Florida Department of Education
Curriculum Framework

Program Title: **Marine Service Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400210	
CIP Number	0647061611	
Grade Level	30,31	
Program Length	1350	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to 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.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of six occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	MTE0003	Marine Rigger	DIESEL MECH @7 7G GASENG RPR @7 7G	300 hours
B	MTE0090	Outboard Engine Technician		300 hours
C	MTE0074	Outboard Engine Diagnostics Technician		150 hours
D	MTE0092	Inboard Gas Engine Technician		300 hours
E	MTE0093	Drive Train Technician		150 hours
F	MTE0056	Inboard Diesel Technician		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of workplace safety and workplace organization.
02.0 Adjust and repair trailers.
03.0 Use marine woods, metals, and fiberglass.
04.0 Maintain and repair basic two-stroke cycle outboard engines.
05.0 Maintain and repair fuel systems on boats.
06.0 Maintain and repair electrical systems.
07.0 Prepare delivery checklist.
08.0 Maintain and repair outboard capacitor discharge and Transistor Controlled (TCI) ignition systems.
09.0 Maintain and repair outboard fuel systems.
10.0 Parts specialist and computer skills to industry standards.
11.0 Maintain and repair basic four-stroke cycle outboard engines.
12.0 Maintain and repair outboard charging systems.
13.0 Maintain and repair outboard battery/EFI ignition systems.
14.0 Maintain and repair outboard cranking systems.
15.0 Maintain and repair outboard lubrication systems.
16.0 Maintain and repair outboard cooling systems.
17.0 Maintain and repair outboard lower gear cases.
18.0 Assemble and maintain outboard lower units and housing assemblies.
19.0 Demonstrate employability skills.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Apply basic computer skills.
22.0 Troubleshoot and solve problems with outboard engines using industry recognized computer-based diagnostic equipment.
23.0 Set up electric and digital control box, and gauges.
24.0 Maintain and repair basic four-stroke cycle inboard gas engine.
25.0 Maintain and repair inboard fuel systems.
26.0 Maintain and repair inboard gas cooling systems.
27.0 Maintain and repair inboard gas lubrication systems.
28.0 Maintain and repair electronic ignition systems.
29.0 Maintain and repair stern drive upper gear cases.
30.0 Maintain and repair stern drive lower gear cases.
31.0 Maintain and repair stern drive intermediate housing.
32.0 Maintain and repair inboard gas transmissions.
33.0 Maintain and repair inboard diesel fuel systems.
34.0 Maintain and repair inboard diesel cooling systems.
35.0 Maintain and repair inboard diesel lubrication systems.
36.0 Maintain and repair inboard diesel charging systems.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Service Technologies**
Career Certificate Program Number: **T400210**

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, fuel systems on boats, 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.

Course Number: MTE0003 **Occupational Completion Point: A** **Marine Rigger – 300 Hours**	
01.0	Demonstrate an understanding of workplace safety and workplace organization. The student will be able to:
01.01	Identify safety requirements for manual, electrical-powered, and pneumatic tools.
01.02	Demonstrate, apply, and provide evidence of safely using manual, electrical-powered, and pneumatic tools.
01.03	Identify safety requirements for operation of automated machines and equipment.
01.04	Demonstrate, apply, and provide evidence of safely operating automated machines and equipment.
01.05	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.06	Read, interpret, and apply service manuals.
01.07	Identify the safe use of paints, chemicals, fiberglass, and compounds
01.08	Demonstrate, apply, and provide evidence of safely using paints, chemicals, fiberglass, and compounds.
01.09	Identify the safe use of electrical connectors and cords.
01.10	Demonstrate, apply, and provide evidence of safely using electrical connectors and cords.
01.11	Identify, demonstrate, apply, and provide evidence of understanding of shop safety rules on an ongoing basis.
01.12	Demonstrate and identify the proper procedures for extinguishing class A, B, and C type fires.
01.13	Identify various workplace injuries related to the marine industry.
01.14	Demonstrate and practice knowledge of first aid and first response procedures appropriate for this course.
01.15	Identify and apply safety procedures in case of smoke or chemical inhalation.
01.16	Demonstrate and apply material handling techniques to safely move materials.
01.17	Demonstrate and apply proper techniques for lifting loads.

01.18	Research and identify Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.
01.19	Demonstrate, apply, and provide evidence of understanding Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.
01.20	Demonstrate safety requirements for material handling equipment such as rigging, ladders, and scaffolds related to the marine industry.
01.21	Explain National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines, and best practices.
01.22	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
01.23	Locate Safety Data Sheets (SDS).
01.24	Demonstrate understanding using and applying the information located on Safety Data Sheets (SDS).
01.25	Proactively respond to a safety concern and then document occurrences.
01.26	Identify and report unsafe conditions.
01.27	Determine the appropriate corrective action after an unsafe condition is identified.
01.28	Explain various emergency alarms and procedures.
01.29	Apply clean-up procedures for spills.
01.30	Identify and apply procedures for handling hazardous material.
01.31	Perform safety and environmental inspections.
01.32	Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.
01.33	Demonstrate proper and safe installation techniques as described in manuals, checklists, and regulations.
01.34	Demonstrate and apply proper equipment shutdown procedures.
01.35	Identify, select, and use personal protective equipment (PPE).
01.36	Identify, demonstrate, and apply ergonomic work techniques.
01.37	Train other students to use and apply safety skills outlined in this standard.
02.0	Adjust and repair trailers. The student will be able to:
02.01	Make boat to trailer adjustments.
02.02	Remove and replace lighting systems.
02.03	Remove, inspect, repack, and replace wheel bearings and springs.
02.04	Remove and replace (R & R) brakes.
02.05	Check lug nuts on trailer for correct torque.

03.0	Use marine woods, metals, and fiberglass. The student will be able to:
03.01	Explain the hazards of a marine environment to woods, metals and fiberglass.
03.02	Explain a galvanic series.
03.03	Explain the theory for using given materials in boat repair activities.
03.04	Perform basic fiberglass repair.
04.0	Maintain and repair basic two-stroke cycle outboard engines. The student will be able to:
04.01	Explain the basic principles of the operation of two-stroke cycle internal combustion engines.
04.02	Identify types of two-stroke cycle engines.
04.03	Locate engine serial and model numbers.
04.04	Set up and use precision measurement tools.
04.05	Drill and remove broken studs and install helicoils.
04.06	Demonstrate appropriate heating techniques and cutting skills.
04.07	Identify engine assemblies and systems.
05.0	Maintain and repair fuel systems on boats. 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	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.
05.05	Locate and identify fuel pumps and test the vacuum and pressure.
06.0	Maintain and repair electrical systems. The student will be able to:
06.01	Locate and match electrical units by their symbols on a wiring diagram.
06.02	Set up and use voltmeters, ammeters and ohmmeters.
06.03	Locate and identify electrical circuit components.
06.04	Sketch a typical circuit using a single wire system.
06.05	Test storage batteries using proper industry recognized battery testing equipment.
06.06	Charge storage batteries.
06.07	Remove and replace batteries and service battery boxes.

06.08	Repair damaged wire and electrical harnesses.
06.09	Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop.
06.10	Sketch and label typical fuel gauge systems.
06.11	Remove and replace gauges or indicating lights.
06.12	Remove and replace fuel-sending units.
06.13	Diagnose gauges and accessory system troubles using voltmeters, ammeters or detached sending units.
06.14	Sketch typical circuits such as those for auto bilge pumps or navigation lights.
06.15	Locate opens, shorts and grounds.
06.16	Demonstrate proficiency in applying industry standard wire terminal practices.
06.17	Demonstrate proper installation of 2 position and 3 position battery switches.
06.18	Demonstrate correct procedure for connecting batteries in series and parallel.
06.19	Check alternator output voltage with engine running compare with specifications.
06.20	Apply 33CFR Standards (if applicable).
06.21	Apply ABYC electrical standards (if applicable).
06.22	Understand basic alternating and direct current.
07.0	Prepare delivery checklist. The student will be able to:
07.01	Formulate center line measurements for outboard motor installation.
07.02	Locate manufacturers' I.D. plates.
07.03	Mount control boxes at the helm.
07.04	Place wiring and cables in a neat and orderly manner.
07.05	Adjust the control cables from the engine to the control box.
07.06	Connect the steering cable to the engine.
07.07	Find suitable locations for accessories and mount them to the boat.
07.08	Lubricate shafts, install propellers and fasten both securely.
07.09	Check for proper fluid levels (as required).
07.10	Check manufacturers' specifications.
07.11	Describe how to or test-run boats.

	07.12 Recheck work completed.
	07.13 Demonstrate proper procedures for checking oil level capacity.
	07.14 Install or connect drain plugs, petcocks, hose clamps, hoses, etc.
	07.15 Remove and replace running lights.
	07.16 Troubleshoot lighting systems and accessories.
	07.17 Check and adjust throttles, cables, horns, lights and tachometers.
	07.18 Check steering system for proper operation.
08.0	Maintain and repair outboard capacitor discharge and Transistor Controlled (TCI) ignition systems. The student will be able to:
	08.01 Sketch and label electrical symbols.
	08.02 Set up and use ohmmeters.
	08.03 Set up and use a DVA tester or equivalent.
	08.04 Set up and use spark testers.
	08.05 Set up and use timing lights.
	08.06 Set up and use multi-meter.
	08.07 Locate and identify parts of capacitor discharge ignition (CDI) and Transistor Controlled Ignition (TCI) systems.
	08.08 Locate and match electrical units by their symbols on a wiring diagram.
	08.09 Sketch and label complete C/D ignition and Transistor Controlled Ignition (TCI) systems.
	08.10 Check coil resistance, shorts, and grounds with an ohmmeter.
	08.11 Check stator windings with an ohmmeter.
	08.12 Check sensor coils, charge coils, ignition coils and shorts to ground with a DVA tester or equivalent.
	08.13 Check power packs with an ohmmeter and a DVA tester or equivalent.
09.0	Maintain and repair outboard fuel systems. The student will be able to:
	09.01 Identify the major types of carburetors.
	09.02 Check and adjust throttle.
	09.03 Identify and service different types of EFI/DFI systems.
	09.04 Identify air cleaners/flame arrestors.
	09.05 Identify basic carburetor circuits (chokes, floats, fuel inlets; idle, intermediate, and high speeds; mains, etc.)

	09.06 Diagnose carburetor problems.
	09.07 Remove, clean, overhaul, replace and make final adjustments to carburetors.
	09.08 Diagnose exhaust problems such as back pressure.
10.0	Parts specialist and computer skills to industry standards. The student will be able to:
	10.01 Identify the skills needed to be a service writer.
	10.02 Identify the skills needed to be a parts specialist.
	10.03 Demonstrate appropriate computer skills.
	10.04 Identify different parts and accessories.

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, cranking systems, lubrication systems, cooling systems, lower gear cases, lower units and housing assemblies, employability, and entrepreneurship.

Course Number: MTE0090 Occupational Completion Point: B Outboard Engine Technician – 300 Hours	
11.0	Maintain and repair basic four-stroke cycle outboard engines. The student will be able to:
	11.01 Explain the basic principles of the operation of four-stroke cycle internal combustion engines.
	11.02 Identify types of four-stroke cycle engines.
	11.03 Locate engine serial and model numbers.
	11.04 Identify engine assemblies and systems.
	11.05 Diagnose valve and head problems by use of the visual inspection method.
	11.06 Diagnose valve and head problems by use of the compression tester method.
	11.07 Perform cylinder leak down test.
	11.08 Clean and inspect heads for cracks, warpage and damaged spark plug threads.
	11.09 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
	11.10 Set up and use precision measurement tools.
	11.11 Adjust valves.
	11.12 Remove and inspect camshafts and lifters.

	11.13 Clean and inspect lifters for wear.
	11.14 Time valve drive assemblies.
	11.15 R & R powerhead and associated parts.
	11.16 Inspect oil seals.
	11.17 Inspect/replace timing belt/chain.
12.0	Maintain and repair outboard charging systems. The student will be able to:
	12.01 Sketch and label the units of complete charging circuits.
	12.02 Disassemble charging systems and identify the components.
	12.03 Perform stator and rectifier testing on charging systems.
	12.04 Reassemble and test charging systems.
	12.05 Set up and use ohmmeters.
13.0	Maintain and repair outboard battery/EFI ignition systems. The student will be able to:
	13.01 Locate and identify parts of battery ignition systems.
	13.02 Locate and match electrical units by their symbols on a wiring diagram.
	13.03 Sketch and label complete battery ignition systems.
	13.04 Check coil resistance with an ohmmeter.
	13.05 Set up and use test equipment.
	13.06 Set timing using timing light.
	13.07 Clean and re-gap spark plugs.
	13.08 Explain the functions of sensors in Electronic Fuel Injection (EFI) systems.
	13.09 Explain the function of actuators.
	13.10 Explain the function of control modules.
14.0	Maintain and repair outboard cranking systems. The student will be able to:
	14.01 Disassemble recoil starters.
	14.02 Inspect components of recoil starters.
	14.03 Reassemble recoil starters.
	14.04 Identify components of electrical starting systems.

	14.05 Bench test switches.
	14.06 Troubleshoot starting systems using multi-meter.
	14.07 Locate opens, short and grounds.
	14.08 Remove, disassemble, inspect, and reassemble starters.
15.0	Maintain and repair outboard lubrication systems. The student will be able to:
	15.01 Identify the types and functions of lubrication systems.
	15.02 Explain the principles of lubrication systems.
	15.03 Identify and locate components of lubrication systems.
	15.04 Check engines for oil leaks.
	15.05 Change engine oil and filters.
	15.06 Check engine oil pressure and level.
	15.07 Recognize and use only recommended oil.
	15.08 Inspect and service 4-stroke oil metering systems.
16.0	Maintain and repair outboard cooling systems. The student will be able to:
	16.01 Explain the principles of cooling systems.
	16.02 Trace water flow through cooling systems.
	16.03 Disassemble, examine for problems, and reassemble water pumps.
	16.04 Remove, check, and replace thermostats.
	16.05 Service poppet valves.
	16.06 Service or replace thermostat and thermostat housings.
17.0	Maintain and repair outboard lower gear cases. The student will be able to:
	17.01 Remove and replace lower gear cases.
	17.02 Disassemble, inspect and reassemble lower gear case.
	17.03 Identify the components of lower gear case.
	17.04 Refill lower gear cases with specified oil.
	17.05 Determine propeller pitch diameter and hub type.
18.0	Assemble and maintain outboard lower units and housing assemblies. The student will be able to:

	18.01 Disassemble and reassemble steering handle groups.
	18.02 Describe the process for disassembling and assembling exhaust housings and water tube assemblies.
	18.03 Describe the process for replacing motor mounts and shock absorbers.
	18.04 Lubricate all fittings.
	18.05 Pressure and vacuum test gear cases.
	18.06 Demonstrate the process for removing and servicing cylinders and rams.
	18.07 Adjust the trim and tilt.
	18.08 Determine the differences between mechanical, electrical, and hydraulic shifting units.
	18.09 Explain the shifting theory of the lower unit.
	18.10 Perform correct procedure for filling trim and tilt with hydraulic oil.
19.0	Demonstrate employability skills. The student will be able to:
	19.01 Conduct a job search using periodicals and the internet.
	19.02 Secure information about a job.
	19.03 Identify documents that may be required when applying for a job interview.
	19.04 Complete a job application form correctly.
	19.05 Demonstrate competence in job interview techniques.
	19.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other employees.
	19.07 Identify acceptable work habits.
	19.08 Demonstrate knowledge of how to make appropriate job changes.
	19.09 Demonstrate acceptable employee health habits.
	19.10 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
20.0	Demonstrate an understanding of entrepreneurship. The student will be able to:
	20.01 Define entrepreneurship.
	20.02 Describe the importance of entrepreneurship to the American economy.
	20.03 List the advantages and disadvantages of business ownership.
	20.04 Identify and explain the risks involved in ownership of a business.
	20.05 Identify and explain the necessary personal characteristics of a successful entrepreneur.

20.06	Identify and explain the business skills needed to operate a small business efficiently and effectively.
20.07	Identify and explain the various types of business structures, e.g., sole proprietor, S-Corporation, etc.

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 basic computer skills, computer-based diagnostic equipment, electrical, control box, and gauges.

Course Number: MTE0074 Occupational Completion Point: C Outboard Engine Diagnostics Technician – 150 Hours	
21.0	Apply basic computer skills. The student will be able to:
21.01	Identify and apply the proper procedures for turning on and turning off a computer.
21.02	Identify and apply the proper procedures for logging on and logging off a computer.
21.03	Demonstrate knowledge of properly using and navigating operating systems.
21.04	Identify and properly use various peripheral devices. (e.g., printers, scanners, external storage devices)
21.05	Demonstrate and apply the process for locating, copying, pasting, saving, and backing up a file and folder
21.06	Demonstrate the process for opening and saving a file using program specific extensions. (e.g., .docx, .pdf, .txt)
21.07	Identify and apply the proper procedures for securely uploading and downloading files over external and internal networks.
21.08	Demonstrate the proper procedures for using and navigating e-mail programs.
21.09	Create and send messages using proper electronic communication etiquette.
21.10	Show understanding for properly attaching a file within an e-mail message.
22.0	Troubleshoot and solve problems with outboard engines using industry recognized computer-based diagnostic equipment. The student will be able to:
22.01	Demonstrate and understand the proper procedures for connecting diagnostic equipment to an outboard engine.
22.02	Identify and demonstrate the proper procedures for opening and closing diagnostic programs.
22.03	Use multiple research techniques to identify faults and data to be used to solve outboard engine trouble.
22.04	Formulate a plan to repair outboard engines given the data found.
22.05	Download, save, and print output data from an outboard engine.
23.0	Set up electric and digital control box, and gauges. The student will be able to:
23.01	Assign position to outboard engines.

23.02	Set up trim and tilt limits.
23.03	Set up digital gauges.
23.04	Demonstrate and understand the proper procedures for connecting and troubleshooting NEMA and CAN-BUS systems.

Course Description: Students will learn skills for the inboard 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.

Course Number: MTE0092 Occupational Completion Point: D Inboard Gas Engine Technician – 300 Hours	
24.0	Maintain and repair basic four-stroke cycle inboard gas engines. The student will be able to:
24.01	Diagnose valve and head problems by use of the visual inspection method.
24.02	Diagnose valve and head problems by use of the compression tester method.
24.03	Disassemble engines and inspect parts.
24.04	Clean and inspect heads for cracks, warpage, and damaged spark plug threads.
24.05	Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.
24.06	Adjust valves.
24.07	Demonstrate the process for removing and inspecting camshafts and lifters.
24.08	Demonstrate the process for cleaning and inspecting lifters for wear.
24.09	Time valve drive assemblies.
24.10	Reassemble engines.
25.0	Maintain and repair inboard fuel systems. The student will be able to:
25.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
25.02	Sketch and label typical fuel gauge systems.
25.03	Sketch and label the parts of total fuel systems.
25.04	Remove and replace fuel gauges.
25.05	Service fuel lines.
25.06	Remove and replace fuel-sending units.
25.07	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.

	25.08 Vacuum test fuel system.
	25.09 Remove, replace service and check the pressure of fuel pumps.
	25.10 Remove, clean and replace in-line filters.
	25.11 Identify the major types of carburetors.
	25.12 Check and adjust throttle linkages.
	25.13 Identify and service different types of EFI systems.
	25.14 Identify and understand different types of Vapor Separator Tank (VST) systems.
	25.15 Remove, service, and replace flame arrestors.
26.0	Maintain and repair inboard gas cooling systems. The student will be able to:
	26.01 Explain the principles of cooling systems, including fresh water-cooling systems.
	26.02 Trace water flow through cooling systems.
	26.03 Disassemble and reassemble water pumps.
	26.04 Remove, check, and replace thermostats.
	26.05 Check thermostat pressure relief systems.
	26.06 Service manifolds, risers, and thermostat housings.
27.0	Maintain and repair inboard gas lubrication systems. The student will be able to:
	27.01 Identify the types and functions of lubrication systems.
	27.02 Explain the principles of lubrication systems.
	27.03 Identify and locate components of lubrication systems.
	27.04 Check engines for oil leaks.
	27.05 Change engine oil and filters.
	27.06 Check engine oil pressure and level.
	27.07 Recognize and use only recommended oil.
28.0	Maintain and repair electronic ignition systems. The student will be able to:
	28.01 Locate and match electrical units by their symbols on a wiring diagram.
	28.02 Sketch and label complete battery ignition systems.
	28.03 Set up and use test equipment.

	28.04 Set timing using a timing light

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 stern drive upper and lower cases, intermediate housings, and inboard gas transmissions.

Course Number: MTE0093 Occupational Completion Point: E Drive Train Technician – 150 Hours	
29.0	Maintain and repair stern drive upper gear case. The student will be able to:
	29.01 Identify components of upper gear case.
	29.02 Use the proper oil to refill upper and lower gear cases.
	29.03 Check manufacturers' installation procedures for stern drive units.
30.0	Maintain and repair stern drive lower gear cases. The student will be able to:
	30.01 Identify components of lower gear case.
	30.02 Remove and replace lower gear cases.
	30.03 Refill lower gear cases with specified oil.
	30.04 Determine propeller pitch, diameter and hub type.
	30.05 Disassemble, examine for problems, and reassembly water pumps on stern drive (if applicable).
31.0	Maintain and repair stern drive intermediate housings. The student will be able to:
	31.01 Check engine alignment.
	31.02 Check electrical components with proper test equipment.
	31.03 Identify components of transom plates.
	31.04 Service, install, and adjust trim and tilt systems.
32.0	Maintain and repair inboard gas transmissions. The student will be able to:
	32.01 Remove and replace transmissions.
	32.02 Drain transmissions.
	32.03 Determine capacity using the transmission service manuals.
	32.04 Refill transmissions according to manufacturers' specifications.
	32.05 Describe or demonstrate procedure for aligning the engine to with the drive shaft.

Course Description: Students will learn entry-level skills for the diesel marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of diesel fuel, cooling, lubrication, and charging systems.

Course Number: MTE0056 Occupational Completion Point: F Inboard Diesel Technician – 150 Hours	
33.0	Maintain and repair inboard diesel fuel systems. The student will be able to:
33.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).
33.02	Sketch and label the parts of total fuel systems.
33.03	Service fuel lines.
33.04	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.
33.05	Identify and locate fuel control devices.
33.06	Remove, clean and replace in-line filters.
33.07	Check and adjust throttle and governor linkages.
33.08	Check fuel systems for leaks.
33.09	Bleed systems for starting.
33.10	Set the injection pump angle (timing).
33.11	Check or replace glow plugs.
33.12	Check; stop solenoids.
33.13	Describe the function of diesel engine electronic control systems.
34.0	Maintain and repair inboard diesel cooling systems. The student will be able to:
34.01	Disassemble and reassemble water pumps.
34.02	Remove, check, and replace thermostats.
34.03	Use thermostat pressure relief systems.
34.04	Service manifolds, risers, and thermostat housings.
34.05	Service water-cooling systems for diesel engines.
35.0	Maintain and repair inboard diesel lubrication systems. The student will be able to:
35.01	Identify the types and functions of lubrication systems.
35.02	Explain the principles of lubrication systems.

	35.03 Identify and locate components of lubrication systems.
	35.04 Check engines for oil leaks.
	35.05 Change engine oil and filters.
	35.06 Check engine oil pressure and level.
	35.07 Recognize and use only recommended oil.
36.0	Maintain and repair inboard diesel charging systems. The student will be able to:
	36.01 Inspect, remove, and replace alternator belts.
	36.02 Check the output of charging systems.
	36.03 Analyze malfunctions.
37.0	Maintain and repair AC electrical systems. The student will be able to:
	37.01 Understand and repair DC to AC Inverters and Generators.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools, and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate, and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.