VEHICLE FUEL SYSTEM MAINTENANCE

UNIT CODE: 0716 451 9A

TVET CDACC UNIT CODE: ENG/CU/AUT/CR/01/5/MA

UNIT DURATION: 120 Hours

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Maintain Vehicle Fuel System

Unit Description

This unit specifies competencies required to maintain vehicle engine. It involves Servicing Vehicle Fuel injection system, Servicing vehicle Intake-Exhaust system, carrying out vehicle engine diagnosis and Performing vehicle fuel system tune up

Summary of Learning Outcomes

S/No.	Learning Outcomes	Duration (Hours)
1.	Service Vehicle Fuel injection system	30
2.	Service vehicle Intake-Exhaust system.	20
3.	Carry out vehicle engine diagnosis	20
4.	Perform vehicle fuel system tune up	20
5.	Fuel system intelligence	30
	TOTAL	120

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Service Vehicle Fuel injection system	1.1 Work area organization and safety measures 1.1.1 Importance of a well-organized work area 1.1.2 Safety measures 1.1.3 Emergency procedures 1.1.4 Housekeeping	• Practical • Project • Portfolio of evidence • Third party report • Written tests

	practices 1.1.5 Waste disposal 1.2 Fuel system construction and operation 1.2.1 Petrol fuel system 1.2.2 Diesel fuel system 1.3 Petrol injection systems 1.3.1 K jetronic 1.3.2 KE jetronic 1.3.3 D jetronic 1.3.4 LE Jetronic 1.3.5 L jetronic 1.4 Layout 1.4.1 Throttle body injection system 1.4.2 Multipoint injection system 1.4.3 Direct petrol injection (GDI) 1.5 Diesel injection systems 1.5.1 Direct injection 1.5.2 Indirect injection 1.6 Fuel system service tools and equipment 1.6.1 Uses and maintenance practices 1.7 Fuel system diagnosis and remedies 1.7.1 Short circuit 1.7.2 Open circuits 1.7.3 Engine control unit malfunction	

	1.7.4 Pressure fluctuations 1.8 Fuel system inspection 1.8.1 Serviceability 1.8.2 Leakages 1.8.3 Clogging 1.8.4 Spray pattern 1.9 Fuel system components service/replacement 1.9.1 Fuel filter 1.9.2 Fuel injector 1.9.3 Fuel pump 1.9.4 Blockage 1.9.5 Injector nozzles 1.10 Fuel system re installation checks 1.10.1 Fuel lines 1.10.2 Pressure check 1.10.3 Injector functionality 1.10.4 Leak checks 1.10.5 ECU and sensors 1.11 Fuel system service documentation 1.11.1 Customer details and vehicle details 1.11.2 Over view of fuel system condition and service report	
2. Service vehicle intake-Exhaust system	2.1 Functions of intake- exhaust system 2.2 Exhaust system components 2.2.1 catalytic converter 2.2.2 Oxygen sensor	• Practical • Project • Portfolio of evidence • Third party report • Written tests

	2.2.3 Muffler / Silencers 2.2.4 Manifold 2.2.5 Air filter 2.2.6 Tail pipe 2.2.7 Turbo chargers 2.2.8 Super chargers 2.3 Exhaust system faults 2.4 Intake-exhaust system tools, equipment and materials 2.5 Intake exhaust system diagnosis 2.6 Intake Exhaust service safety measures 2.7 Intake-Exhaust system parts installation 2.8 Intake Exhaust system service documentation	
3. Carry out vehicle Engine diagnosis	3.1 Diagnosis safety measures 3.2 Diagnosis tools, equipment and materials 3.3 Engine management system 3.3.1 ECU 3.3.2 Engine sensors 3.4 On board diagnostics 3.4.1 Diagnostics trouble codes	• Practical • Project • Portfolio of evidence • Third party report • Written tests
4. Perform vehicle fuel system tune up	4.1 Workplace organisation and safety measures 4.2 Tune up tools and equipment 4.3 Engine mapping 4.3.1 Speed 4.3.2 Load (throttle	• Practical • Project • Portfolio of evidence • Third party report • Written tests

	opening) 4.3.3 Ignition timing 4.3.4 Air-fuel ratio 4.3.5 Engine 4.3.6 Ambient temperatures 4.4 Tune up service documentation	
5. Fuel system intelligence	5.1 Variable valve timing (VVT) 5.1.1 Variable valve timing with intelligence (VVTI) 5.1.2 Valve mastic 5.1.3 Sky active 5.1.4 Turbo stratified injection (TSI) 5.1.5 Turbo charged diesel injection (TDI 5.2 Layout 5.2.1 Throttle body injection system 5.2.2 Multipoint injection system 5.2.3 Direct petrol injection (GDI) 5.3 Diesel injection systems 5.3.1 Direct injection 5.3.2 Indirect injection 5.4 Diesel electronic fuel injection 5.4.1 Layout 5.4.2 Operation 5.4.3 Filling phase 5.4.4 Spill phase 5.4.5 Injection phase	• Practical • Project • Portfolio of evidence • Third party report • Written tests

	5.4.6 Pressure drop phase 5.4.7 Common rail 5.5 Fuel system diagnosis 5.5.1 Short circuit 5.5.2 Open circuits 5.5.3 Pressure fluctuations 5.6 Fuel system inspection 5.6.1 Serviceability 5.6.2 Leakages 5.6.3 Clogging 5.6.4 Spray pattern 5.7 Fuel system components service/replacement 5.8 Fuel system re installation checks 5.9 Fuel system service documentation	

Suggested Methods of Instruction

- Demonstrations
- Practical
- Projects
- Group Discussion
- Direct instructions

The delivery may also be supplimented and enhanced by the following , if the opportunity allows;

- Visiting lecturer/trainer from the motor vehicle service and repair sector
- Industrial visits

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/Specifications	Quantity	Recommended Ratio (Item: Trainee)

A	**Learning Materials**			
1	Textbooks	Comprehensive texts on engine service.	5 pcs	1:5
2	Charts	Visual aids covering engine and safety protocols	10 pcs	1:2.5
3	PowerPoint Presentations	For trainer's use, covering course content and practical applications	1	1:25
B	**Learning Facilities & Infrastructure**			
1	Lecture/Theory Room	Equipped with projectors and seating for 25 trainees, ~60 sqm	1	1:25
2	Workshop	Hands-on training area with workbenches, tools, and safety equipment, ~80 sqm	1	1:25
3	Computer Laboratory	Equipped with internet access	5	1:5
C	**Consumable Materials**			
25.	First aid kit		5 pieces	1:5
26.	Lubricating oil	For replacing during overhaul	10 litres	2:5
27.	Petrol fuel	For testing and running engine	10 litres	2:5
28.	diesel fuel	For testing and running engine	10 litres	2:5
29.	Paraffin	For cleaning components during overhaul	10 litres	2:5
30.	Anti rust solution	For cleaning rusted parts	5 pcs	1:5
31.	Cotton waste	For cleaning components	1 bag	

32.	Valve grinding paste	For grinding valves	10 pieces	2:5
33.	Oil filter	For replacement during service	2	
34.	Fuel filter	For replacement during service	2	
35.	Air filters	For replacement during service	2	
36.	Coolant	For replacement during service	10 litres	2:5
37.				
D	**Tools and Equipment**			
41.	Diesel vehicle	For servicing engine	1	1:25
42.	Petrol vehicle	For servicing engine	1	1:25
43.	Petrol engines	For overhauling	5	1:5
44.	Diesel engines	For overhauling	5	1:5
45.	Complete combination cabinet toolbox	Assorted sets for various applications	5 cabinets	1:5
46.	Engine stand	For mounting engines	10	2:5
47.	Trolley jacks	For lifting engines	2	1:13
48.	Valve spring compressors	For removing engine valves	5	1:5
49.	Piston ring squeezers	For fitting piston rings	5	1:5
50.	Cooling system test kit	For testing cooling system components	2	1:13

51.	Petrol engine compression gauge	For testing	1	1:25
52.	Diesel engine compression gauge	For testing	1	1:25
53.	Cylinder bore gauge	For testing	2 sets	1:13
54.	Vacuum gauge	For testing engine vacuum	2	1:13
55.	Air compressor	For compressed air supply	1	1:25
56.	Multimeter	For testing	5	1:25
57.	OBD II scanner	For diagnosis	5	1:25
58.	Hydraulic press	For pressing	1	1:25
59.	Diesel pump Calibration machine	For testing phasing and calibration	1	1:25
60.	Injector testing machine	For testing injection pressure	1	1:25
61.	Spark plug testing machine	For testing spark plug functionality	1	1:25
62.	Work tables with vices		5	1:5
63.	Dust bin	For dust collecting	3	1:9
64.	Waste oil tank	For collecting waste oil	1	1:25
E	**PPE (Personal Protective Equipment)**			
1	PPE Sets	Includes gloves, safety boot, and overall/ dust bin	25 sets	1:1
2	Safety Signs and Barriers	For simulating safety zones and hazards	10 sets	1:2.5

3	Wheel chokes	For choking wheels while servicing	8 pieces	1:3
F	**Reference Materials**			
1	Engine manuals	Covering principles and practices in automation	25 pcs	1:1
3	Technical Handbooks	On vehicle engine service	25 pcs	1:1
4	Training Presentations/Slides	Digital format for shared access among trainees	1	1:25
5	Multimedia Learning Modules	Digital licenses for videos and tutorials	25 pcs	1:1
6	Practical Assessment Guides	Worksheets for practical assessments	25 pcs	1:1