Specification of Competency Standards
for the Automotive
Unit of Competency

Functional Area - Vehicle Servicing

Title	Master complicated techniques of the power systems on combustion engine vehicles
Code	111750L4
Range	This unit of competency is applicable to the technicians working at vehicle service and technical departments. Practitioners should be able to obtain a thorough understanding of the operating principles of various types of power systems on combustion engine vehicles and their impact on power output and fuel consumption, and to inspect and diagnose complicated system faults efficiently and accurately according to the instructions in the vehicle manufacturer's service manual and the relevant requirements on environmental protection, occupational safety and health regulations.
Level	4
Credit	9 *(For Reference Only)*
Competency	**Performance Requirements**

	1. Knowledge (Power generation of internal combustion engines)
	• Fuel:
	  ○ Good understanding of the characteristics of different fuels (e.g., petrol, diesel, liquefied petroleum gas, biofuels, natural gas and hydrogen), including heating value, combustibility, anti-knock property, boiling point and combustion temperature.
	  ○ Good understanding of related sciences of chemistry, fluid and heat, including basic knowledge in safety aspects
	  ○ Good understanding of combustion theory and the principle of power generation
	  ○ Master the conditions and processes of combustion for different fuel types performing in internal combustion engines, and understand the factors affecting combustion efficiency and heat releasing rate
	  ○ Good understanding of the methods and processes of power generation by internal combustion engines
	  ○ Good understanding of the factors affecting engine power output
	• Engine design:
	  ○ Master the structure, materials and functions of various components
	  ○ Good understanding of the configuration of various movable components and the principle of dynamic balance
	  ○ Master the relationship between engine setting and relevant specifications, such as capacity, compression ratio, bore-stroke ratio, intake efficiency, engine speed, quantity of mixture, mean effective pressure, torque, power, revolving resistance, etc.
	  ○ Good understanding of the methods to increase engine power output and their application limits, such as breathing efficiency, ignition and fuel injection timings
	  ○ Good understanding of the principles of devices enhancing breathing efficiency, such as variable intake and exhaust tract lengths, variable valve timing and lift, and matching of pressure charging system with engine
	  ○ Good understanding of the principles of engine working temperature control and reduction of movable component wear
	  ○ Good understanding of the principle of fuel metering for various types of engines, to optimise power output and comply with the requirements of exhaust emissions
	  ○ Master the basic principles of controlling or treatment of engine pollutants, such as exhaust gas recirculation and after-treatment devices, etc.

Assessment Criteria	The integrated outcome requirements of this unit of competency are that the practitioner being assessed shall prove that he/she is: • Capable of obtaining a thorough understanding of the structure, functions and operating principles of various types of power systems, including engines, their subsystems and related components, so as to enhance the efficiency and accuracy of inspection and diagnosis of complicated system faults; • Capable of mastering the principles of power generation by internal combustion engines, and the impact of factors such as efficiencies of intake, exhaust, and combustion, fuel quality, etc. on the performance of power output to facilitate technical problem-solving; • Capable of solving the complicated technical problems in relation to the power systems of combustion engine vehicles safely, such as excessive fuel consumption and emission of pollutants, noisy operation, power degradation and rough running, stalling and startup failure according to the instructions in the vehicle manufacturer's service manual and the relevant requirements on environmental protection, occupational safety and health regulations; and • Capable of compiling written reports covering preventive measures, instructions on inspection and maintenance, as well as providing suggestions for improvement, in accordance with the specific defects found in respective power systems.
Remark	The credit value for this competency unit assumes that the practitioner has already acquired extensive knowledge of automotive combustion engines, associated repair and diagnostic procedures.