COURSE OUTLINE: CVC615 - FUEL SYSTEMS

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Course Code: Title	CVC615: FUEL SYSTEMS
Program Number: Name	6080: COMM VEHICLE-COMMON
Department:	MOTIVE POWER APPRENTICESHIP
Academic Year:	2024-2025
Course Description:	Upon successful completion the apprentice is able to describe the fundamentals of diesel fuel, is able to inspect engine fuel systems, is able to recommend repairs to diesel fuel sub-systems, is able to recommend repairs to injectors - all according to manufacturers recommendations.
Total Credits:	3
Hours/Week:	0
Total Hours:	24
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
Essential Employability Skills (EES) addressed in this course:	EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 10 Manage the use of time and other resources to complete projects.
General Education Themes:	Science and Technology
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	Grade Definition Grade Point Equivalent A+ 90 100% 4.00 A 80 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 59% 1.00 F (Fail) 49% and below 0.00

CR (Credit) Credit for diploma requirements has been awarded.
S Satisfactory achievement in field /clinical placement or non-graded subject area.
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR Grade not reported to Registrar`s office.
W Student has withdrawn from the course without academic penalty.

Books and Required Resources:

Medium/Heavy Duty Truck Engines, Fuels and Computerized Management Systems by Sean Bennett
Publisher: cengage Edition: 5

Course Outcomes and Learning Objectives:

Course Outcome 1	**Learning Objectives for Course Outcome 1**
Upon successful completion, the apprentice is able to describe the fundamentals of diesel fuel following manufacturers` recommendations.	Upon successful completion, the apprentice is able to: 5.1.1 Explain the purpose and fundamentals of fuels. [2/0] - engine theory - thermodynamics - heat energy/calorific value - combustion ratios - fuel chemistry 5.1.2 Identify the functions, composition, and properties of fuels. [3/0] - diesel fuel - volatility - cetane number - viscosity - additives - sulphur content - gasoline - octane ratings - additives - compressed natural gas - propane - alternative fuels - bio-diesel 5.1.3 Describe the combustion principles of fuels. [1/0] - oxidation reactions - products of combustion - air/fuel ratios
Course Outcome 2	**Learning Objectives for Course Outcome 2**
Upon successful completion, the apprentice is able to inspect engine fuel systems following manufacturers`	Upon successful completion, the apprentice is able to: 5.2.1 Explain the purpose and fundamentals of fuel systems. [1/0] - hydraulics - engine operating principles

	recommendations.	- the Diesel and Otto cycle - cylinder combustion dynamics 5.2.2 Identify the functions, composition features, types, and application of fuel system components. [1/0] - fuel system circuit layout - fuel sub-systems - pressure injection apparatus - combustion chamber types - indirect injection - direct injection - hydromechanical engine management - electronic engine management - identifying fuel systems by type 5.2.3 Describe the combustion principles of fuels. [2/0] - types of low and high pressure pumps - indirect injection - direct injection - ignition timing, cylinder pressure, and crank throw mechanics 5.2.4 Perform inspection and testing procedures following manufacturers` recommendations for fuel systems. [0/1] - identify fuel circuit components on different engines - demonstrate the external differences between mechanical and electronic engine fuel systems  5.2.5 Recommend reconditioning or repairs following manufacturers` recommendations for fuel systems. [0/1] - identify different OEM engines and fuel systems - use OEM service information systems
	Course Outcome 3	**Learning Objectives for Course Outcome 3**
	Upon successful completion, the apprentice is able to recommend repairs to diesel fuel subsystems following manufacturers` recommendations.	Upon successful completion, the apprentice is able to: 5.3.1 Explain the purpose and fundamentals of diesel fuel sub-systems. [1/0] - hydraulics - diesel fuel injection - the Diesel cycle 5.3.2 Identify the construction, composition, types, and application of diesel fuel sub-systems. [2/0] - diesel fuel classification

	- fuel tanks - venting apparatus - pick-up tubes and sending units - primary fuel circuit and primary fuel filters - anti-siphon valves - water separators - transfer pumps - secondary (charge) fuel circuit and secondary fuel filters - fuel manifolds - fuel return circuit - leak-off pipes - fuel hose types and grades - crossover plumbing - bleeding devices - fuel heaters - water in fuel sensors (WIF) - charge pressure sensors - fuel temperature sensors - fuel coolers 5.3.3 Describe the principles of operation of diesel fuel sub-systems. [1/0] - heat exchangers - primary and secondary filters - vane, plunger and gear type pumps - pressure relief valves - vent valves - rollover check valves - coolant and electrical fuel heaters - priming fuel sub-systems 5.3.4 Perform the inspection and testing procedures following manufacturers` recommendations for diesel engine fuel sub-systems. [0/1] - inspection and testing procedures for: - identifying deteriorated fuel - testing primary circuit restriction to specification - testing secondary (charge) circuit pressure to specification - testing a fuel sending unit 5.3.5 Recommend reconditioning or repairs following manufacturers`````````` `` recommendations for diesel engine fuel sub-systems. [0/1] - service procedures: - fuel filter replacement - prime a fuel sub-system
Course Outcome 4	**Learning Objectives for Course Outcome 4**
Upon successful completion, the apprentice	Upon successful completion, the apprentice is able to: 5.4.1 Explain the purpose and fundamentals of diesel engine

	is able to recommend repairs to injectors following manufacturers` recommendations.	injectors. [1/0] - high pressure fuel injection - hydraulics - pressure and sectional area - requirements for combustion of liquid fuels - combustion characteristics - indirect injection - direct injection 5.4.2 Identify the functions, construction features, composition, types, and application of diesel engine injectors. [1/0] - electro hydraulic nozzles - electronic unit injectors (EUI) - common rail - hydraulic nozzles - poppet nozzles - pintle nozzles - multi-orifii nozzles - mechanical unit injectors (MUI) - electronic unit injectors (EUI) - hydraulic electronic unit injectors (HEUI) - high pressure pipes - leak-off lines - fuel manifolds 5.4.3 Describe the principles of operation of diesel engine injectors. [2/0] - electro hydraulic nozzles - soft opening control - solenoid actuators - piezo actuators - pintle nozzles - multi-orifii nozzles - hydraulic nozzles - mechanical unit injectors (MUI) - electronic unit injector (EUI) - hydraulic electronic unit injectors (HEUI) - nozzle flow area and pressure - atomization requirements of engine by type - nozzle differential ratio - variable control orifice nozzle principle - pressure wave reflection 5.4.4 Demonstrate the inspection and testing procedures following manufacturers` recommendations for diesel injectors. [0/2] - nozzle body service - nozzle opening pressure (NOP) testing

	- nozzle opening pressure (NOP) adjustment - testing for forward leakage, back leakage, and spray pattern geometry - identifying the effects of nozzle malfunction on engine components

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
practical application testing	25%
theory testing	75%

Date: November 12, 2024

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.