

Diesel Technology Program Elements
 January 2023

Career Cluster: Transportation - Pathway: Diesel Services							
Principles		CTE Concentrator A		CTE Concentrator B		Pathway Capstone	
7216	Principles of Diesel Services	7210	Diesel Steering and Brakes	7211	Diesel Transmissions	7221	Diesel Services Capstone

7216 Principles of Diesel Services	
Course Description	<i>This course introduces the maintenance requirements and procedures of modern diesel engines and medium and heavy-duty trucks. Proper procedures and requirements for the Federal Highway Safety Inspection (DOT) will be discussed and practiced. In addition, this course gives students an overview of the electrical operating systems of the modern automobile. Students will be introduced to the safety and operation of equipment and tools used in the electrical diagnosis and repair in the automotive electrical industry. Students will study the fundamentals of electricity and automotive electronics.</i>
Pre/Co Req	None
Credits	Credits: 2 semester course, 2 semesters required, 1 credit per semester, 2 credits maximum
Counts Toward	Counts as a directed elective or elective for all diplomas
VU Courses	DESL 110 - Diesel Electrical; DESL 110L - Diesel Electrical Lab

CONTENT STANDARDS AND COMPETENCIES	
Competency #	Competency
Domain	<i>Preventive Maintenance</i>
7216.D1.1	Identify Proper shop safety practices while in the labs
7216.D1.2	Identify tools, equipment, & fasteners used in truck repair.
7216.D1.3	Identify and explain how the truck repair industry is structured.
7216.D1.4	Identify and explain operation of the major systems of the trucks.
7216.D1.5	Identify and explain what EPA, CAFÉ, FMCSR, CDL, and NHTSA regulations are and how they affect the transportation industry.
7216.D1.6	Perform complete FMC annual inspection of tractors and trailers.
7216.D1.7	Examine maintenance requirements and procedures for heavy duty trucks.

7216.D1.8	Change oil and filters and lubricate the complete chassis.
7216.D1.9	Perform CDL pre-trip inspections.
7216.D1.10	Perform the CDL air brake leak down safety test and inspection.
7216.D1.11	Attain readiness to take Torque exams.
7216.D1.12	Attain readiness to take the SP/2 Mechanical Safety exam.
7216.D1.13	Attain readiness to take the SP/2 Pollution Prevention exam.
Domain	Basic Electrical
7216.D2.1	Demonstrate safe shop practices while working with electrical systems.
7216.D2.2	Describe the basic laws of electricity and circuit construction.
7216.D2.3	Identify Electrical symbols and components.
7216.D2.4	Calculate resistance, current, and voltage problems using Ohms Laws.
7216.D2.5	Perform voltage, current, and resistance measurements using the proper measurement devices.
7216.D2.6	Perform voltage drop testing on multiplex and non-multiplex circuits.
7216.D2.7	Perform basic battery testing and diagnosis.
7216.D2.8	Identify starting and charging system components and circuits.
7216.D2.9	Diagnose starting and charging system faults.
7216.D2.10	Attain readiness to take the Snap On 504 Multimeter exam.
7216.D2.11	Demonstrate safe shop practices while working with electrical systems.
7216.D2.12	Describe the basic laws of electricity and circuit construction.
7216.D2.13	Identify Electrical symbols and components.
7216.D2.14	Calculate resistance, current, and voltage problems using Ohm's Laws.
7216.D2.15	Perform voltage, current, and resistance measurements using the proper measurement devices.
7216.D2.16	Perform voltage drop testing on multiplex and non-multiplex circuits.
7216.D2.17	Perform basic battery testing and diagnosis.
7216.D2.18	Identify starting and charging system components and circuits.
7216.D2.19	Diagnose starting and charging system faults.
7216.D2.20	Attain readiness to be certified to use an industry standard multimeter or fluke meter (e.g. Snap-On EEDM504B4).

SAMPLE ACTIVITIES			
Domain	Technical Skills	Activity	Assessment / Evaluation
<i>Inspection and Preventive Maintenance</i>	<ul style="list-style-type: none"> • Student performs engine and powertrain inspection and preventive maintenance. • Student performs full vehicle service including tire rotation inspection. • Student performs proper use for tools and identifications. • Student performs frame and chassis inspection and preventive maintenance. • Student performs electrical systems inspection and preventive maintenance. 	<ul style="list-style-type: none"> • Identify proper shop safety practices while in the labs. • Perform a step-by-step complete service. • Conduct D.O.T Inspection. • Change oil and filters and lubricate the complete service. • Perform CDL pre-trip. • Learn the different types of tools and practice identifying them. • Time the students for the work they perform. 	<ul style="list-style-type: none"> • Completing a D.O.T inspection form. • Final Test on Google form on Safety. • CDX Chapter 4. • Filling out service Records. • 100 tool ID test. • 100 parts ID test. • Grading on flat rate.
<i>Basic Electrical</i>	<ul style="list-style-type: none"> • Student performs starting/charging system service, diagnosis and repair. • Student performs general electrical system service, diagnosis and repair. • Student understands test tools, such as scan tools and voltages, AMPs, and resistance. 	<ul style="list-style-type: none"> • What role does electricity play in how to repair a diesel engine? • Be able to explain the relationship between relays, fuses, charging systems, batteries, starters, and how they work. • Testing a Battery with a load tester. • Wiring up all basics on test board from key switch to the starter, alternator to the battery, turn signals, brakes, trailer brakes, and horn. 	<ul style="list-style-type: none"> • Use the electrical test board. • Testing on multimeter. • Quiz on Cranking amps. • Testing on solenoids and relays. • Quiz on gauge of wire. • CDX Section 2 Electrical Systems, Ch. 8-26.

7210 Diesel Steering and Brakes	
Course Description	<i>This course studies steering, and suspension systems commonly used on modern tractors and trailers. Study will include steering and suspension components, power steering units, alignment theory and procedures, tire repair and service, and wheel balancing. Diagnosis, repair, and servicing of components including modern air suspension systems will be emphasized. Additionally, this course will cover theory, service, and repair of medium and heavy truck brake systems and their components. Emphasis is given to air brakes and their theory of operation, repair, and service of system components. Spring brakes and anti-lock systems will be studied on tractors and trailers.</i>
Pre/Co Req	Principles of Diesel Technology
Credits	Credits: 2 semester course, 2 semesters required, 1 credit per semester, 2 credits maximum
Counts Toward	Counts as a directed elective or elective for all diplomas
VU Courses	

CONTENT STANDARDS AND COMPETENCIES	
Competency #	Competency
Domain	<i>Steering and Suspensions</i>
7210.D1.1	Identify tools used for steering and suspension repair.
7210.D1.2	Disable supplemental restraint systems in accordance with manufacturers' procedures.
7210.D1.3	Diagnose power steering systems and determine need for replacement.
7210.D1.4	Diagnose steering and suspension components to determine need for replacement.
7210.D1.5	Remove and replace steering and suspension components.
7210.D1.6	Describe steering and alignment geometry.
7210.D1.7	Perform pre-alignment checks according to industry standards.
7210.D1.8	Diagnose rear suspension system and determine needed service or repair.
7210.D1.9	Check and adjust all alignment angles and measurements.
7210.D1.10	Inspect, rotate, mount, and balance tires.
7210.D1.11	Repair tire leaks.
7210.D1.12	Inspect, service, and replace front leaf spring bushings, pins, and shackles.
7210.D1.13	Inspect and service air springs.

7210.D1.14	Inspect, diagnose, and repair air ride systems.
7210.D1.15	Inspect and service kingpins.
Domain	Brakes
7210.D2.1	Demonstrate proper shop safety practices while using brake tools and equipment.
7210.D2.2	Use and identify tools and equipment used to repair brake systems.
7210.D2.3	Identify and explore operation, construction, and nomenclature of braking system components including hydraulic, air, and mechanical control devices.
7210.D2.4	Use safety procedures while servicing caged spring brake systems.
7210.D2.5	Diagnose and repair ABS and traction control systems on tractors and trailers.
7210.D2.6	Diagnose, service, and repair air brake systems.
7210.D2.7	Test and service air supply and storage circuits.
7210.D2.8	Perform air brake leak down test.
7210.D2.9	Inspect, test, and repair air brake lines and hoses.
7210.D2.10	Replace drive axle bearings, hubs, axle shafts, seals, and wheel studs.

SAMPLE ACTIVITIES			
Domain	Technical Skills	Activity	Assessment / Evaluation
Steering and Suspensions	<ul style="list-style-type: none"> • Student performs steering service, diagnosis, and repair. • Student performs suspension service, diagnosis. • Student performs computer/electronic system service, diagnosis, and repair. • Student performs wheel and tire service, diagnosis, and repair. 	<ul style="list-style-type: none"> • Replace steering components on test truck. • Adjust and align front end. • Align truck with alignment rack. • CDX 27-32 Section 3. • Change three different sizes of tires and balance them. 	<ul style="list-style-type: none"> • CDX Quiz 27-32. • Google form Quiz. • Hands-on tire test. • Tire quiz.
Brakes	<ul style="list-style-type: none"> • Student performs air brakes diagnostics and repair. • Student performs hydraulic brake service, diagnosis. 	<ul style="list-style-type: none"> • Use the school for demonstration. • Hands-on labs. • Locate the key components for the air brake system on test semi, name them and discuss their purpose. • Assemble and reassemble a master cylinder and wheel cylinder. • Bleed brakes. • CDX 33-39. 	<ul style="list-style-type: none"> • Pop quiz. • CDX section 3. • Chapter 33-39 quiz. • Hands on test. • Hydraulic brake Quiz.

7211 Diesel Transmissions	
Course Description	<i>This course explores theory, diagnosis, and overhaul procedures related to manual transmissions and differentials. Course includes service of twin countershaft, under-drive, overdrive, power-dividers, and air shift systems. Additionally, this course Studies precision tools, equipment, and procedures needed to repair modern diesel engines. Repair, proper assembly, and component identification are studied along with service of removable cylinder liners.</i>
Pre/Co Req	Principles of Diesel Technology
Credits	Credits: 2 semester course, 2 semesters required, 1 credit per semester, 2 credits maximum
Counts Toward	Counts as a directed elective or elective for all diplomas
VU Courses	

CONTENT STANDARDS AND COMPETENCIES	
Competency #	Competency
Domain	<i>Transmissions</i>
7211.D1 .1	Demonstrate proper shop safety practices while repairing transmissions and drivetrains.
7211.D1 .2	Identify tools, equipment, and pullers used in the repair of manual drive trains.
7211.D1 .3	Identify and describe the function of manual drive train parts and components
7211.D1 .4	Diagnose shifting related concerns.
7211.D1 .5	Disassemble, inspect, determine needed action, and reassemble manual transmissions
7211.D1 .6	Diagnose, repair, or replace air shift controls.
7211.D1 .7	Tear down, inspect, and set-up a differential assembly to specifications.
7211.D1 .8	Inspect power divider assembly, determine needed action.
7211.D1 .9	Demonstrate power flow of a manual transmission and transaxle.
7211.D1 .10	Diagnosis, service, replace, and adjust a double clutch system.
7211.D1 .11	Diagnose slipping, incorrect shifting, and abnormal noise caused by the clutch system.
7211.D1 .12	Inspect flywheel and bell housing alignment
7211.D1 .13	Inspect, service, and replace universal joints, yokes, and shafts.

SAMPLE ACTIVITIES			
Domain	Technical Skills	Activity	Assessment / Evaluation
Transmission	<ul style="list-style-type: none"> • Student performs a standard automatic transmission service filter and fluid change. • Students perform a tear down on a manual transmission. • Student understands the purpose and functions of heating and air flow components as they relate to heavy trucks. 	<ul style="list-style-type: none"> • Disassemble transmission and discuss the operations. • CDX section 4 chapter 40-57. • Disassemble and assemble a manual transmission. 	<ul style="list-style-type: none"> • CDX section 4 40-57 Quiz. • Hands on test. • Transmission tool ID.

7221 Diesel Services Capstone	
Course Description	<i>This course further explores important skills and competencies within the Diesel Technology Pathway. Topics such as Truck Climate Control Systems, Diesel Engine Performance, HT Electrical Systems, Hd Truck Auto. Transmission and Heavy Truck Electronics. Additionally, Co Op and Internship opportunities will be available for students.</i>
Pre/Co Req	Principles of Diesel Technology; Diesel Steering and Brakes; Diesel Transmission
Credits	Credits: 2 semester course, 2 semesters required, 1 credit per semester, 2 credits maximum
Counts Toward	Counts as a Directed Elective or Elective for all diplomas Counts as a quantitative reasoning course*
VU Courses	DESL 130 - Diesel Engine Systems; DESL 130L - Diesel Engine Systems Lab
Promoted Certifications	ASE T2; ASE T4-T6; ASE T8

CONTENT STANDARDS AND COMPETENCIES	
Competency #	Competency
Domain	Engine Repair
7221.D1.1	Demonstrate proper shop safety practices while overhauling and repairing engines.
7221.D1.2	Identify tools and equipment used in engine repair.
7221.D1.3	Inspect and determine serviceability of cylinder head according to manufacturer specifications.
7221.D1.4	Inspect and determine serviceability of cylinder block according to recommended manufacturer specifications.
7221.D1.5	Adjust or measure valve and engine brake clearance.
7221.D1.6	Install camshaft according to manufacturer specifications.
7221.D1.7	Inspect connecting rods and pistons.
7221.D1.8	Measure the crankshaft and determine serviceability.
7221.D1.9	Diagnose and or repair of the oil lubrication system.
7221.D1.10	Install piston rings according to manufacturer specifications.
7221.D1.11	Install connecting rod and main bearings according to manufacturer specifications.
7221.D1.12	Assemble engines according to industry standards.

7221.D1.13	Time camshaft and components to manufacturer specifications.
7221.D1.14	Inspect cooling system and components for needed repair.
7221.D1.15	Perform injector replacement procedures.
7221.D1.16	Remove and reinstall the cylinder liner and check and adjust protrusion.
7221.D1.17	Clean engine procedures
Domain	Engine Performance
7221.D2.1	Demonstrate proper shop safety practices and around high-pressure fuel lines.
7221.D2.2	Identify tools used in Diesel Engine Performance.
7221.D2.3	Diagnose, test, and replace fuel system components including mechanical injectors.
7221.D2.4	Diagnose, test, and service intake and exhaust systems.
7221.D2.5	Identify key emission systems.
7221.D2.6	Use diagnostic scan tools to pull codes, set parameters, and inspect sensor values.
7221.D2.7	Diagnose, test, and service sensors and actuators.
7221.D2.8	Test, inspect, and service turbo systems.
7221.D2.9	Inspect and service engine brake systems.
7221.D2.10	Test and repair bus communication systems.
Domain	HT Electrical Systems
7221.D3.1	Demonstrate safe shop practices while working with electrical systems.
7221.D3.2	Identify the diagnostic equipment used for computer controlled truck and diesel systems.
7221.D3.3	Explain and diagnose advanced truck and diesel electrical system networks.
7221.D3.4	Utilize scan tools, lab scopes, and other electronic diagnostic equipment.
7221.D3.5	Identify and access engine computer control sensors and systems.
7221.D3.6	Identify and diagnose body computer systems.
7221.D3.7	Identify and diagnose anti-lock brake and traction control systems.
7221.D3.8	Identify and diagnose advanced active and passive restraint systems.
7221.D3.9	Identify and diagnose various electrical control systems.
7221.D3.10	Identify and diagnose multi-battery starting and charging systems.

7221.D3.11	Identify and diagnose warning indicator systems, lighting, and dash gauge systems.
Domain	<i>HT Climate Control</i>
7221.D4.1	Demonstrate proper handling of refrigerants.
7221.D4.2	Identify tools and equipment used in climate control systems.
7221.D4.3	Identify all components of the heating and air conditioning system.
7221.D4.4	Explain the purpose and function of the heating and air conditioning systems.
7221.D4.5	Explain refrigeration theory.
7221.D4.6	Diagnose service and repair heating and air conditioning components.
7221.D4.7	Recover and recycle refrigerants using approved equipment.
7221.D4.8	Demonstrate knowledge of Auxiliary Power Units used for climate control systems.
7221.D4.9	Explain trailer refrigeration principles.

SAMPLE ACTIVITIES			
Domain	Technical Skills	Activity	Assessment / Evaluation
Engine Repair	<ul style="list-style-type: none"> • Student performs general engine service, diagnosis and repair. • Student performs fuel system service, diagnosis and repair. • Students perform cooling system service, diagnosis, and repair. • Student understands concepts of air conditioning and refrigerants as they relate to heavy trucks. 	<ul style="list-style-type: none"> • Hands-on teardown in groups, discuss all parts of engine, measure parts, discuss tolerances, and set the valves. • Measuring with micrometers. • Tearing down all the different fuel systems and understanding what they are and how they work. • Rebuild water pump and looking inside of radiator and intercooler. 	<ul style="list-style-type: none"> • CDX Engine Section III 9-13 chapter. • Hands-on test on plastic gauge the clearances and adjust valves. • Torque head bolts and following the right sequence. • Test on testing fuel pressure.
Engine Performance	<ul style="list-style-type: none"> • Student performs the basic troubleshooting tasks to check the performance of an engine. 	<ul style="list-style-type: none"> • Using scan tools. • Fuel pressure test. • Checking and finding air in the fuel system. 	<ul style="list-style-type: none"> • Small review test on performance and fuel systems.
HT Electrical Systems	<ul style="list-style-type: none"> • Student performs starting/charging system service, diagnosis and repair. • Student performs general electrical system service, diagnosis and repair. • Student understands test tools, such as scan tools and voltages, AMPs, and resistance. 	<ul style="list-style-type: none"> • What role does electricity play in how to repair a diesel engine? • Be able to explain the relationship between relays, fuses, charging systems, batteries, starters, and how they work. • Testing a Battery with a load tester. • Wiring up all basics on test board from key switch to the starter, alternator to the battery, turn signals, brakes, trailer brakes, and horn. 	<ul style="list-style-type: none"> • Use the electrical test board. • Testing on multimeter. • Quiz on Cranking amps. • Testing on solenoids and relays. • Quiz on gauge of wire. • CDX Section 2 Electrical Systems, Ch. 8-26.
HT Climate Control	<ul style="list-style-type: none"> • Student performs a basic understanding of the concepts of air conditioning and refrigerants as they relate to heavy trucks. • Student performs a basic understanding of the purpose and functions of the heating and air flow components as they relate to heavy trucks. 	<ul style="list-style-type: none"> • Basic hands-on identifying components of heating and air. • Use CDX Section 5 sample activities. 	<ul style="list-style-type: none"> • CDX Section 5 Heating, Ventilation, and Air Conditioning, Ch. 58-60.