression testers (gas and diesel)
41. Lathe
42. C.D. 77 Voltmeter or equivalent
43. Gear case oil filler
44. Gear case vacuum and pressure testers
45. Safety related shop equipment
46. Appropriate puller sets
47. Appropriate special tools