Florida Department of Education
CLUSTER CURRICULUM FRAMEWORK

Cluster Title: Heavy Mechanic
Cluster Type: Job Preparatory
Occupational Area: Industrial Education
Components Two Programs, One Core, Nine Occupational Completion Points

	Secondary	PSAV
Grade Level	9-12, 30, 31	30, 31
Facility Code	203	203
CTSO	SkillsUSA-VICA	SkillsUSA-VICA
Co-op Method	Yes	Yes
Apprenticeship	Yes	Yes

I. **PURPOSE:** The purpose of this program is to prepare students for employment as bus, truck and diesel engine mechanics (85311641), diesel mechanics helpers (625.684-010), Mobile heavy equipment mechanics (85314643), construction equipment mechanics (620.261-022), industrial truck mechanics (620.281-050).

The course content will include, but not limited to, the following: maintaining and repairing diesel engines and electrical systems; reconditioning diesel fuel injection systems; overhauling diesel engines; and performing diesel engine preventive maintenance.

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

II. **CLUSTER STRUCTURE:** This cluster is a planned sequence of two programs instruction consisting of one specialization area a common core and 9 occupational completion points. The recommended sequence allows students to complete specified portions of the program for employment or to remain for advanced training. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or terminate as an occupational completer.

It is recommended that students complete the core or demonstrate a mastery of the performance standards contained in the core before advancing. Diesel Engine Service Specialization is a prerequisite for the Heavy Equipment Mechanic program and the Heavy Duty Truck and Bus program.

The courses after the core may be taken in any sequence. However, an individual must take both of the Preventive Maintenance courses. The Heavy Equipment Mechanic Program and the Heavy Duty Truck and Bus Mechanics Program may be offered at both the secondary and postsecondary adult vocational (PSAV) levels. For the Heavy Equipment Mechanics Program, the Diesel Power Train and Tracks course work may be offered only at the PSAV level. All of the previous course work in the Heavy Equipment Mechanics program may be offered at both secondary and PSAV levels.

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.

8742010 - Diesel Engine Service 1 (150)
8742020 - Diesel Engine Service 2 (150)
8742030 - Diesel Engine Service 3 (150) [360] OCP - A
8742040 - Diesel Engine Service 4 (150) [240] OCP - B
8742050 - Diesel Engine Service 5 (150) [120] OCP - C
8742060 - Diesel Engine Service 6 (150) [120] OCP - D
8742070 - Diesel Engine Service 7 (150)
8742080 - Diesel Engine Service 8 (150) [240] OCP - E
8742090 - Diesel Engine Service 9 (150) [120] OCP - F
8742091 - Diesel Engine Service 10 (150) [120] OCP - G
8742092 - Diesel Engine Service 11 (150) [120] OCP - H
8742093 - Diesel Engine Service 12 (150) [240] OCP - I

The safety guidelines in the student performance standards have been recommended in the ASE Program Certification Standards for Medium/Heavy Truck Technician Training Program administered by National Automotive Technicians Education Foundation (NATEF).

III. **LABORATORY ACTIVITIES**: Classroom, Shop, and laboratory activities are an integral part of this cluster. These activities include instruction in the use of safety procedures, tools, equipment, materials and processes found in the industry. Equipment and supplies should be provided to enhance hands-on experiences for students in the chosen occupation. A generic equipment list for the programs in this cluster is available.

IV. **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.

The programs in this cluster may be offered in postsecondary adult and vocational (PSAV) courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 230.643, F.S.

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,

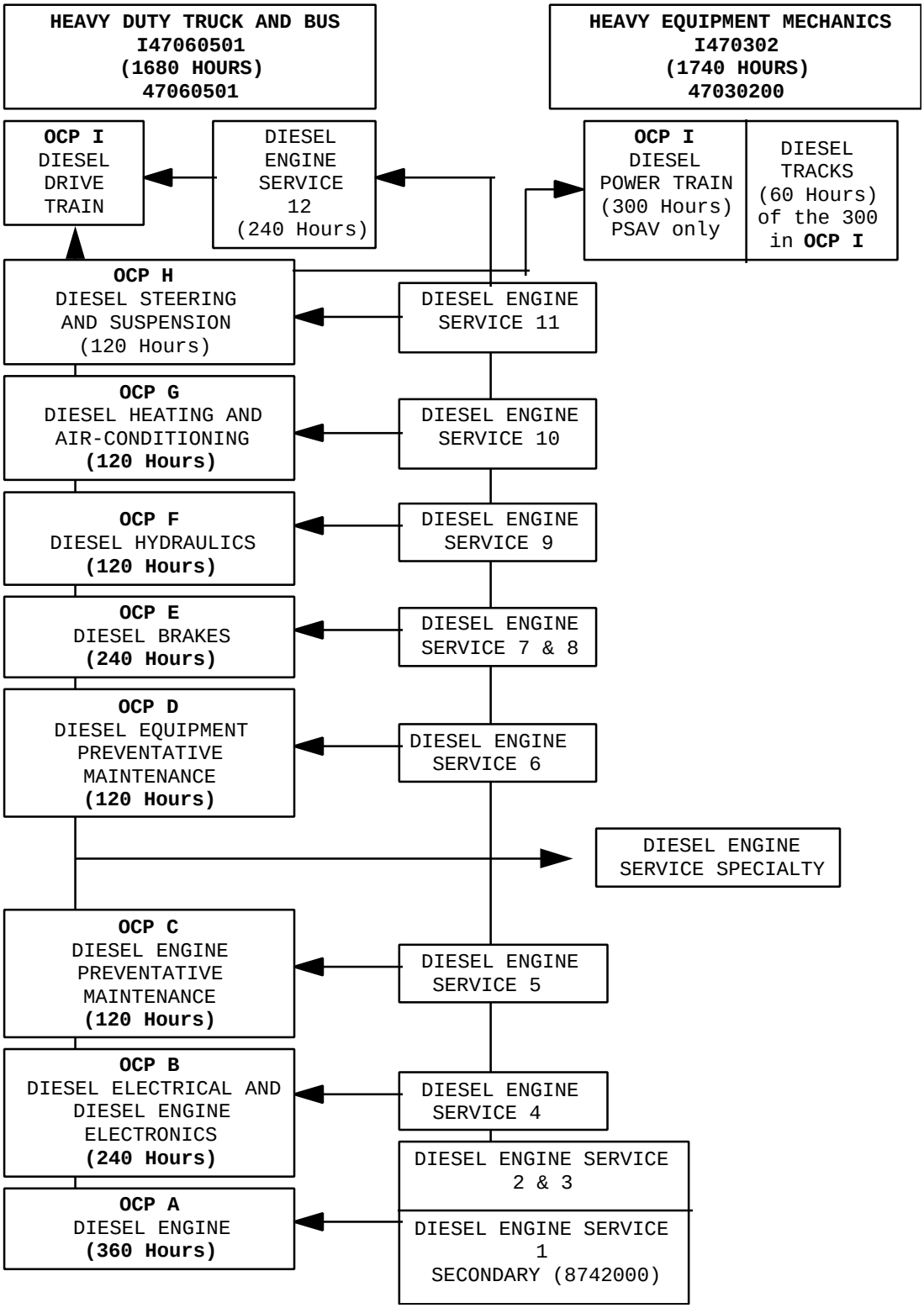
the particular outcomes and student performance standards, which the student must master to earn credit, must be specified on an individual basis. The job or jobs for which the student is being trained should be reflected in the student's desired postschool outcome statement on the Transition Individual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

IV. 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.

The standard program length for the Heavy Duty Truck and Bus program is 1680 hours.
The standard program length for Heavy Equipment Mechanics is 1740 hours.

The following diagram illustreates the program structure:

HEAVY DUTY TRUCK AND BUS CLUSTER



Florida Department of Education
DIESEL TECHNOLOGY

Program Title: Heavy Duty Truck and Bus Mechanic

	Secondary	PSAV
Program Number	**8742000**	**I470605**
CIP Number	0647.060501	0647.060501
Grade Level	9-12, 30, 31	30, 31
Length	14 Credits	1680 Hours
Certification	DIESEL MECH @7 G	DIESEL MECH @7 G
Math		9
Language		9
Reading		9

V. **INTENDED OUTCOMES:** After successfully completing the appropriate course(s) for each occupational completion point of this program, the student will be able to perform the following:

OCCUPATIONAL COMPLETION POINT - DATA CODE - A (360 Hours)
DIESEL ENGINE MECHANIC/TECHNICIAN HELPER - INDUSTRY TITLE

01.0 Identify shop organization, management, and safety requirements.
02.0 Demonstrate infection control procedures and practice general shop safety.
03.0 Identify the basic diesel components and functions.
04.0 Demonstrate the use of basic tools and equipment.
05.0 Demonstrate workplace communication skills.
06.0 Apply math skills to diesel technology tasks.
07.0 Apply scientific principles common to diesel technology operations.
08.0 Demonstrate employability skills for diesel technology occupations.
09.0 Identify entrepreneurial opportunities in the diesel technology industry.
10.0 Demonstrate shop and occupational safety procedures.
11.0 Identify principles, assemblies, and systems of engine operation.
12.0 Troubleshoot and repair engine systems.
13.0 Rebuild a cylinder-head assembly.
14.0 Remove and replace camshaft assemblies.
15.0 Rebuild a block assembly.
16.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B (240 Hours)
DIESEL ELECTRICAL AND ELECTRONICS TECHNICIAN - INDUSTRY TITLE

17.0 Demonstrate shop and occupational safety procedures.
18.0 Identify and apply electrical principles related to diesel technology.
19.0 Identify and apply electronic principles related to diesel technology.
20.0 Maintain and repair electrical systems.
21.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C (120 Hours)
DIESEL ENGINE PREVENTIVE MAINTENANCE TECHNICIAN - INDUSTRY TITLE

22.0 Demonstrate shop and occupational safety procedures.
23.0 Perform engine preventive maintenance.
24.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - D (120 Hours)
DIESEL EQUIPMENT PREVENTIVE MAINTENANCE TECHNICIAN -INDUSTRY TITLE

25.0 Demonstrate shop and occupational safety, first aide and infection control procedures.
26.0 Perform equipment preventive maintenance.
27.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - E (240 Hours)
DIESEL BRAKES TECHNICIAN - INDUSTRY TITLE

28.0 Demonstrate shop and occupational safety procedures.
29.0 Maintain and repair brake systems.
30.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - F (120 Hours)
DIESEL HYDRAULICS TECHNICIAN - INDUSTRY TITLE

31.0 Demonstrate shop and occupational safety procedures.
32.0 Maintain and repair hydraulic systems.
33.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - G (120 Hours)
DIESEL HEATING AND AIR-CONDITIONING TECHNICIAN - INDUSTRY TITLE

34.0 Demonstrate shop and occupational safety procedures.
35.0 Maintain and repair air-conditioning and heating systems.
36.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - H (120 Hours)
DIESEL STEERING AND SUSPENSION TECHNICIAN - INDUSTRY TITLE

37.0 Demonstrate shop and occupational safety procedures.
38.0 Maintain and repair steering and suspension systems.
39.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - I (240 Hours)
DIESEL DRIVE TRAIN TECHNICIAN - INDUSTRY TITLE

40.0 Demonstrate shop and occupational safety procedures.
41.0 Maintain and repair power train systems and components.
42.0 Demonstrate the qualifications for employment.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

OCCUPATIONAL COMPLETION POINT - DATA CODE - A
DIESEL ENGINE MECHANIC/TECHNICIAN HELPER - INDUSTRY TITLE

01.0 IDENTIFY SHOP ORGANIZATION, MANAGEMENT, AND SAFETY REQUIREMENTS--The student will be able to:

01.01 Identify basic shop organization and management regulations.
01.02 Identify required shop-safety practices.
01.03 Identify and describe shop-maintenance procedures, including precautions for handling and storing work-related chemicals and hazardous materials.

02.0 DEMONSTRATE INFECTION CONTROL PROCEDURES AND GENERAL SHOP SAFETY-The student will be able to:

02.01 Understand how bloodborne pathogens are spread and how to clean contamination on environmental surfaces.
02.02 Identify cleaning solutions that will kill the AIDS virus on environmental surfaces.
02.03 Practice general shop safety.

03.0 IDENTIFY THE BASIC DIESEL COMPONENTS AND FUNCTIONS--The student will be able to:

03.01 Identify types of bearings and their uses.
03.02 Identify seals, gaskets, and fasteners.
03.03 Identify drive power train components and functions.
03.04 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility.

04.0 DEMONSTRATE THE USE OF BASIC TOOLS AND EQUIPMENT--The student will be able to:

04.01 Identify and use the following correctly and safely:
a. Basic hand tools
b. Basic welding tools and equipment
c. Power tools
d. Measuring and precision tools.
04.02 Read a digital multimeter.

05.0 DEMONSTRATE WORKPLACE COMMUNICATION SKILLS--The student will be able to:

05.01 Locate information in technical literature, such as a manufacturer’s manual, in both print and computer versions.
05.02 Read, interpret, and apply information from parts and service manuals.
05.03 Read and follow written and oral instructions.
05.04 Read and interpret graphs, charts, diagrams, and tables commonly used in the diesel technology industry.
05.05 Answer and ask questions coherently and concisely.
05.06 Use basic keyboarding and computer skills.
05.07 Use industry-related computer software.
05.08 Interpret technical specification information and diagnose problems, both verbally and in writing.
05.09 Solve basic diesel technology problems by combining knowledge of diesel systems with technical information and diagnostic data.

05.10 Complete accurately the required information for journals, repair orders, invoices, time cards, job sheets, and forms.
05.11 Demonstrate telephone and interpersonal communication skills to accurately and courteously exchange information with customers, co-worker, and supervisors.

06.0 APPLY MATH SKILLS TO DIESEL TECHNOLOGY TASKS--The student will be able to:

06.01 Apply math skills commonly required for performing job duties in diesel technology occupations.
a. Recognize, identify, and make metric conversions.
b. Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
c. Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
d. Add, subtract, multiply, and divide using fractions, decimals, and whole numbers.
06.02 Determine the correct purchase price, including sales tax, for a materials list containing a minimum of six items.
06.03 Calculate federal, state, and local taxes.
06.04 Explain industry time standards, including the use of flat-rate information.

07.0 APPLY SCIENTIFIC PRINCIPLES COMMON TO DIESEL TECHNOLOGY OPERATIONS--The student will be able to:

07.01 Explain molecular action caused by temperature extremes, chemical reaction, and moisture content.
07.02 Interpret and draw reasonable conclusions from information provided in graphs, scales, and gauges.
07.03 Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
07.04 Read and interpret pressure measurement in terms of pounds per square inch (PSI), inches of mercury, and kilopascal (KPA).

08.0 DEMONSTRATE EMPLOYABILITY SKILLS FOR DIESEL TECHNOLOGY OCCUPATIONS--The student will be able to:

08.01 Describe the field of diesel technology, including working conditions and career opportunities.
08.02 Identify and demonstrate work habits of successful employees concerning
a. quality of work
b. Work hours and schedule
c. Actions, initiative, teamwork, dependability, and responsible decision making
d. Self-control, responses to criticism, and relationships with customers and supervisors
e. Time management, cost effectiveness, and fair pricing
f. Personal hygiene, health habits, and professional appearance
g. Driving records, drug-free workplace, and industry policies
h. Methods of changing jobs
08.03 Conduct a job search and identify advanced training opportunities in diesel technology occupations, including specialized industry training.

08.04 Obtain information about different jobs on training and licensing requirements, bonding requirements, equipment needs, responsibilities, pay, benefits, work conditions, risks, and opportunities for advancement.
08.05 Identify information and documents that may be required when applying for a job.
08.06 Complete a job-application form correctly.
08.07 Demonstrate competence in job-interview techniques.
08.08 Demonstrate knowledge of the Florida “Right-to-Know” law, Florida Statutes, Chapter 442.

09.0 IDENTIFY ENTREPRENEURIAL OPPORTUNITIES IN THE DIESEL TECHNOLOGY INDUSTRY--The student will be able to:

09.01 Describe the meaning of entrepreneurship.
09.02 Describe the importance of entrepreneurship to the American economy.
09.03 Describe types of diesel technology businesses and list the advantages, disadvantages, and risks of business ownership.
09.04 Identify the necessary personal characteristics of a successful entrepreneur.
09.05 Identify the business skills needed to operate a small business efficiently and effectively.
09.06 Compare opportunities for starting a diesel technology business to other job opportunities in the industry.

10.0 DEMONSTRATE SHOP AND OCCUPATIONAL PROCEDURES--The student will be able to:

10.01 Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
10.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.

11.0 IDENTIFY PRINCIPLES, ASSEMBLIES, AND SYSTEMS OF ENGINE OPERATION--The student will be able to:

11.01 Explain the basic principles in the operation of the four-stroke-cycle diesel engine.
11.02 Identify engine assemblies and systems.
11.03 Explain the operating principles of two-and four-stroke cycle engines.
11.04 Identify the components of two-and four-stroke-cycle engines.
11.05 Identify governor types and explain their operating principles.

12.0 TROUBLESHOOT AND REPAIR ENGINE SYSTEMS--The student will be able to:

12.01 Troubleshoot and repair cooling systems.
12.02 Troubleshoot and repair lubrication systems.
12.03 Troubleshoot and repair induction and exhaust systems.
12.04 Troubleshoot and repair diesel fuel-injection systems and components.
a. Inspect for operation and condition of the parts and systems, including fuel quality and consumption, safety shut-down devices, circuits, sensors, electronic governors, and flywheel.
b. Prime and bleed fuel-injection system.
c. Remove, test, and adjust injectors and nozzles.

d. Troubleshoot mechanical governors.
e. Remove, repair, and replace individual components as needed.

13.0 REBUILD A CYLINDER-HEAD ASSEMBLY--The student will be able to:

13.01 Diagnose valve and head problems using the visual inspection method.
13.02 Diagnose valve and head problems using the compression-tester or cylinder air-pressure method.
13.03 Diagnose valve and head problems using the stethoscope method.
13.04 Disassemble engines.
13.05 Clean and inspect the heads for cracks, warpage, and injector sleeves.
13.06 Inspect the valve seat and check for warpage, burns, cracks, and stem and tip wear.
13.07 Grinds valve seats and reface valves.
13.08 Check and inspect springs for free height, distortion, and installed height.
13.09 Adjust the valve lash.

14.0 REMOVE AND REPLACE CAMSHAFT ASSEMBLIES--The student will be able to:

14.01 Remove and inspect camshaft bearings and lifters.
14.02 Time valve-drive assemblies.

15.0 REBUILD A BLOCK ASSEMBLY--The student will be able to:

15.01 Remove the pistons from the rod assemblies.
15.02 Measure out-of-round and cylinder taper using a dial bore gauge or micrometer.
15.03 Check the piston pins and boss for wear.
15.04 Measure the piston ring lands width, out-of-round, and taper.
15.05 Measure the piston ring gap in a cylinder bore.
15.06 Install and fit the piston pins.
15.07 Check the rod-and-piston assembly alignment.
15.08 Remove and replace the rod bearings.
15.09 Hone and clean the cylinders.
15.10 Install rings on the pistons.
15.11 Measure and check the crankshafts with a micrometer.
15.12 Check the bearing bore with a telescope gauge.
15.13 Reassemble engines using a plastic gauge.
15.14 Install oil seals.
15.15 Check for end play.

16.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

16.01 Demonstrate the shop organization, management, and safety requirements for a diesel engine technician.
16.02 Demonstrate the use of tools and equipment required for a diesel engine technician.
16.03 Demonstrate workplace communication skills required by a diesel engine technician.
16.04 Demonstrate the application of math and science principles required for a diesel engine technician’s job tasks.
16.05 Demonstrate employability skills as a diesel engine technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B
DIESEL ELECTRICAL AND ELECTRONICS TECHNICIAN - INDUSTRY TITLE

17.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

17.01 Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
17.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.

18.0 IDENTIFY AND APPLY ELECTRICAL PRINCIPLES RELATED TO DIESEL TECHNOLOGY--The student will be able to:

18.01 Explain the nature of electricity.
18.02 Analyze electrical circuits.
18.03 Work problems using Ohm’s and Kirchoff’s laws.
18.04 Explain magnetism and electromagnetic induction.
18.05 Explain applications of alternating current (AC).
18.06 Explain principles of direct current (DC) motors and generators.
18.07 Explain principles of AC motors.
18.08 Locate and match electrical units by their symbols on a wiring diagram.
18.09 Set up and use voltmeters, ammeters, and ohmmeters.

19.0 IDENTIFY AND APPLY ELECTRONIC PRINCIPLES RELATED TO DIESEL TECHNOLOGY--The student will be able to:

19.01 Explain the principles of diodes and rectifiers.
19.02 Explain the principles of voltage regulation and power supply circuits.
19.03 Explain the principles of transistors.
19.04 Explain the principles of the silicon-controlled rectifier (SCR).
19.05 Identify components of electronic systems and explain their functions.

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

20.01 Test and service the following:
a. Batteries
b. Instruments and gauges
20.02 Test and repair the following systems:
a. Starting
b. Charging
c. Ignition
d. Lighting and accessories
20.03 Inspect, remove, clean, and install batteries and cables for parallel and/or series hookups.
20.04 Install batteries correctly where two or more batteries are used.
20.05 Identify, diagnose, remove and replace electronic sensors.
20.06 Identify the methods for testing and repair of electronic governors.

21.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

21.01 Demonstrate shop organization, management, and safety requirements for an electrical and electronics technician.
21.02 Demonstrate the use of tools and equipment required for an electrical and electronics technician.
21.03 Demonstrate workplace communication skills required by an electrical and electronics technician.
21.04 Demonstrate the application of math and science principles required for an electrical and electronics technician's job tasks.
21.05 Demonstrate employability skills as an electrical and electronics technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C
DIESEL ENGINE PREVENTIVE MAINTENANCE TECHNICIAN - INDUSTRY TITLE

22.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

22.01 For all preventive maintenance technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
22.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

23.0 PERFORM ENGINE PREVENTIVE MAINTENANCE--The student will be able to:

23.01 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer and company specifications.
23.02 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
23.03 Perform preventive-maintenance inspections and record results according to manufacturer and company specifications.
23.04 Demonstrate the ability to remove correctly an oil sample for analysis.

24.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

24.01 Demonstrate shop organization, management, and safety.
24.02 Demonstrate the use of tools and equipment required for a preventive maintenance technician.
24.03 Demonstrate workplace communication skills required by a preventive maintenance technician.
24.04 Demonstrate the application of math and science principles required for a preventive maintenance technician's job tasks.
24.05 Demonstrate employability skills as a preventive maintenance technician.

OCCUPATIONAL COMPLETION POINT - DATE CODE - D
DIESEL EQUIPMENT PREVENTIVE MAINTENANCE TECHNICIAN - INDUSTRY TITLE

25.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

25.01 For all preventive maintenance technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
25.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

26.0 PERFORM EQUIPMENT PREVENTIVE MAINTENANCE--The student will be able to:

26.01 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer and company specifications.
26.02 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
26.03 Perform preventive-maintenance inspections and record results according to manufacturer and company specifications, including:
a. Air, parking, and anti-locking brake systems
b. Wheels, bearings, hubs, and tires
c. Heating and air-conditioning components, refrigerants, and system operations
d. Hydraulic systems, including fluids, filters, lines, and reservoirs
26.04 Test-drive equipment, where liability and safety allow such tests, and identify needed repairs.

27.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

27.01 Demonstrate shop organization, management, and safety requirements for a preventive maintenance technician.
27.02 Demonstrate the use of tools and equipment required for a preventive maintenance technician.
27.03 Demonstrate workplace communication skills required by a preventive maintenance technician.
27.04 Demonstrate the application of math and science principles required for a preventive maintenance technician’s job tasks.
27.05 Demonstrate employability skills as a preventive maintenance technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - E
DIESEL BRAKES TECHNICIAN - INDUSTRY TITLE

28.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

28.01 For all Diesel Brakes Technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.

28.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

29.0 MAINTAIN AND REPAIR BRAKE SYSTEMS--The student will be able to:

29.01 Explain the principles and identify components of hydraulic brake systems.
29.02 Service and recondition hydraulic brake systems.
29.03 Identify the principles and components of the following brake systems.
a. Air
b. Parking
c. Anti-locking (ABS)
29.04 Troubleshoot brake systems.
29.05 Service and recondition air brake systems.
29.06 Service and adjust air compressors and governors.
29.07 Service and recondition parking brakes.
29.08 Troubleshoot and service hydraulic booster.

30.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

30.01 Demonstrate shop organization, management, and safety requirements for a brake maintenance technician.
30.02 Demonstrate the use of tools and equipment required for a brake technician.
30.03 Demonstrate workplace communication skills required by a brake technician.
30.04 Demonstrate the application of math and science principles required for a brake technician’s job tasks.
30.05 Demonstrate employability skills as a brake technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - F
DIESEL HYDRAULICS TECHNICIAN - INDUSTRY TITLE

31.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

31.01 For hydraulic technicians activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
31.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

32.0 MAINTAIN AND REPAIR BRAKE SYSTEM COMPONENTS--The student will be able to:

32.01 Explain the basic principles of hydraulics.
32.02 Identify and explain the operating components of hydraulic systems.
32.03 Locate and identify hydraulic units by their symbols on a diagram.
32.04 Troubleshoot hydraulic circuits using test equipment.
32.05 Maintain hydraulic fluids, filters, lines, and reservoirs.
32.06 Recondition the following:
a. Hydraulic pumps and motors
b. Control valves

c. Hydraulic cylinders
d. Hydraulic accessories

33.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

33.01 Demonstrate shop organization, management, and safety requirements for a hydraulic maintenance technician.
33.02 Demonstrate the use of tools and equipment required for an hydraulic technician.
33.03 Demonstrate workplace communication skills required by a hydraulic maintenance technician.
33.04 Demonstrate the application of math and science principles required for a hydraulic maintenance technician's job tasks.
33.05 Demonstrate employability skills as a hydraulic maintenance technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - G
DIESEL HEATING AND AIR-CONDITIONING TECHNICIAN - INDUSTRY TITLE

34.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

34.01 For all heating and air-conditioning technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
34.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

35.0 MAINTAIN AND REPAIR AIR-CONDITIONING AND HEATING SYSTEMS--The student will be able to:

35.01 Identify basic heating and air-conditioning components.
35.02 Identify different types of refrigerants.
35.03 Describe EPA requirements for handling recycled refrigerants.
35.04 Demonstrate the use of recovery and reclaim systems.
35.05 Inspect and pressure tests a basic air-conditioning (AC) system.
35.06 Inspect, remove, and replace compressor belts.
35.07 Leak-test a basic AC system.
35.08 Evaluate and charge a basic AC system using recovery equipment.
35.09 Service AC electrical circuits.
35.10 Service vacuum circuits.
35.11 Diagnose basic AC system problems.
35.12 Remove and replace components in basic AC systems.
35.13 Remove, repair, and replace engine fan clutches and controls.
35.14 Remove and replace blower motors.
35.15 Diagnose heater malfunctions.
35.16 Remove and replace heater cores, control units, and cables.

36.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

36.01 Demonstrate shop organization, management, and safety requirements for a heating and air-conditioning technician.
36.02 Demonstrate the use of tools and equipment required for an heating and air-conditioning technician.
36.03 Demonstrate workplace communication skills required by a heating and air-conditioning technician.

36.04 Demonstrate the application of math and science principles required for a heating and air-conditioning technician's job tasks.
36.05 Demonstrate employability skills as a preventive maintenance technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - H
DIESEL STEERING AND SUSPENSION TECHNICIAN - INDUSTRY TITLE

37.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

37.01 For all steering and suspension technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
37.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

38.0 MAINTAIN AND REPAIR STEERING AND SUSPENSION SYSTEMS--The student will be able to:

38.01 Troubleshoot and repair the following:
a. Conventional steering systems
b. Hydraulic steering systems
c. Rear-axle suspensions
d. Front-axle suspensions
e. Fifth wheels
38.02 Service wheels, bearings, hubs, and seals.
38.03 Service tires.
38.03 Align tractors.
38.04 Align trailers.

39.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

39.01 Demonstrate shop organization, management, and safety requirements for a steering and suspension technician.
39.02 Demonstrate the use of tools and equipment required for an steering and suspension technician.
39.03 Demonstrate workplace communication skills required by a steering and suspension maintenance technician.
39.04 Demonstrate the application of math and science principles required for a steering and suspension technician's job tasks.
39.05 Demonstrate employability skills as a steering and suspension maintenance technician.

OCCUPATIONAL COMPLETION POINT - DATA CODE - I
DIESEL DRIVE TRAIN TECHNICIAN - INDUSTRY TITLE

40.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

40.01 For all drive train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
40.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

41.0 MAINTAIN AND REPAIR POWER TRAIN SYSTEMS AND COMPONENTS--The student will be able to:

41.01 Explain power train operating principles and identify components.
41.02 Remove, replace, and adjust clutches.
41.03 Repair standard transmissions.
41.04 Troubleshoot power trains.
41.05 Service automatic transmissions.
41.06 Service and repair differentials.
41.07 Identify and service the following:
a. Drivelines
b. Power takeoffs
c. Transfer cases

42.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

42.01 Demonstrate shop organization, management, and safety requirements for a diesel drive train technician.
42.02 Demonstrate the use of tools and equipment required for an diesel drive train technician.
42.03 Demonstrate workplace communication skills required by a diesel drive train technician.
42.04 Demonstrate the application of math and science principles required for a diesel drive train technician’s job tasks.
42.05 Demonstrate employability skills as a diesel drive train technician.

FLORIDA DEPARTMENT OF EDUCATION
CURRICULUM FRAMEWORK

Program Title:	Heavy Equipment Mechanics
Occupational Area:	Industrial Education
	PSAV
Program Number	**I470302**
CIP Number	0647.030200
Grade Level	30, 31
Length	1740 Hours
Certification	DIESEL MECH @7 G

OCCUPATIONAL COMPLETION POINTS A, B, C, D, E, F, G, H will have been completed prior to OCP I

OCCUPATIONAL COMPLETION POINT - DATA CODE - I (300 hours)
DIESEL POWER TRAIN TECHNICIAN - INDUSTRY TITLE

43.0 Demonstrate shop and occupational safety procedures.
44.0 Identify the requirements for maintaining and repairing track systems.
45.0 Maintain and repair power train systems and components.
46.0 Troubleshoot and repair differentials, final drives and drive lines.
47.0 Demonstrate the qualifications for employment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - I
DIESEL POWER TRAIN TECHNICIAN - INDUSTRY TITLE

43.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

43.01 For all track system and power train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
43.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

44.0 IDENTIFY THE REQUIREMENTS FOR MAINTENANCE AND REPAIRING TRACK SYSTEMS--The student will be able to:

44.01 Identify types of track system components.
44.02 Describe common problems with track systems and components.
44.03 Explain methods for removing, installing, and aligning track assemblies.
44.04 Demonstrate methods for maintaining and repairing track systems.
44.05 Demonstrate methods for maintaining track assemblies, sprockets, bottom rollers, top rollers, and idler.

45.0 MAINTAIN AND REPAIR POWER TRAIN SYSTEMS AND COMPONENTS--The student will be able to:

45.01 Trouble shoot and repair components and assemblies of winches, clutches, and transmissions.
45.02 Describe common problems of operation of winches, clutches, and transmissions.
45.03 Remove, replace or rebuild, and adjust transmissions.

45.04 Remove, replace, and adjust push- and pull-type clutches.
45.05 Inspect flywheel surface for wear or cracks.
45.06 Replace pilot and clutch release bearing.
45.07 Rebuild and adjust manual transmission and linkage.

46.0 MAINTAIN AND REPAIR DIFFERENTIALS, FINAL DRIVES, AND DRIVETRAINS--The student will be able to:

46.01 Describe procedures to troubleshoot and repair final drive assemblies.
46.02 Inspect drive shaft for correct timing.
46.03 Replace universal joints.
46.04 Rebuild differential assembly.
46.05 Overhaul differential.

47.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

47.01 Demonstrate shop organization, management, and safety requirements for a diesel power train technician.
47.02 Demonstrate the use of tools and equipment required for an electrical and electronics technician.
47.03 Demonstrate workplace communication skills required by a diesel power train technician.
47.04 Demonstrate the application of math and science principles required for a diesel power train technician’s job tasks.
47.05 Demonstrate employability skills as a diesel power train technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 1
Course Number: 8742010
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

01.0 IDENTIFY SHOP ORGANIZATION, MANAGEMENT, AND SAFETY REQUIREMENTS--The student will be able to:

01.01 Identify basic shop organization and management regulations.
01.02 Identify required shop-safety practices.
01.03 Identify and describe shop-maintenance procedures, including precautions for handling and storing work-related chemicals and hazardous materials.

02.0 DEMONSTRATE INFECTION CONTROL PROCEDURES AND GENERAL SHOP SAFETY-The student will be able to:

02.01 Understand how bloodborne pathogens are spread and how to clean contamination on environmental surfaces.
02.02 Identify cleaning solutions that will kill the AIDS virus on environmental surfaces.
02.03 Practice general shop safety.

03.0 IDENTIFY THE BASIC DIESEL COMPONENTS AND FUNCTIONS--The student will be able to:

03.01 Identify types of bearings and their uses.
03.02 Identify seals, gaskets, and fasteners.
03.03 Identify drive power train components and functions.
03.04 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility.

04.0 DEMONSTRATE THE USE OF BASIC TOOLS AND EQUIPMENT--The student will be able to:

04.01 Identify and use the following correctly and safely:
a. Basic hand tools
b. Basic welding tools and equipment
c. Power tools
d. Measuring and precision tools.
04.02 Read a digital multimeter.

05.0 DEMONSTRATE WORKPLACE COMMUNICATION SKILLS--The student will be able to:

05.01 Locate information in technical literature, such as a manufacturer’s manual, in both print and computer versions.
05.02 Read, interpret, and apply information from parts and service manuals.
05.03 Read and follow written and oral instructions.

05.04 Read and interpret graphs, charts, diagrams, and tables commonly used in the diesel technology industry.
05.05 Answer and ask questions coherently and concisely.
05.06 Use basic keyboarding and computer skills.
05.07 Use industry-related computer software.
05.08 Interpret technical specification information and diagnose problems, both verbally and in writing.
05.09 Solve basic diesel technology problems by combining knowledge of diesel systems with technical information and diagnostic data.
05.10 Complete accurately the required information for journals, repair orders, invoices, time cards, job sheets, and forms.
05.11 Demonstrate telephone and interpersonal communication skills to accurately and courteously exchange information with customers, co-worker, and supervisors.

06.0 APPLY MATH SKILLS TO DIESEL TECHNOLOGY TASKS--The student will be able to:

06.01 Apply math skills commonly required for performing job duties in diesel technology occupations.
a. Recognize, identify, and make metric conversions.
b. Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
c. Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
d. Add, subtract, multiply, and divide using fractions, decimals, and whole numbers.
06.02 Determine the correct purchase price, including sales tax, for a materials list containing a minimum of six items.
06.03 Calculate federal, state, and local taxes.
06.04 Explain industry time standards, including the use of flat-rate information.

07.0 APPLY SCIENTIFIC PRINCIPLES COMMON TO DIESEL TECHNOLOGY OPERATIONS--The student will be able to:

07.01 Explain molecular action caused by temperature extremes, chemical reaction, and moisture content.
07.02 Interpret and draw reasonable conclusions from information provided in graphs, scales, and gauges.
07.03 Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
07.04 Read and interpret pressure measurement in terms of pounds per square inch (PSI), inches of mercury, and kilopascal (KPA).

08.0 DEMONSTRATE EMPLOYABILITY SKILLS FOR DIESEL TECHNOLOGY OCCUPATIONS--The student will be able to:

08.01 Describe the field of diesel technology, including working conditions and career opportunities.
08.02 Identify and demonstrate work habits of successful employees concerning
a. Quality of work
b. Work hours and schedule
c. Actions, initiative, teamwork, dependability, and responsible decision making
d. Self-control, responses to criticism, and relationships with customers and supervisors
e. Time management, cost effectiveness, and fair pricing

f. Personal hygiene, health habits, and professional appearance
g. Driving records, drug-free workplace, and industry policies
h. Methods of changing jobs

08.03 Conduct a job search and identify advanced training opportunities in diesel technology occupations, including specialized industry training.
08.04 Obtain information about different jobs on training and licensing requirements, bonding requirements, equipment needs, responsibilities, pay, benefits, work conditions, risks, and opportunities for advancement.
08.05 Identify information and documents that may be required when applying for a job.
08.06 Complete a job-application form correctly.
08.07 Demonstrate competence in job-interview techniques.
08.08 Demonstrate knowledge of the Florida “Right-to-Know” law, Florida Statutes, Chapter 442.

09.0 IDENTIFY ENTREPRENEURIAL OPPORTUNITIES IN THE DIESEL TECHNOLOGY INDUSTRY--The student will be able to:

09.01 Describe the meaning of entrepreneurship.
09.02 Describe the importance of entrepreneurship to the American economy.
09.03 Describe types of diesel technology businesses and list the advantages, disadvantages, and risks of business ownership.
09.04 Identify the necessary personal characteristics of a successful entrepreneur.
09.05 Identify the business skills needed to operate a small business efficiently and effectively.
09.06 Compare opportunities for starting a diesel technology business to other job opportunities in the industry.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 2
Course Number: 8742020
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

10.0 DEMONSTRATE SHOP AND OCCUPATIONAL PROCEDURES--The student will be able to:

- 10.01 Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
- 10.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.

11.0 IDENTIFY PRINCIPLES, ASSEMBLIES, AND SYSTEMS OF ENGINE OPERATION--The student will be able to:

- 11.01 Explain the basic principles in the operation of the four-stroke-cycle diesel engine.
- 11.02 Identify engine assemblies and systems.
- 11.03 Explain the operating principles of two-and four-stroke cycle engines.
- 11.04 Identify the components of two-and four-stroke-cycle engines.
- 11.05 Identify governor types and explain their operating principles.

12.0 TROUBLESHOOT AND REPAIR ENGINE SYSTEMS--The student will be able to:

- 12.01 Troubleshoot and repair cooling systems.
- 12.02 Troubleshoot and repair lubrication systems.
- 12.03 Troubleshoot and repair induction and exhaust systems.
- 12.04 Troubleshoot and repair diesel fuel-injection systems and components.
  - a. Inspect for operation and condition of the parts and systems, including fuel quality and consumption, safety shut-down devices, circuits, sensors, electronic governors, and flywheel.
  - b. Prime and bleed fuel-injection system.
  - c. Remove, test, and adjust injectors and nozzles.
  - d. Troubleshoot mechanical governors.
  - e. Remove, repair, and replace individual components as needed.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 3
Course Number: 8742030
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

13.0 REBUILD A CYLINDER-HEAD ASSEMBLY--The student will be able to:

- 13.01 Diagnose valve and head problems using the visual inspection method.
- 13.02 Diagnose valve and head problems using the compression-tester or cylinder air-pressure method.
- 13.03 Diagnose valve and head problems using the stethoscope method.
- 13.04 Disassemble engines.
- 13.05 Clean and inspect the heads for cracks, warpage, and injector sleeves.
- 13.06 Inspect the valve seat and check for warpage, burns, cracks, and stem and tip wear.
- 13.07 Grind valve seats and reface valves.
- 13.08 Check and inspect springs for free height, distortion, and installed height.
- 13.09 Adjust the valve lash.

14.0 REMOVE AND REPLACE CAMSHAFT ASSEMBLIES--The student will be able to:

- 14.01 Remove and inspect camshaft bearings and lifters.
- 14.02 Time valve-drive assemblies.

15.0 REBUILD A BLOCK ASSEMBLY--The student will be able to:

- 15.01 Remove the pistons from the rod assemblies.
- 15.02 Measure out-of-round and cylinder taper using a dial bore gauge or micrometer.
- 15.03 Check the piston pins and boss for wear.
- 15.04 Measure the piston ring lands width, out-of-round, and taper.
- 15.05 Measure the piston ring gap in a cylinder bore.
- 15.06 Install and fit the piston pins.
- 15.07 Check the rod-and-piston assembly alignment.
- 15.08 Remove and replace the rod bearings.
- 15.09 Hone and clean the cylinders.
- 15.10 Install rings on the pistons.
- 15.11 Measure and check the crankshafts with a micrometer.
- 15.12 Check the bearing bore with a telescope gauge.
- 15.13 Reassemble engines using a plastic gauge.
- 15.14 Install oil seals.
- 15.15 Check for end play.

16.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

16.01 Demonstrate the shop organization, management, and safety requirements for a diesel engine technician.
16.02 Demonstrate the use of tools and equipment required for a diesel engine technician.
16.03 Demonstrate workplace communication skills required by a diesel engine technician.
16.04 Demonstrate the application of math and science principles required for a diesel engine technician’s job tasks.
16.05 Demonstrate employability skills as a diesel engine technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 4
Course Number: 8742040
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

17.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

17.01 Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
17.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.

18.0 IDENTIFY AND APPLY ELECTRICAL PRINCIPLES RELATED TO DIESEL TECHNOLOGY--The student will be able to:

18.01 Explain the nature of electricity.
18.02 Analyze electrical circuits.
18.03 Work problems using Ohm’s and Kirchoff’s laws.
18.04 Explain magnetism and electromagnetic induction.
18.05 Explain applications of alternating current (AC).
18.06 Explain principles of direct current (DC) motors and generators.
18.07 Explain principles of AC motors.
18.08 Locate and match electrical units by their symbols on a wiring diagram.
18.09 Set up and use voltmeters, ammeters, and ohmmeters.

19.0 IDENTIFY AND APPLY ELECTRONIC PRINCIPLES RELATED TO DIESEL TECHNOLOGY--The student will be able to:

19.01 Explain the principles of diodes and rectifiers.
19.02 Explain the principles of voltage regulation and power supply circuits.
19.03 Explain the principles of transistors.
19.04 Explain the principles of the silicon-controlled rectifier (SCR).
19.05 Identify components of electronic systems and explain their functions.

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

20.01 Test and service the following:
a. Batteries
b. Instruments and gauges
20.02 Test and repair the following systems:
a. Starting

b. Charging
c. Ignition
d. Lighting and accessories

20.03 Inspect, remove, clean, and install batteries and cables for parallel and/or series hookups.
20.04 Install batteries correctly where two or more batteries are used.
20.05 Identify, diagnose, remove and replace electronic sensors.
20.06 Identify the methods for testing and repair of electronic governors.

21.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

21.01 Demonstrate shop organization, management, and safety requirements for an electrical and electronics technician.
21.02 Demonstrate the use of tools and equipment required for an electrical and electronics technician.
21.03 Demonstrate workplace communication skills required by an electrical and electronics technician.
21.04 Demonstrate the application of math and science principles required for an electrical and electronics technician’s job tasks.
21.05 Demonstrate employability skills as an electrical and electronics technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 5
Course Number: 8742050
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

22.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

22.01 For all preventive maintenance technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
22.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

23.0 PERFORM ENGINE PREVENTIVE MAINTENANCE--The student will be able to:

23.01 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer and company specifications.
23.02 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
23.03 Perform preventive-maintenance inspections and record results according to manufacturer and company specifications.
23.04 Demonstrate the ability to remove correctly an oil sample for analysis.

24.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

24.01 Demonstrate shop organization, management, and safety.
24.02 Demonstrate the use of tools and equipment required for a preventive maintenance technician.
24.03 Demonstrate workplace communication skills required by a preventive maintenance technician.
24.04 Demonstrate the application of math and science principles required for a preventive maintenance technician’s job tasks.
24.05 Demonstrate employability skills as a preventive maintenance technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 6
Course Number: 8742060
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

25.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

25.01 For all preventive maintenance technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
25.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

26.0 PERFORM EQUIPMENT PREVENTIVE MAINTENANCE--The student will be able to:

26.01 Identify the types of preventive maintenance, including oil analysis, required for components and systems, according to manufacturer and company specifications.
26.02 Schedule preventive-maintenance inspections at the miles and/or times required by manufacturer and company specifications.
26.03 Perform preventive-maintenance inspections and record results according to manufacturer and company specifications, including:
a. Air, parking, and anti-locking brake systems
b. Wheels, bearings, hubs, and tires
c. Heating and air-conditioning components, refrigerants, and system operations
d. Hydraulic systems, including fluids, filters, lines, and reservoirs
26.04 Test-drive equipment, where liability and safety allow such tests, and identify needed repairs.

27.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

27.01 Demonstrate shop organization, management, and safety requirements for a preventive maintenance technician.
27.02 Demonstrate the use of tools and equipment required for a preventive maintenance technician.
27.03 Demonstrate workplace communication skills required by a preventive maintenance technician.
27.04 Demonstrate the application of math and science principles required for a preventive maintenance technician’s job tasks.
27.05 Demonstrate employability skills as a preventive maintenance technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 7
Course Number: 8742070
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

28.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

- 28.01 For all Diesel Brakes Technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
- 28.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

29.0 MAINTAIN AND REPAIR BRAKE SYSTEMS--The student will be able to:

- 29.01 Explain the principles and identify components of hydraulic brake systems.
- 29.02 Service and recondition hydraulic brake systems.
- 29.03 Identify the principles and components of the following brake systems.
  - a. Air
  - b. Parking
  - c. Anti-locking (ABS)
- 29.04 Troubleshoot brake systems.
- 29.05 Service and recondition air brake systems.
- 29.06 Service and adjust air compressors and governors.
- 29.07 Service and recondition parking brakes.
- 29.08 Troubleshoot and service hydraulic booster.

30.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

- 30.01 Demonstrate shop organization, management, and safety requirements for a brake maintenance technician.
- 30.02 Demonstrate the use of tools and equipment required for an brake technician.
- 30.03 Demonstrate workplace communication skills required by a brake technician.
- 30.04 Demonstrate the application of math and science principles required for a brake technician’s job tasks.
- 30.05 Demonstrate employability skills as a brake technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 8
Course Number: 8742080
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

31.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

31.01 For hydraulic technicians activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
31.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

32.0 MAINTAIN AND REPAIR BRAKE SYSTEM COMPONENTS--The student will be able to:

32.01 Explain the basic principles of hydraulics.
32.02 Identify and explain the operating components of hydraulic systems.
32.03 Locate and identify hydraulic units by their symbols on a diagram.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 9
Course Number: 8742090
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

32.04 Troubleshoot hydraulic circuits using test equipment.
32.05 Maintain hydraulic fluids, filters, lines, and reservoirs.
32.06 Recondition the following:
- a. Hydraulic pumps and motors
- b. Control valves
- c. Hydraulic cylinders
- d. Hydraulic accessories

33.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

33.01 Demonstrate shop organization, management, and safety requirements for a hydraulic maintenance technician.
33.02 Demonstrate the use of tools and equipment required for an hydraulic technician.
33.03 Demonstrate workplace communication skills required by a hydraulic maintenance technician.
33.04 Demonstrate the application of math and science principles required for a hydraulic maintenance technician’s job tasks.
33.05 Demonstrate employability skills as a hydraulic maintenance technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 10
Course Number: 8742091
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

34.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

34.01 For all heating and air-conditioning technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
34.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

35.0 MAINTAIN AND REPAIR AIR-CONDITIONING AND HEATING SYSTEMS--The student will be able to:

35.01 Identify basic heating and air-conditioning components.
35.02 Identify different types of refrigerants.
35.03 Describe EPA requirements for handling recycled refrigerants.
35.04 Demonstrate the use of recovery and reclaim systems.
35.05 Inspect and pressure tests a basic air-conditioning (AC) system.
35.06 Inspect, remove, and replace compressor belts.
35.07 Leak-test a basic AC system.
35.08 Evaluate and charge a basic AC system using recovery equipment.
35.09 Service AC electrical circuits.
35.10 Service vacuum circuits.
35.11 Diagnose basic AC system problems.
35.12 Remove and replace components in basic AC systems.
35.13 Remove, repair, and replace engine fan clutches and controls.
35.14 Remove and replace blower motors.
35.15 Diagnose heater malfunctions.
35.16 Remove and replace heater cores, control units, and cables.

36.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

36.01 Demonstrate shop organization, management, and safety requirements for a heating and air-conditioning technician.
36.02 Demonstrate the use of tools and equipment required for an heating and air-conditioning technician.
36.03 Demonstrate workplace communication skills required by a heating and air-conditioning technician.

36.04 Demonstrate the application of math and science principles required for a heating and air-conditioning technician’s job tasks.
36.05 Demonstrate employability skills as a preventive maintenance technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 11
Course Number: 8742092
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

37.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

37.01 For all steering and suspension technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
37.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

38.0 MAINTAIN AND REPAIR STEERING AND SUSPENSION SYSTEMS--The student will be able to:

38.01 Troubleshoot and repair the following:
a. Conventional steering systems
b. Hydraulic steering systems
c. Rear-axle suspensions
d. Front-axle suspensions
e. Fifth wheels
38.02 Service wheels, bearings, hubs, and seals.
38.03 Service tires.
38.03 Align tractors.
38.04 Align trailers.

39.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

39.01 Demonstrate shop organization, management, and safety requirements for a steering and suspension technician.
39.02 Demonstrate the use of tools and equipment required for an steering and suspension technician.
39.03 Demonstrate workplace communication skills required by a steering and suspension maintenance technician.
39.04 Demonstrate the application of math and science principles required for a steering and suspension technician’s job tasks.
39.05 Demonstrate employability skills as a steering and suspension maintenance technician.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Occupational Area: Industrial Education
Program Title: Heavy Duty Truck and Bus
Course Title: Diesel Engine Service 12
Course Number: 8742093
Course Credit: 1

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

40.0 DEMONSTRATE SHOP AND OCCUPATIONAL SAFETY PROCEDURES--The student will be able to:

- 40.01 For all drive train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
- 40.02 Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment; and the handling, storage, and disposal of chemicals and hazardous materials.

41.0 MAINTAIN AND REPAIR POWER TRAIN SYSTEMS AND COMPONENTS--The student will be able to:

- 41.01 Explain power train operating principles and identify components.
- 41.02 Remove, replace, and adjust clutches.
- 41.03 Repair standard transmissions.
- 41.04 Troubleshoot power trains.
- 41.05 Service automatic transmissions.
- 41.06 Service and repair differentials.
- 41.07 Identify and service the following:
  - a. Drivelines
  - b. Power takeoffs
  - c. Transfer cases

42.0 DEMONSTRATE THE QUALIFICATIONS FOR EMPLOYMENT--The student will be able to:

- 42.01 Demonstrate shop organization, management, and safety requirements for a diesel drive train technician.
- 42.02 Demonstrate the use of tools and equipment required for an diesel drive train technician.
- 42.03 Demonstrate workplace communication skills required by a diesel drive train technician.
- 42.04 Demonstrate the application of math and science principles required for a diesel drive train technician’s job tasks.
- 42.05 Demonstrate employability skills as a diesel drive train technician.

PUNCHES

- pin, 3/16″ - 3/8″
- starter, 3/16″ - 3/8″
- aligning set
- brass
- center

safety glasses (per OSHA requirements)
scraper, 1″ wide or larger
screwdriver

- blade-type (1″, 6″, 9″, 12″, offset)
- Phillips (1″ - #1, #2; 6″ - #1, #2; 12″ - #3)
- Pozidriv offset (6″, 12″)
- Torx set (T-15, T-20, T-25, T-30)

socket set, 1/4″ drive

- 3/16″ - 5/8″ U.S. standard depth
- 3/16″ - 5/8″ U.S. deep
- 4 mm - 14 mm U.S. metric standard depth
- 4 mm - 14 mm U.S. metric deep
- extensions: short, medium, long
- ratchet handle
- universal joint

socket set, 3/8″ drive

- 1/4″ -7/8″ U.S. standard depth (12 point)
- 1/4″ - 7/8″ U.S. deep
- 8 mm - 19 mm metric standard depth (6 point)
- 8 mm - 19 mm metric deep (6 point)
- breaker bar
- extensions: short, medium, and long
- ratchet handle
- universal joint

socket set, 1/2″ drive

- 3/8″ - 1 and 1/8″ shallow, impact or chrome
- 7/16″ - 1 and 1/8″ deep, impact or chrome
- 10 mm - 32 mm shallow, impact or chrome
- 10 mm - 32 mm deep, impact or chrome
- breaker bar
- extensions: short, medium and long
- ratchet handle
- universal joint

tape measure (12’)
tire depth gauge
tire pressure gauge, truck
toolbox
wire brush

GENERAL LAB/SHOP EQUIPMENT

The tools and equipment on this list are used in general lab/shop work, but are not generally considered to be individual hand tools.

adjustable wrenches (up to 18″)
air blow gun, rubber tip (per OSHA requirements)
air jacks (bottle style)
air ratchet wrench: 3/8″ drive with socket set, standard and metric
arc welder
axle stands (10-ton minimum)
belt tension gauge
cleaning tank

combination wrench sets:

- 3/8″ - 1″ and 1/2″; 6 mm - 24 mm
- 3/8″ - 3/4″ offset (optional)

    7 mm - 15 mm offset (optional)
    computer scan tool, hand-held: on-board diagnostics level II (OBD) - trouble-code complaint (recommended)
coolant conditioner test kit
cooling system pressure tester
creepers
dial caliper, standard and metric
dial indicator set, magnetic base
drain pan
drill, 3/8″ and 1/2″ variable speed, reversible
drill bits, 1/16″ - 1/2″
easy outs (1 set)
feeler gauge, blade-type (.005″ and .005 - .070 mm)
filter wrenches, small and large
fin comb
floor jack (10 ton)
funnels
gear oil dispenser
grease gun
grinder, bench: 8″ minimum
hammers
    48 oz. ball peen
    24 oz. brass
    12 oz. hand sledge
hydraulic press with adapters (50-100 ton)
impact wrenches, 1/2″, 3/4″, and 1″ drives with sockets
impact universal joints, 3/8″ and 1/2″
lifting chains
lifting eyes
micrometer set
    standard (0″ - -6″)
    metric (0 mm - 150 mm)
micrometer
    inside (0″ - 6″)
    depth micrometer (0″ - 6″)
oilcan, pump-type
oxyacetylene system
pliers
    snap-ring--internal and external
    wheel weight
portable crane
porto power (10-on minimum)
pressure gauge, (0 - 300 psi and 0 - 3000 psi)
pry bar set
pullers, two-jaw set and three-jaw set
pyrometer
refractometer, antifreeze tester
seal puller
spring scale
socket set
    3/4″ drive
    Allen drivers, standard 3/16″ - 1/2″ and metric 4 mm - 12 mm)
    axle nut
    crow feet, standard and metric
    Torx drivers, T-15 through T-55
soldering gun
tap and die set, standard and metric
thermometer
thread chaser set
tire valve core remover
torque wrench
    3/8″ drive, 0 - 100 lb. ft. and 0 - 150 lb. in.
    1/2″ drive (0 - 250 lb. ft.)
    3/4″ drive (up to 600 lb. ft.)

transmission jack
truck tire chuck
tubing cutter/flaring set
vacuum gauge
wheel chocks
wheel dolly

SPECIALTY TOOLS AND EQUIPMENT

This section covers the tools and equipment a lab/shop should have for training in any given specialty area. This equipment is specialized and it must be available in the lab/shop. No specific type or brand names are identified because they will vary in each local situation.

Note: All shops are assumed to have an air compressor, air hoses, adequate electrical capability, fender covers, seat covers, and work benches with vises.

BRAKES

- bearing packer
- bearing race installer
- brake adjusting gauge
- brake bleeder
- brake rotor (disc) gauge
- brake shoe retaining spring tool
- brake spring tool, air, hydraulic type
- disc caliper tool for compressing caliper pistons
- drum brake gauge
- seal installers
- seal ring installers
- slack adjuster index tool (template)

DRIVE TRAIN

- aligning studs, 3/8″, 1/2″, and 5/8″
- axle-stud cone pliers
- blind hole puller
- clutch adjusting tool, double disc
- drive pinion nut sockets, 3/4″
- protractor, angle finder
- u-joint puller
- yoke puller

ELECTRICAL/ELECTRONIC SYSTEMS

- battery charger, 50-amp minimum
- battery terminal adapters
- component jumper wire set
- inductive ammeter, clamp-on
- instrument gauge tester
- jumper cable set
- starting and charging battery-load tester, 1,000 amp minimum
- terminal repair kits
- wiring diagrams

ENGINE TOOLS

- ball and hole gauges
- cam bearing remover/installer
- dial bore gauge
- diesel compression gauge
- engine pre-oilier
- engine stands
- fuel-injection nozzle pop-tester
- fuel-site gauge
- harmonic balance puller
- injector removal tool(s)

lift t-handles
liner installer, universal
liner puller
manometer, water
precision straight edge
protrusion gauge, cylinder liner height
radius gauge set
ring compressor
ring expander(s)
rod bolt protectors
slack tube or magnetic gauge
soft jaw vise
valve spring compressor
valve spring tester

GAS ENGINE TOOLS

compression gauge
EFI pressure gauge with adapters
four gas exhaust analyzer, bar 90 certified
fuel injector cleaner
IBM PC-compatible diagnostic/information terminal and/or engine analyzer with scope
injector pulse tester (NOID light)
magnetic timing meter or inductive pick-up timing light
oxygen sensor socket
spark plug boot (wire) remover
spark plug socket
spark plug thread tap

HEATING AND AIR-CONDITIONING

A/C repair unit
adapters
circuit testers
dispenser valves
hoses
leak detector
pullers
ratchet
removers
special feeler gauges
thermometer
vacuum pump, portable
A/C clutch pullers
charging adapter kit*****
charging station or weight scales and heat blanket
compressor oil dipstick
gloves

halogen leak detector (for CFCs and HFCs)*****
heater hose clamp-off tool
insulation tape for expansion valves
manifold gauge set*****
measuring cup
orifice tube remover
recovery and recycling equipment with two storage cylinders
refrigerant oil
spring-lock coupler remover
truck A/C manual: general service
valve-core replacement tool

PREVENTIVE MAINTENANCE TOOLS

seven-way trailer cord tester
stopwatch

truck maintenance inspection checklist

SUSPENSION AND STEERING

air hammer with chisels
alignment equipment (minimum to perform tasks)
drag link and shock tool
flow meter, power steering
pitman arm puller
tape measure (50’)
tools, those required to check tandem alignment
wheel balance, or means by which to determine out-of-balance

* Method for removing asbestos contamination (parts cleaner) meeting EPA standards

* The Clean Air Act requires separate A/C equipment to service vehicles with Refrigerant HFC-134a.