Florida Department of Education
Curriculum Framework

Program Title: **Heavy Equipment Service Technician**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T440100	
CIP Number	0647030201	
Grade Level	30, 31	
Program Length	1800 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Please see the CIP to SOC located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communication (Reading and Language Arts): 9

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 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.

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 nine occupational completion points.

When offered at the postsecondary level, 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	DIM0101	Diesel Engine Mechanic/Technician Helper	DIESEL MECH @7 7G	150 hours
B	DIM0102	Diesel Electrical and Electronics Technician		300 hours
C	DIM0103	Diesel Engine Preventative Maintenance Technician		150 hours
D	DIM0104	Diesel Engine Technician		300 hours
E	DIM0130	Diesel Brakes/Fluid Technician		300 hours
F	DIM0106	Diesel Heating and Air Conditioning Technician		150 hours
G	DIM0107	Diesel Steering and Suspension Technician		150 hours
H	DIM0108	Diesel Drivetrain Technician		150 hours
I	DIM0110	Diesel Power Train Technician		150 hours

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline, or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social, and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership, and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

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

01.0 Proficiently explain and apply required shop and personal safety tasks.
02.0 Identify the basic diesel components and functions.
03.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment.
04.0 Identify engine systems to include emission, principles of operation, and assemblies.
05.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
06.0 Demonstrate workplace employability skills related to personal standards and work habits/ethics.
07.0 Diagnose and repair general electrical systems to include CAN Bus systems.
08.0 Diagnose and repair battery systems.
09.0 Diagnose and repair starting systems.
10.0 Diagnose and repair charging systems.
11.0 Diagnose and repair lighting systems.
12.0 Diagnose and repair gauges and warning devices.
13.0 Diagnose and repair related electrical systems.
14.0 Diagnose and repair engine systems.
15.0 Diagnose and repair fuel system.
16.0 Diagnose and repair air induction and exhaust system.
17.0 Diagnose and repair cooling system.
18.0 Diagnose and repair lubrication system.
19.0 Diagnose and repair instruments and controls.
20.0 Diagnose and repair safety equipment.
21.0 Diagnose and repair hardware.
22.0 Diagnose and repair heating, ventilation, and air conditioning (HVAC)
23.0 Diagnose and repair air brake systems.
24.0 Diagnose and repair hydraulic brake systems.
25.0 Diagnose and repair drive train systems.
26.0 Diagnose and repair suspension and steering systems.
27.0 Diagnose and repair tires and wheels.
28.0 General engine diagnosis and repair.
29.0 Cylinder head and valve train diagnosis and repair.
30.0 Engine block diagnosis and repair.
31.0 Lubrication systems diagnosis and repair.
32.0 Cooling system diagnosis and repair.
33.0 Air induction and exhaust systems diagnosis and repair.
34.0 Fuel system diagnosis and repair.
35.0 Diagnose and repair engine brakes.
36.0 Diagnose and repair air supply and service systems.

37.0 Diagnose and repair mechanical/foundation air brake systems.
38.0 Diagnose and repair parking brakes.
39.0 Diagnose and repair hydraulic systems.
40.0 Diagnose and repair power assist units.
41.0 Diagnose and repair wheel bearings.
42.0 General hydraulic system diagnosis and repair.
43.0 Diagnose and repair hydraulic pumps.
44.0 Diagnose and repair hydraulic filtration/reservoirs (tanks).
45.0 Diagnose and repair hydraulic hoses, fittings, and connections.
46.0 Diagnose and repair hydraulic control valves.
47.0 Diagnose and repair hydraulic actuators.
48.0 HVAC systems diagnosis, service, and repair.
49.0 A/C system and component diagnosis, service, and repair.
50.0 Diagnose and repair compressor and clutch.
51.0 Diagnose and repair evaporator, condenser, and related components.
52.0 Heating and engine cooling systems diagnosis, service, and repair.
53.0 Electrical system diagnosis, service, and repair.
54.0 Air/vacuum/mechanical diagnosis, service, and repair.
55.0 Refrigerant recovery, recycling, and handling.
56.0 Steering column diagnosis, service, and repair.
57.0 Steering units' diagnosis, service, and repair.
58.0 Steering linkage diagnosis, service, and repair.
59.0 Suspension systems diagnosis and repair.
60.0 Wheels, tires, tracks (rubber and steel) diagnosis, service, and repair.
61.0 Clutch diagnosis and repair.
62.0 Transmission diagnosis and repair.
63.0 Driveshaft and universal joint diagnosis and repair.
64.0 Drive axle diagnosis and repair.
65.0 Demonstrate shop and occupational safety procedures.
66.0 Identify the requirements for maintaining and repairing track systems.
67.0 Maintain and repair power train systems and components.
68.0 Troubleshoot and repair differentials, final drives and drive lines.
69.0 Demonstrate the qualifications for employment.

Florida Department of Education
Student Performance Standards

Program Title: **Heavy Equipment Service Technician**
Career Certificate Program Number: **T440100**

Course Description: The Diesel Engine Mechanic/Technician Helper course prepares students for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop safety, infectious control, basic diesel components, tools and equipment, communication skills, math skills, scientific principles, employability skills, entrepreneurship, engine operation, and employment qualifications.

Course Number: DIM0101 **Occupational Completion Point: A** **Diesel Engine Mechanic/Technician Helper – 150 Hours**	
01.0	Proficiently explain and apply required shop and personal safety tasks. The student will be able to:
01.01	Identify basic shop organization and management regulations.
01.02	Identify and apply general and required shop safety rules and procedures.
01.03	Utilize safe procedures for handling of tools and equipment.
01.04	Identify proper load capacity and placement of floor jacks and jack stands.
01.05	Identify and use proper procedures for safe lift operation.
01.06	Utilize proper ventilation procedures for working within the lab/shop area.
01.07	Identify marked safety areas.
01.08	Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
01.09	Identify the location and use of eye wash stations.
01.10	Identify the location of the posted evacuation routes.
01.11	Comply with the required use of safety glasses, ear protection, gloves, aerial lifts, and shoes during lab/shop activities.
01.12	Identify and wear appropriate clothing for lab/shop activities.
01.13	Secure hair and jewelry for lab/shop activities.
01.14	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
01.15	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HDD) lamps, ignition systems, injection systems, etc.).

	01.16 Locate and demonstrate knowledge of Safety Data Sheets (SDS).
	01.17 Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
	01.18 Identify and comply with personal and environmental safety practices associated with the handling, storage, and disposal of chemicals and hazardous materials.
	01.19 Understand safe procedures for lifting, blocking, and cribbing equipment, along with use of overhead lifting devices.
02.0	Identify the basic diesel components and functions. The student will be able to:
	02.01 Identify types of bearings and their uses.
	02.02 Identify seals, gaskets, and fasteners.
	02.03 Identify drive power train components and functions.
	02.04 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility
03.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment. The student will be able to:
	03.01 Identify tools and their usage in heavy equipment applications.
	03.02 Demonstrate the ability to convert between different units of measurement.
	03.03 Demonstrate safe handling and use of appropriate tools.
	03.04 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
	03.05 Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper, etc.).
04.0	Identify engine systems to include emission, principles of operation, and assemblies. The student will be able to:
	04.01 Explain the basic principles in the operation of the four-stroke-cycle diesel engine
	04.02 Identify engine assemblies and systems (e.g., cooling, fuel, and emission systems).
	04.03 Identify the equipment of two-and-four-stroke-cycle engines.
	04.04 Identify governor types and their operating principles.
05.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services. The student will be able to:
	05.01 Identify information needed and the service requested on a repair order.
	05.02 Identify purpose and demonstrate use of wheel chocks, frame locks, and other machine maintenance safety devices.
	05.03 Demonstrate use of the three C’s (Concern, Cause, and Correction).
	05.04 Review vehicle service history.
	05.05 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, detailed description of diagnostics and corrective action.

05.06	Ensure equipment is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)
05.07	Demonstrate accurate, complete, and concise verbal communication throughout the repair process with Service Department/Customer.
06.0	Demonstrate workplace employability skills related to personal standards and work habits/ethics. The student will be able to:
06.01	Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.
06.02	Dresses appropriately and uses language and manners suitable for the workplace.
06.03	Maintains appropriate personal hygiene.
06.04	Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
06.05	Demonstrates honesty, integrity, and reliability.
06.06	Complies with workplace policies/laws
06.07	Contributes to the success of the team, assists others and requests help when needed.
06.08	Works well with all customers and coworkers.
06.09	Negotiates solutions to interpersonal and workplace conflicts.
06.10	Contributes ideas and initiative.
06.11	Follows directions.
06.12	Communicates (written and verbal) effectively with customers and coworkers.
06.13	Reads and interprets workplace documents; writes clearly and concisely.
06.14	Analyzes and resolves problems that arise in completing assigned tasks.
06.15	Organizes and implements a productive plan of work.
06.16	Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
06.17	Identifies and address the needs of all customers, providing helpful, courteous, and knowledgeable service and advice as needed.

Course Description: The Diesel Electrical and Electronics Technician course is designed to build on the skills and knowledge students learned in the Diesel Engine Mechanic/Technician Helper course for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts. Students study electrical systems diagnosis, battery systems, starting systems, charging systems, lighting systems, gauges and warning devices, and related electrical systems.

Course Number: DIM0102 Occupational Completion Point: B Diesel Electrical and Electronics Technician – 300 Hours	
07.0	Diagnose and repair general electrical systems to include CAN Bus systems. The student will be able to:

	07.01 Read and interpret electrical/electronic circuits using wiring diagrams.
	07.02 Check continuity in electrical/electronic circuits using appropriate test equipment.
	07.03 Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
	07.04 Check current flow in electrical/electronic circuits and components using appropriate test equipment.
	07.05 Check resistance in electrical/electronic circuits and components using appropriate test equipment.
	07.06 Locate shorts, grounds, and opens in electrical/electronic circuits.
	07.07 Diagnose parasitic (key-off) battery drain problems; perform tests; determine needed action.
	07.08 Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
	07.09 Inspect and test spike suppression devices; replace as needed.
	07.10 Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.
08.0	Diagnose and repair battery systems. The student will be able to:
	08.01 Identify battery type; perform appropriate battery load test; determine needed action.
	08.02 Determine 12- or 24-volt system, then verify battery state of charge using an open circuit voltage test.
	08.03 Inspect, clean, and service battery; replace as needed.
	08.04 Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
	08.05 Charge battery using appropriate method for battery type.
	08.06 Inspect, test, and clean battery cables and connectors; repair or replace as needed.
	08.07 Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.
	08.08 Perform battery capacitance test; determine needed action.
	08.09 Identify and test low voltage disconnect (LVD) systems; determine needed repair.
09.0	Diagnose and repair starting systems. The student will be able to:
	09.01 Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
	09.02 Inspect and test components (key switch, push button, relays, safety devices, and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed
	09.03 Inspect and test starter relays and solenoids/switches; replace as needed.
	09.04 Remove and replace starter; inspect flywheel ring gear or flex plate.
10.0	Diagnose and repair charging systems. The student will be able to:
	10.01 Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.

10.02	Identify causes of a no charge, low charge, or overcharge problems; determine needed action.
10.03	Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.
10.04	Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
10.05	Perform charging circuit voltage drop tests; determine needed action.
10.06	Remove and replace alternator.
10.07	Inspect, repair, or replace cables, wires, and connectors in the charging circuit.
11.0	Diagnose and repair lighting systems. The student will be able to:
11.01	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
11.02	Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
11.03	Identify the requirements of systems
11.04	Test, aim, and replace headlights.
11.05	Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
11.06	Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
11.07	Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
11.08	Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, low voltage disconnect (LVD), connectors, terminals, wires, and control components/modules; repair or replace as needed.
11.09	Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
11.10	Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
11.11	Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
11.12	Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires, and control components/modules; repair or replace as needed.
12.0	Diagnose and repair gauges and warning devices. The student will be able to:
12.01	Interface with vehicle's on-board computer; perform diagnostic procedure, verify instrument cluster operations using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
12.02	Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
12.03	Identify causes of data bus-driven gauge malfunctions; determine needed action.
12.04	Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.

12.05	Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.
12.06	Inspect, test, replace, and calibrate (if applicable) system monitoring units (e.g., electronic speedometer, odometer, and tachometer systems).
13.0	Diagnose and repair related electrical systems. The student will be able to:
13.01	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.
13.02	Identify causes of constant, intermittent, or no horn operation; determine needed action.
13.03	Inspect and test horn circuit relays, horns, switches, connectors, wires, clock springs, and control components/modules; repair or replace as needed.
13.04	Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
13.05	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires, and control components/modules; repair or replace as needed.
13.06	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
13.07	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.08	Inspect and test heater and A/C electrical components including A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.09	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
13.10	Inspect and test block heaters; determine needed repairs.
13.11	Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.
13.12	Identify causes of data bus communication problems; determine needed action.

Course Description: The Diesel Engine Preventative Maintenance Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine system, cab and hood systems, electrical/electronic systems, frame and chassis systems diagnostics, service, and repair.

For every task in Diesel Engine Preventative Maintenance Technician, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The tasks included in the Diesel Engine Preventative Maintenance Technician area are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning

PM Task List:
P-1 = 132
P-2 = 11
P-3 = 0
Total 143

environment. They are not intended to satisfy the Annual Federal Vehicle Inspection requirement as prescribed in the Federal Motor Carrier Safety Regulations, Part 396, Appendix G to Subchapter B, Minimum Periodic Inspection Standards.

The first task in Diesel Engine Preventative Maintenance Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

Course Number: DIM0103 Occupational Completion Point: C Diesel Engine Preventative Maintenance Technician – 150 Hours	**Priority Number**
12.0 Inspect and service engine systems record findings as needed. The student will be able to:	
12.01 Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.	P-1
12.02 Inspect vibration damper.	P-1
12.03 Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.	P-1
12.04 Check engine oil level and condition; check dipstick seal.	P-1
12.05 Inspect engine mounts for looseness and deterioration.	P-1
12.06 Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Off and Running).	P-1
12.07 Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.	P-1
12.08 Check electrical wiring, routing, and hold-down clamps, including Engine Control Module/Powertrain Control Module (ECM/PCM).	
13.0 Diagnose and repair fuel system. The student will be able to:	
13.01 Check fuel tanks, mountings, lines, caps, and vents.	P-1
13.02 Drain water from fuel system.	P-1
13.03 Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.	P-1
14.0 Diagnose and repair air induction and exhaust system. The student will be able to:	
14.01 Check exhaust system mountings for looseness and damage.	P-1
14.02 Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after treatment devices, if equipped.	P-1
14.03 Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.	P-1
14.04 Inspect turbocharger for leaks; check mountings and connections.	P-1
14.05 Check operation of engine compression/exhaust brake.	P-2

14.06 Service or replace air filter as needed; check and reset air filter restriction indicator.	P-1
14.07 Inspect and service crankcase ventilation system.	P-1
14.08 Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter (if equipped).	P-1
14.09 Inspect selective catalyst reduction (SCR) system; including diesel exhaust fluid (DEF) for proper levels, leaks, mounting and connections (if equipped).	P-2
15.0 Diagnose and repair cooling system. The student will be able to:	
15.01 Check operation of fan clutch.	P-1
15.02 Inspect radiator (including air flow restriction, leaks, and damage) and mountings.	P-1
15.03 Inspect fan assembly and shroud.	P-1
15.04 Pressure test cooling system and radiator cap.	P-1
15.05 Inspect coolant hoses and clamps.	P-1
15.06 Inspect coolant recovery system.	P-1
15.07 Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).	P-1
15.08 Service coolant filter (if equipped).	P-1
15.09 Inspect water pump.	P-1
16.0 Diagnose and repair lubrication system. The student will be able to:	
16.01 Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.	P-1
16.02 Take an engine oil sample for analysis.	P-1
17.0 Diagnose and repair instruments and control systems. The student will be able to:	
17.01 Inspect key condition and operation of ignition switch.	P-1
17.02 Check warning indicators.	P-1
17.03 Check instruments; record oil pressure and system voltage.	P-1
17.04 Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)	P-2
17.05 Check HVAC controls.	P-1
17.06 Check operation of all accessories.	P-1
17.07 Using electronic service tool(s) or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems).	P-1
17.08 Check mechanical and electronic engine speed controls (if equipped).	

18.0	Diagnose and repair safety equipment. The student will be able to:	
	18.01 Check operation of electric/air horns and back-up warning devices.	P-1
	18.02 Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.	P-1
	18.03 Inspect seat belts and sleeper restraints.	P-1
	18.04 Inspect wiper blades and arms.	P-1
19.0	Diagnose and repair hardware. The student will be able to:	
	19.01 Check operation of wiper and washer.	P-1
	19.02 Inspect windshield glass for cracks or discoloration; check sun visor.	P-1
	19.03 Check seat condition, operation, and mounting.	P-1
	19.04 Check door glass and window operation.	P-1
	19.05 Inspect steps, catwalks, and grab handles (if applicable).	P-1
	19.06 Inspect mirrors, mountings, brackets, and glass.	P-1
	19.07 Record all observed physical damage.	P-2
	19.08 Lubricate all cab and hood grease fittings.	P-2
	19.09 Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.	P-1
	19.10 Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.	P-1
	19.11 Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed.	
20.0	Diagnose and repair heating, ventilation, and air conditioning (HVAC). The student will be able to:	
	20.01 Inspect A/C condenser and lines for condition and visible leaks; check mountings.	P-2
	20.02 Inspect A/C compressor and lines for condition and visible leaks; check mountings.	P-2
	20.03 Check A/C system condition and operation; check A/C monitoring system, if applicable.	P-1
	20.04 Check HVAC air inlet filters and ducts; service as needed.	P-1
21.0	Diagnose and repair electrical/electronic battery and starting systems. The student will be able to:	
	21.01 Inspect battery box(es), cover(s), and mountings.	P-1
	21.02 Inspect battery hold-downs, connections, cables, and cable routing; service as needed.	P-1
	21.03 Check/record battery state-of-charge (open circuit voltage) and condition.	P-1
	21.04 Perform battery test (capacitance).	P-1

21.05 Inspect starter, mounting, and connections.	P-1
21.06 Engage starter; check for unusual noises, starter drag, and starting difficulty.	P-1
22.0 Diagnose and repair electrical/electronic charging systems. The student will be able to:	
22.01 Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.	P-1
22.02 Perform alternator output tests.	P-1
23.0 Diagnose and repair electrical/electronic lighting systems. The student will be able to:	
23.01 Check operation of interior lights; determine needed action.	P-1
23.02 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.	P-1
23.03 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.	P-1
24.0 Diagnose and repair air brake systems. The student will be able to:	
24.01 Check operation of parking brake.	P-1
24.02 Record air governor cut-in and cut-out setting (psi).	P-1
24.03 Check operation of air reservoir/tank drain valves.	P-1
24.04 Check air system for leaks (brakes released).	P-1
24.05 Check air system for leaks (brakes applied).	P-1
24.06 Test one-way and double-check valves.	P-1
24.07 Check low air pressure warning devices.	P-1
24.08 Check emergency (spring) brake control/modulator valve, if applicable.	P-1
24.09 Check tractor protection valve.	P-1
24.10 Test air pressure build-up time.	P-1
24.11 Inspect coupling air lines, holders, and gladhands.	P-1
24.12 Check brake chambers and air lines for secure mounting and damage.	P-1
24.13 Check operation of air drier.	P-1
24.14 Inspect and record brake shoe/pad condition, thickness, and contamination.	P-1
24.15 Inspect and record condition of brake drums/rotors.	P-1
24.16 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing	P-1
24.17 Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.	P-1

	24.18 Lubricate all brake component grease fittings.	P-1
	24.19 Check condition and operation of hand brake (trailer) control valve, if applicable.	P-2
	24.20 Perform antilock brake system (ABS) operational system self-test.	P-1
	24.21 Drain air tanks and check for contamination.	P-1
	24.22 Check condition of pressure relief (safety) valves.	P-1
25.0	Diagnose and repair hydraulic brake systems. The student will be able to:	
	25.01 Check master cylinder fluid level and condition.	P-1
	25.02 Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.	P-1
	25.03 Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.	P-1
	25.04 Check operation of hydraulic system: pedal travel, pedal effort, pedal feel.	P-1
	25.05 Inspect calipers for leakage, binding and damage.	P-1
	25.06 Inspect brake assist system (booster), hoses and control valves; check for leaks.	P-1
	25.07 Inspect and record brake lining/pad condition, thickness, and contamination.	P-1
	25.08 Inspect and record condition of brake rotors.	P-1
	25.09 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
	25.10 Check drum brakes for proper adjustment.	
26.0	Inspect, service and record drive train systems. The student will be able to:	
	26.01 Check operation of clutch, clutch brake, and gearshift.	P-1
	26.02 Check clutch linkage/cable for looseness or binding, if applicable.	P-1
	26.03 Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.	P-1
	26.04 Check clutch adjustment; adjust as needed.	P-1
	26.05 Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks.	P-1
	26.06 Inspect transmission breather.	P-1
	26.07 Inspect transmission mounts.	P-1
	26.08 Check transmission oil level, condition, determine proper type and service as needed.	P-1
	26.09 Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.	P-1
	26.10 Inspect axle housing(s) for cracks and leaks.	P-1

26.11 Inspect axle breather(s).	P-1
26.12 Lubricate all drivetrain grease fittings.	P-1
26.13 Check drive axle(s) oil level, condition, determine proper type, and service as needed.	P-1
26.14 Change drive axle(s) oil and filter/screen, if applicable; check and clean magnetic plugs.	P-2
26.15 Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.	P-1
26.16 Change transmission oil and filter, if applicable; check and clean magnetic plugs.	P-2
26.17 Check interaxle differential lock operation.	P-1
26.18 Check transmission range shift operation.	P-1
27.0 Diagnose and repair suspension and steering systems. The student will be able to:	
27.01 Check steering wheel operation for free play and binding.	P-1
27.02 Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.	P-1
27.03 Change power steering fluid and filter.	P-1
27.04 Inspect steering gear for leaks and secure mounting.	P-1
27.05 Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.	P-1
27.06 Check kingpins for wear.	P-1
27.07 Check wheel bearings for looseness and noise; adjust as necessary.	P-1
27.08 Check oil level and condition in all non-drive hubs; check for leaks.	P-1
27.09 Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.	P-1
27.10 Inspect shock absorbers for leaks and secure mounting.	P-1
27.11 Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.	P-1
27.12 Check and record suspension ride height.	P-1
27.13 Lubricate all suspension and steering grease fittings.	P-1
27.14 Check axle locating components (radius, torque, and/or track rods).	P-1
28.0 Diagnose and repair tires and wheels. The student will be able to:	
28.01 Inspect tires for wear patterns and proper mounting.	P-1
28.02 Inspect tires for cuts, cracks, bulges, and sidewall damage.	P-1
28.03 Inspect valve caps and stems; determine needed action.	P-1

	28.04 Measure and record tread depth; probe for imbedded debris.	P-1
	28.05 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.	P-1
	28.06 Check wheel mounting hardware condition; determine needed action.	P-1
	28.07 Inspect wheel/rims for proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-1
	28.08 Check tire matching (diameter and tread) on single and dual tire applications.	P-1
	28.09 Retorque lugs in accordance with manufacturer's specifications.	
29.0	Diagnose and repair frame and fifth wheel. The student will be able to:	
	29.01 Inspect fifth wheel mounting, bolts, air lines, and locks.	P-1
	29.02 Test operation of fifth wheel locking device; adjust if necessary.	P-1
	29.03 Check quarter fenders, mud flaps, and brackets.	P-1
	29.04 Check pintle hook assembly and mounting; if applicable.	P-2
	29.05 Lubricate all fifth wheel grease fittings and plate; if applicable	P-1
	29.06 Inspect frame and frame members for cracks and damage.	P-1

Course Description: The Diesel Engine Technician course is designed to build on the skills and knowledge students learned in the Diesel Engine Preventative Maintenance Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study engine diagnostics, cylinder head, valve train, engine block, lubrication, cooling, air induction, exhaust, fuel system diagnostics, and engine brakes.

Course Number: DIM0104 Occupational Completion Point: D Diesel Engine Technician – 300 Hours	
32.0	General engine diagnosis and repair. The student will be able to:
	32.01 Inspect fuel, oil, Diesel Exhaust Fluid (DEF) and coolant levels, and condition; determine needed action.
	32.02 Identify and diagnose the causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
	32.03 Listen and interpret engine noises; determine needed action.
	32.04 Observe engine exhaust smoke color and quantity; determine needed action.
	32.05 Check and diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
	32.06 Identify and diagnose causes of engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.

	32.07 Identify and diagnose engine vibration problems; determine needed action.
	32.08 Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.
	32.09 Perform air intake system restriction and leakage tests, CAC leak and Diff test; determine needed action.
	32.10 Perform intake manifold pressure (boost) test; determine needed action.
	32.11 Perform exhaust back pressure test; determine needed action.
	32.12 Perform cylinder compression test, interrupt the blowby measurement and determine needed action.
33.0	Cylinder head and valve train diagnosis and repair. The student will be able to:
	33.01 Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
	33.02 Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
	33.03 Measure valve head height relative to deck, valve face-to-seat contact; determine needed action.
	33.04 Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action.
	33.05 Inspect valve train components; determine needed action.
	33.06 Reassemble cylinder head.
	33.07 Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
	33.08 Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.
	33.09 Inspect and adjust valve bridges (crossheads); adjust valve clearances and injector settings.
	33.10 Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
	33.11 Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
	33.12 Inspect pushrods, rocker arms, rocker arm shafts, and blocked oil passages; perform needed action.
	33.13 Inspect cam followers; perform needed action.
34.0	Engine block diagnosis and repair. The student will be able to:
	34.01 Perform crankcase pressure test; determine needed action
	34.02 Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
	34.03 Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.
	34.04 Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.
	34.05 Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.

34.06	Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
34.07	Inspect in-block camshaft bearings for wear and damage; determine needed action.
34.08	Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
34.09	Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
34.10	Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
34.11	Inspect, install, and time gear train; measure gear backlash; determine needed action.
34.12	Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
34.13	Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
34.14	Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
34.15	Check condition of piston cooling jets (nozzles); determine needed action.
34.16	Inspect and measure crankshaft vibration damper; determine needed action.
34.17	Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
34.18	Inspect flywheel/flex-plate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.
35.0	Lubrication systems diagnosis and repair. The student will be able to:
35.01	Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit, test engine oil temperature and check operation of temperature sensor; determine needed action.
35.02	Check engine oil level, condition, and consumption; determine needed action.
35.03	Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
35.04	Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
35.05	Inspect, clean, and test oil cooler and components; determine needed action.
35.06	Inspect turbocharger lubrication system; determine needed action.
35.07	Determine proper lubricant and perform oil and filter change.
36.0	Cooling system diagnosis and repair. The student will be able to:
36.01	Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.
36.02	Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.

	36.03 Perform radiator temperature drop differential test.
	36.04 Diagnose overheat conditions, (e.g., faulty water pumps and restricted radiators.).
	36.05 Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
	36.06 Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
	36.07 Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
	36.08 Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
	36.09 Inspect water pump and hoses; replace as needed.
	36.10 Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action.
	36.11 Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
	36.12 Inspect turbo charger cooling systems; determine needed action.
37.0	Air induction and exhaust systems diagnosis and repair. The student will be able to:
	37.01 Perform air intake system restriction and leakage test; determine needed action.
	37.02 Perform intake manifold pressure (boost) test; determine needed action.
	37.03 Check exhaust back pressure; determine needed action.
	37.04 Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
	37.05 Inspect turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
	37.06 Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.
	37.07 Remove and reinstall turbocharger/wastegate assembly.
	37.08 Inspect intake manifold, gaskets, and connections; replace as needed.
	37.09 Inspect, clean, and test charge air cooler assemblies; replace as needed.
	37.10 Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
	37.11 Inspect exhaust after treatment devices, perform after-treatment regeneration tests; determine necessary action.
	37.12 Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
	37.13 Inspect exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
38.0	Fuel system diagnosis and repair. The student will be able to:
	38.01 Fuel supply system
	• Check fuel level, and condition; determine needed action.

• Perform fuel supply and return system tests; determine needed action.
• Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
• Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
• Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
• Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
• Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
• Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
• Inspect and adjust throttle control linkage; determine needed action.
• Inspect air/fuel ratio control systems; determine needed action.
• Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
38.02 Electronic fuel management system
• Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multi-meter (DMM); determine needed action.
• Interface with vehicle's on-board computer; perform diagnostic procedures using electronic service tool(s) (to include PC based software and/or data scan tools); determine needed action.
• Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.
• Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
• Inspect and replace electrical connector terminals, seals, and locks.
• Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
• Using electronic service tool(s) access and interpret customer programmable parameters.
• Perform on-engine inspections, test, and adjustments on electronic unit injectors (EUI); determine needed action
• Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
• Perform cylinder contribution test utilizing electronic service tool(s).
• Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.
• Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control systems; determine needed action.

	• Perform on-engine inspections and tests on high pressure common rail (HPCR) type injection systems; determine needed action.
	• Inspect high pressure injection lines, hold downs, fittings, and seals; determine needed action.
	• Perform engine timing sensor calibration (if applicable).
	• Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action.
	• Perform on-engine inspections and tests on in-line type injection pump electronic controls; determine needed action.
39.0	Diagnose and repair engine brakes. The student will be able to:
39.01	Inspect and adjust engine compression/exhaust brakes; determine needed action.
39.02	Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; determine needed action.
39.03	Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.

Course Description: The Diesel Brakes/Fluid Technician course is designed to build on the skills and knowledge students learned for entry into the Heavy Equipment industry. Content emphasizes beginning skills and concepts. Students study air and hydraulic brakes/fluid systems.

Course Number: DIM0130 Occupational Completion Point: E Diesel Brakes/Fluid Technician – 300 Hours	
36.0	Diagnose and repair air supply and service systems. The student will be able to:
36.01	Identify and diagnose poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.
36.02	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
37.0	Diagnose and repair mechanical/foundation air brake systems. The student will be able to:
37.01	Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.
37.02	Inspect and measure brake shoes or pads; perform needed action.
37.03	Inspect and measure brake drums or rotors; perform needed action.
38.0	Diagnose and repair parking brakes. The student will be able to**:**
38.01	Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
38.02	Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
38.03	Inspect and test parking (spring) brake application and release valve; replace as needed.
38.04	Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.

	38.05 Identify and test anti compounding brake function.
39.0	Diagnose and repair hydraulic systems. The student will be able to:
	39.01 Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
	39.02 Inspect hydraulic system brake lines for leaks and damage, flexible hoses, and fittings for leaks and damage; replace as needed.
	39.03 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
	39.04 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; repair or replace as needed.
	39.05 Inspect/test/interpret fluid analysis; bleed and/or flush system; determine proper fluid type.
	39.06 Perform brake accumulator performance test.
	39.07 Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
	39.08 Inspect and measure rotors; perform needed action.
	39.09 Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
	39.10 Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
	39.11 Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action.
40.0	Diagnose and repair power assist units. The student will be able to:
	40.01 Identify and diagnose stopping problems caused by the brake assist (booster) system; determine needed action.
	40.02 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
	40.03 Check emergency (back-up, reserve, and accumulators) brake assist system.
41.0	Diagnose and repair wheel bearings. The student will be able to:
	41.01 Clean, inspect, lubricate, and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings. Verify end play with dial indicator method.
42.0	General hydraulic system diagnosis and repair. The student will be able to:
	42.01 Identify system type (closed and open) and verify proper operation.
	42.02 Read and interpret system diagrams and schematics.
	42.03 Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
	42.04 Verify placement of equipment /component safety labels and placards; determine needed action.
43.0	Diagnose and repair hydraulic pumps. The student will be able to:
	43.01 Identify system fluid type.

	43.02 Identify causes of pump failure, unusual pump noises, temperature flow, and leakage problems; determine needed action.
	43.03 Determine pump type, rotation, and drive system.
	43.04 Remove and install pump; prime and/or bleed system.
	43.05 Inspect pump inlet for restrictions and leaks; determine needed action.
	43.06 Inspect pump outlet for restrictions and leaks; determine needed action.
44.0	Diagnose and repair hydraulic filtration/reservoirs (tanks). The student will be able to:
	44.01 Identify type of filtration system; verify filter application and flow direction.
	44.02 Service filters and breathers.
	44.03 Identify causes of system contamination; determine needed action.
	44.04 Take a hydraulic oil sample for analysis.
	44.05 Check reservoir fluid level and condition; determine needed action.
	44.06 Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
45.0	Diagnose and repair hydraulic hoses, fittings, and connections. The student will be able to:
	45.01 Diagnose causes of component leakage, damage, and restriction; determine needed action.
	45.02 Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
	45.03 Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.
	45.04 Inspect and replace fitting seals and sealants.
46.0	Diagnose and repair hydraulic control valves. The student will be able to:
	46.01 Pressure test system safety relief valve; determine needed action.
	46.02 Perform control valve operating pressure and flow tests; determine needed action.
	46.03 Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
	46.04 Identify causes of control valve leakage problems (internal/external); determine needed action.
	46.05 Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
47.0	Diagnose and repair hydraulic actuators. The student will be able to:
Comply with manufacturers' and industry accepted safety practices associated with equipment lock out/tag out; pressure line release; implement/support (blocked or resting on ground); and articulated cylinder devices/machinery safety locks.	
	47.01 Identify actuator type (single/double acting, multi-stage/telescopic, and motors).
	47.02 Identify the cause of seal failure; determine needed repairs.

47.03	Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
47.04	Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
47.05	Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.
47.06	Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
47.07	Purge and/or bleed system in accordance with manufacturers' recommended procedures.

Course Description: The Diesel Heating and Air Conditioning Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study diagnostic, service, and repair of HVAC, and A/C systems.

For every task in Diesel Heating and Air Conditioning Technician, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The first task in Diesel Heating and Air Conditioning Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

HV Task List:
P-1 = 31
P-2 = 17
P-3 = 10
Total 58

Course Number: DIM0106 Occupational Completion Point: F Diesel Heating and Air Conditioning Technician – 150 Hours		**Priority Number**
42.0	HVAC systems diagnosis, service, and repair. The student will be able to:	
42.01	Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.	P-1
42.02	Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.	P-1
42.03	Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.	P-1
42.04	Retrieve diagnostic codes; determine needed action.	P-3
43.0	A/C system and component diagnosis, service, and repair. The student will be able to:	
43.01	Identify causes of temperature control problems in the A/C system; determine needed action.	P-1
43.02	Identify refrigerant and lubricant types; check for contamination; determine needed action.	P-1
43.03	Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed	P-1

	action.	
43.04	Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.	P-1
43.05	Perform A/C system leak test; determine needed action.	P-1
43.06	Recover, evacuate, and recharge A/C system using appropriate equipment.	P-1
43.07	Identify contamination in the A/C system components; determine needed action.	P-3
43.08	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
44.0	Diagnose and repair compressor and clutch. The student will be able to:	
44.01	Identify and diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.	P-1
44.02	Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.	P-2
44.03	Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.	P-1
44.04	Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.	P-2
44.05	Inspect and correct A/C compressor lubricant level (if applicable).	P-2
44.06	Inspect, test, or replace A/C compressor.	P-1
44.07	Inspect, repair, or replace A/C compressor mountings and hardware.	P-2
45.0	Diagnose and repair evaporator, condenser, and related components. The student will be able to:	
45.01	Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.	P-1
45.02	Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.	P-1
45.03	Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.	P-1
45.04	Inspect and replace receiver/drier or accumulator/drier.	P-1
45.05	Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.	P-3
45.06	Remove and replace orifice tube.	P-1
45.07	Inspect and test cab/sleeper evaporator core; determine needed action.	P-3
45.08	Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.	P-1
45.09	Identify and inspect A/C system service ports (gauge connections); determine needed action.	P-1

	45.10 Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.	P-2
46.0	Heating and engine cooling systems diagnosis, service, and repair. The student will be able to:	
	46.01 Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.	P-1
	46.02 Diagnose window fogging problems; determine needed action.	P-2
	46.03 Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.	P-1
	46.04 Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.	P-1
	46.05 Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.	P-1
	46.06 Inspect water pump; determine needed action.	P-1
	46.07 Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.	P-2
	46.08 Recover, flush and refill with recommended coolant/additive package; bleed cooling system.	P-1
	46.09 Inspect thermostatic cooling fan system (pneumatic and electronic) and fan shroud; replace as needed.	P-2
	46.10 Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.	P-2
	46.11 Inspect and flush heater core; determine needed action.	P-3
47.0	Electrical system diagnosis, service, and repair. The student will be able to:	
	47.01 Identify causes of HVAC electrical control system problems; determine needed action.	P-1
	47.02 Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.	P-2
	47.03 Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.	P-2
	47.04 Inspect and test A/C related electronic engine control systems; determine needed action.	P-2
	47.05 Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	47.06 Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.	P-2
	47.07 Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.	P-2
	47.08 Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.	P-2
48.0	Air/vacuum/mechanical diagnostics, service, and repair. The student will be able to:	
	48.01 Identify causes of HVAC air and mechanical control problems; determine needed action.	P-3

	48.02 Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.	P-3
	48.03 Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.	P-3
	48.04 Inspect and test HVAC system actuators and hoses; determine needed action.	P-3
	48.05 Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.	P-3
NOTE: Tasks 1 through 5 should be accomplished in accordance with appropriate EPA regulations and SAE "J" standards.		
49.0	Refrigerant recovery, recycling, and handling. The student will be able to:	
	49.01 Maintain and verify correct operation of certified equipment.	P-1
	49.02 Identify and recover A/C system refrigerant.	P-1
	49.03 Recycle or properly dispose of refrigerant.	P-1
	49.04 Handle, label, and store refrigerant.	P-1
	49.05 Test recycled refrigerant for non-condensable gases.	P-1
	49.06 Demonstrate knowledge of federal requirements for the handling of refrigerants.	

Course Description: The Diesel Steering and Suspension Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study diagnostic, service, and repair of steering, suspension, wheel alignment, wheels, tires, and frame systems.

For every task in Diesel Steering and Suspension Technician, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The first task in Diesel Steering and Suspension Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

SS Task List:
P-1 = 23
P-2 = 14
P-3 = 8
Total 45

Course Number: DIM0107 Occupational Completion Point: G Diesel Steering and Suspension Technician – 150 Hours		**Priority Number**
50.0	Steering column diagnosis, service, and repair. The student will be able to:	
	50.01 Identify and diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.	P-1
	50.02 Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.	P-1

	50.03 Check cab mounting and adjust ride height.	P-2
	50.04 Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. Inspect, test, replace and calibrate steering angle sensor.	P-1
	50.05 Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.	P-1
51.0	Steering units diagnosis, service, and repair. The student will be able to:	
	51.01 Identify and diagnose power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.	P-1
	51.02 Determine recommended type of power steering fluid; check level and condition; determine needed action.	P-1
	51.03 Flush and refill power steering system; purge air from system.	P-2
	51.04 Perform power steering system pressure, temperature, and flow tests; determine needed action.	P-3
	51.05 Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.	P-2
	51.06 Inspect power steering pump drive gear and coupling; replace as needed.	P-3
	51.07 Inspect, adjust, or replace power steering pump, mountings, and brackets.	P-3
	51.08 Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.	P-2
	51.09 Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.	P-2
52.0	Steering linkage diagnosis, service, and repair. The student will be able to:	
	52.01 Inspect and align pitman arm; replace as needed.	P-1
	52.02 Check and adjust steering (wheel) stops; verify relief pressures.	P-1
	52.03 Inspect and lubricate steering components.	P-1
	52.04 Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.	
	52.05 Inspect steering arm and levers, and linkage pivot joints; replace as needed.	
	52.06 Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.	
53.0	Suspension systems diagnosis, service, and repair. The student will be able to:	
	53.01 Inspect front axles and attaching hardware; determine needed action.	P-1
	53.02 Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.	P-1
	53.03 Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.	P-1

	53.04 Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.	P-1
	53.05 Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.	P-1
	53.06 Inspect tandem suspension equalizer components; determine needed action.	P-3
	53.07 Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.	P-1
	53.08 Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.	P-1
	53.09 Measure and adjust vehicle ride height; determine needed action.	P-1
	53.10 Identify rough ride problems; determine needed action.	P-3
	53.11 Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.	
54.0	Wheel alignment diagnosis, adjustment, and repair. The student will be able to:	
	54.01 Identify and diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problems; adjust or repair as needed.	P-1
	54.02 Check camber; determine needed action.	P-2
	54.03 Check caster; adjust as needed.	P-2
	54.04 Check and adjust toe settings.	P-1
	54.05 Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.	P-2
	54.06 Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.	P-3
	54.07 Check front axle alignment (centerline); adjust or repair as needed.	P-2
55.0	Wheels and tires diagnosis, service, and repair. The student will be able to:	
	55.01 Identify and diagnose tire wear patterns; check tread depth and pressure; determine needed action.	P-1
	55.02 Identify and diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.	P-2
	55.03 Remove and install steering and drive axle wheel/tire assemblies; torque mounting hardware to specifications with a torque wrench.	P-1
	55.04 Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.	P-2
	55.05 Inspect wheel/rims for flaws, proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-2
	55.06 Check operation of tire pressure monitoring system (TPMS); determine needed action if applicable.	P-3
56.0	Frame and coupling diagnosis, service, and repair. The student will be able to:	

56.01	Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.	P-1
56.02	Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.	P-2
56.03	Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.	P-1
56.04	Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.	P-3
56.05	Inspect, repair or replace pintle hooks and draw bars, if applicable.	P-2

Course Description: The Diesel Drivetrain Technician course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study diagnostic, service, and repair of clutch, transmission, driveshaft, universal joint, and drive axle systems.

For every task in Diesel Drivetrain Technician, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The first task in Diesel Drivetrain Technician is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

DT Task List:	
	P-1 = 27
	P-2 = 18
	P-3 = 12
Total	**57**

Course Number: DIM0108 Occupational Completion Point: H Diesel Drivetrain Technician – 150 Hours		**Priority Number**
57.0	Clutch diagnosis and repair. The student will be able to:	
57.01	Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.	P-1
57.02	Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.	P-1
57.03	Inspect, adjust, repair, and replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.	P-2
57.04	Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.	P-1
57.05	Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.	P-1
57.06	Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.	P-1

57.07	Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.	P-1
57.08	Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.	P-1
57.09	Inspect and replace pilot bearing.	P-1
57.10	Remove and reinstall flywheel, inspect mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.	P-1
57.11	Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.	P-1
57.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.	P-2
58.0	Transmission diagnosis and repair. The student will be able to:	
58.01	Identify causes of transmission noise, shifting concerns, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.	P-1
58.02	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.	P-2
58.03	Inspect and replace transmission mounts, insulators, and mounting bolts.	P-1
58.04	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.	P-1
58.05	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.	P-1
58.06	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.	P-2
58.07	Remove and reinstall transmission.	P-1
58.08	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.	P-3
58.09	Inspect transmission oil filters and coolers and related components; replace as needed.	P-2
58.10	Inspect speedometer components; determine needed action.	P-2
58.11	Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.	P-3
58.12	Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.	P-1
58.13	Inspect and test transmission temperature gauge, wiring harnesses and sensor/sending unit; determine needed action.	P-2
58.14	Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU) neutral/in gear and reverse switches, and wiring harnesses; determine needed action.	P-2
58.15	Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.	P-2

	58.16 Use appropriate electronic service tool(s) and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.	P-1
	58.17 Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.	P-2
	58.18 Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.	P-2
	58.19 Use appropriate electronic service tool(s) and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multi-meter (DMM) readings; determine needed repairs.	P-3
	58.20 Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.	
	58.21 Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.	
	58.22 Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.	
	58.23 Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.	
	58.24 Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.	
	58.25 Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).	
	58.26 Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.	
	58.27 Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.	
	58.28 Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.	
59.0	Driveshaft and universal joint diagnosis and repair. The student will be able to:	
	59.01 Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.	P-1
	59.02 Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; driveshaft boots and seals, and retaining hardware; check phasing of all shafts.	P-1
	59.03 Inspect driveshaft center support bearings and mounts; determine needed action.	P-1
	59.04 Measure drive line angles; determine needed action.	P-1
60.0	Drive axle diagnosis and repair. The student will be able to:	
	60.01 Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.	P-2

60.02	Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.	P-1
60.03	Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.	P-1
60.04	Remove and replace differential carrier assembly.	P-2
60.05	Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.	P-3
60.06	Inspect and replace components of locking differential case assembly.	P-3
60.07	Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.	P-3
60.08	Measure ring gear runout; determine needed action.	P-2
60.09	Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.	P-3
60.10	Measure and adjust drive pinion bearing preload.	P-3
60.11	Measure and adjust drive pinion depth.	P-3
60.12	Measure and adjust side bearing preload and ring gear backlash.	P-2
60.13	Check and interpret ring gear and pinion tooth contact pattern; determine needed action.	P-2
60.14	Inspect, adjust, or replace ring gear thrust block/bolt.	P-3
60.15	Inspect power divider (inter-axle differential) assembly; determine needed action.	P-3
60.16	Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.	P-2
60.17	Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.	P-3
60.18	Inspect and replace drive axle shafts.	P-1
60.19	Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.	P-1
60.20	Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.	P-1
60.21	Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.	P-2
60.22	Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. Verify end play with dial indicator method	P-1

Course Description: The Diesel Power Train Technician course is designed to build on the skills and knowledge students learned in the Diesel Drivetrain Technician course for entry into the Heavy Equipment industry. Content emphasizes beginning skills. Students study shop safety procedures, track systems, power trains, components, and qualifications for employment.

Course Number: DIM0110 Occupational Completion Point: I Diesel Power Train Technician – 150 Hours	
65.0	Demonstrate shop and occupational safety procedures. The student will be able to:
65.01	For all track system and power train technician activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.
65.02	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.
66.0	Identify the requirements for maintenance and repairing track systems.--The student will be able to:
66.01	Identify types of track system components.
66.02	Describe common problems with track systems and components.
66.03	Explain methods for removing, installing, and aligning track assemblies.
66.04	Demonstrate methods for maintaining and repairing track systems.
66.05	Demonstrate methods for maintaining track assemblies, sprockets, bottom rollers, top rollers, and idler.
66.06	Perform undercarriage measurements and specification comparison for wear life percentage.
67.0	Maintain and repair power train systems and components. The student will be able to:
67.01	Troubleshoot and repair components and assemblies of winches, clutches, and transmissions.
67.02	Describe common problems of operation of winches, clutches, and transmissions.
67.03	Remove, replace or rebuild, and adjust transmissions.
67.04	Remove, replace, and adjust push- and pull-type clutches.
67.05	Inspect flywheel surface for wear or cracks.
68.0	Maintain and repair differentials, final drives, and drivetrains. The student will be able to:
68.01	Describe procedures to troubleshoot and repair final drive assemblies; remove and replace as needed.
68.02	Inspect drive shaft for correct timing.
68.03	Replace universal joints.

	68.04 Rebuild differential assembly.
	68.05 Overhaul differential.
69.0	Demonstrate the qualifications for employment. The student will be able to:
	69.01 Demonstrate shop organization, management, and safety requirements for a diesel power train technician.
	69.02 Demonstrate the use of tools and equipment required for an electrical and electronics technician.
	69.03 Demonstrate workplace communication skills required by a diesel power train technician.
	69.04 Demonstrate the application of math and science principles required for a diesel power train technician's job tasks.
	69.05 Demonstrate employability skills as a diesel power train technician.

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)

SkillsUSA is the co-curricular career and technical student organization(s) 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.

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.