



8702

VEHICLE SYSTEMS PART 2
(12C)

40S/40E/40M

An Automotive Technology Course

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Course Description

A student wanting to develop skills in the automotive industry must have knowledge of engine management and emission systems. The student will understand the principles of fuel supply, metering, and vehicle emissions. The student will be able to use an electronic diagnostic interface to diagnose, service, and repair engine management and emission systems. The student will also learn about hybrid and electrical vehicles. This course focuses on the following unit in the Apprenticeship Manitoba Level 1 technical training:

- Unit A13: Hybrid and Electrical Vehicle Systems I

Goal 1: Describe and apply appropriate **health and safety** practices.

GLO 1.1: Describe and apply appropriate **health and safety** practices.

- SLO 12C.1.1.1 Adhere to safe practices and procedures for facilities, processes, materials, tools, and equipment.
- SLO 12C.1.1.2 Identify the process for reporting injuries.
- SLO 12C.1.1.3 Identify hazards and adhere to safe work practices pertaining to hoisting and lifting.
- SLO 12C.1.1.4 Create and maintain a safe and organized working environment.
- SLO 12C.1.1.5 Demonstrate the ability to follow safety information on supplier labels.
- SLO 12C.1.1.6 Demonstrate the ability to locate first aid and eyewash stations.
- SLO 12C.1.1.7 Identify hazards and describe safe work practices pertaining to the use of tools and equipment. (A3.1)

GLO 1.2: Demonstrate awareness of safety as it pertains to the ***Trade Safety Awareness Curriculum for Level 1 Apprentices.***

No applicable SLOs.

Goal 2: Select, use, and manage tools, equipment, materials, and consumables.

GLO 2.1: Select, use, and manage tools and equipment.

- SLO 12C.2.1.1 Demonstrate the ability to select, use, and maintain tools and equipment used in fuel, engine management, emission, and exhaust systems.
 - SLO 12C.2.1.2 Demonstrate the ability to explain advanced functions of scan tools.
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GLO 2.2: Select, use, and manage materials and consumables.

No applicable SLOs.

Goal 3: Describe, inspect, diagnose, service, and repair automotive components and systems.

GLO 3.1: Describe automotive components and systems.

- SLO 12C.3.1.1 Demonstrate an understanding of the fuel-combustion process.
- SLO 12C.3.1.2 Demonstrate an understanding of vehicle emissions.
- SLO 12C.3.1.3 Demonstrate an understanding of emission control systems and components.
- SLO 12C.3.1.4 Demonstrate an understanding of fuel types, grades, additives, and applications.
- SLO 12C.3.1.5 Demonstrate an understanding of fuel-delivery systems and related components (e.g., lines, tanks, pumps).
- SLO 12C.3.1.6 Demonstrate an understanding of fuel management systems (e.g., carburetors, fuel injection systems, diesel).
- SLO 12C.3.1.7 Demonstrate an understanding of the operation of engine management-related input and output devices.
- SLO 12C.3.1.8 Demonstrate an understanding of onboard diagnostic systems and their function.
- SLO 12C.3.1.9 Demonstrate an understanding of the components of fuel-injection systems.
- SLO 12C.3.1.10 Demonstrate an understanding of safety components utilized to disable fuel delivery.
- SLO 12C.3.1.11 Demonstrate an understanding of air induction system concepts and components.
- SLO 12C.3.1.12 Demonstrate an understanding of exhaust system designs and components.
- SLO 12C.3.1.13 Describe alternative propulsion technologies (e.g., electrical, hybrid).

SLO 12C.3.1.14 Describe the fundamentals of hybrid technology. (A13.1)

- differences compared to traditional non-hybrid technologies
 - advantages
 - disadvantages
- types of hybrid powertrain designs
 - series
 - parallel
 - series-parallel
- levels of hybrid vehicles
 - mild hybrid
 - medium hybrid
 - full hybrid

SLO 12C.3.1.15 Describe hybrid vehicle safety standards. (A13.2)

- properly tag out the vehicle
- fire hazards
- electrocution hazards
- electrolyte hazards
- use of hybrid identification markers
- working environment
 - dry floor
 - with a partner

SLO 12C.3.1.16 Describe tools for hybrid vehicle safety. (A13.3)

- personal protective equipment
- high-voltage gloves
- testing high-voltage gloves
- safety glasses
 - insulated steel-toed boots
- high-voltage multimeters and leads (Cat III)
- warning pylons
- insulated tools
- engine crane for battery removal
- hook or gaff for electrocution

- SLO 12C.3.1.17 Describe differences with high-voltage batteries. (A13.4)
- safety precautions for working on high voltage battery
 - personal protective equipment
 - one-hand rule
 - different types of hybrid batteries
 - lead-acid batteries in series
 - nickel-metal hydride
 - lithium-ion
 - safety procedures
 - different disconnect procedures
 - verify voltage
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GLO 3.2: Inspect and diagnose automotive components and systems.

- SLO 12C.3.2.1 Demonstrate the ability to inspect and diagnose management fuel systems.
- SLO 12C.3.2.2 Demonstrate the ability to inspect and diagnose fuel delivery systems.
- SLO 12C.3.2.3 Demonstrate the ability to inspect and diagnose engine management systems.
- SLO 12C.3.2.4 Demonstrate the ability to inspect and diagnose emission systems.
- SLO 12C.3.2.5 Demonstrate the ability to inspect and diagnose exhaust systems.
- SLO 12C.3.2.6 Demonstrate the ability to perform advanced scan-tool information retrieval and analysis (e.g., component testing, reset, live signals).
- SLO 12C.3.2.7 Demonstrate the ability to interpret diagnostic trouble codes (DTCs).
- SLO 12C.3.2.8 Demonstrate the ability to follow diagnostic procedures based on diagnostic trouble codes (DTCs).
- SLO 12C.3.2.9 Demonstrate the ability to perform driveability diagnostic procedures with and without DTCs.
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GLO 3.3: Service and repair automotive components and systems.

- SLO 12C.3.3.1 Demonstrate the ability to service and repair fuel management systems.
- SLO 12C.3.3.2 Demonstrate the ability to service and repair fuel delivery systems.
- SLO 12C.3.3.3 Demonstrate the ability to service and repair engine management systems.
- SLO 12C.3.3.4 Demonstrate the ability to service and repair emission systems.
- SLO 12C.3.3.5 Demonstrate the ability to service and repair exhaust systems.

Goal 4: Describe and apply transferable **cross-curricular** knowledge and skills.

GLO 4.1: Describe and apply knowledge and skills from **information and communication technologies**.

No applicable SLOs.

GLO 4.2: Describe and apply knowledge and skills from the **sciences**.

- SLO 12C.4.2.1 Demonstrate an understanding of the chemistry of combustion and emissions.

GLO 4.3: Read, interpret, and communicate information.

No applicable SLOs.

GLO 4.4: Describe and apply knowledge and skills from **mathematics**.

No applicable SLOs.

Goal 5: Demonstrate an understanding of **sustainability**.

GLO 5.1: Demonstrate an understanding of **sustainability**.

- SLO 12C.5.1.1 Demonstrate an understanding of the requirements and responsibilities for proper battery recycling.
- SLO 12C.5.1.2 Demonstrate an understanding of the impact of chemical hazards on the environment.
- SLO 12C.5.1.3 Demonstrate an understanding of the relationship between sustainability and the production and use of electric and hybrid-electric vehicles.

SLO 12C.5.1.4 Demonstrate an understanding of the relationship between emission controls and environmental sustainability.

SLO 12C.5.1.5 Demonstrate an understanding of ethical and legal standards related to catalytic converters.

Goal 6: Demonstrate awareness of **ethical and legal standards**.

GLO 6.1: Demonstrate awareness of **ethical and legal standards**.

SLO 12C.6.1.1 Demonstrate awareness of liability concerns related to automotive systems and service.

Goal 7: Demonstrate **employability skills**.

GLO 7.1: Demonstrate **employability skills**.

SLO 12C.7.1.1 Demonstrate problem-solving skills.

SLO 12C.7.1.2 Demonstrate critical-thinking skills.

SLO 12C.7.1.3 Demonstrate regular attendance and punctuality.

SLO 12C.7.1.4 Demonstrate accountability by taking responsibility for their actions.

SLO 12C.7.1.5 Demonstrate adaptability, initiative, and effort.

SLO 12C.7.1.6 Demonstrate the ability to accept and follow directions and feedback.

SLO 12C.7.1.7 Demonstrate teamwork skills.

SLO 12C.7.1.8 Demonstrate the ability to stay on task and effectively use time in class and shop environments.

SLO 12C.7.1.9 Communicate respectfully and effectively with coworkers and customers.

GLO 7.2: Demonstrate an understanding of the **business operation** of a repair/service facility.

No applicable SLOs.

Goal 8: Demonstrate an understanding of **educational and career opportunities**.

GLO 8.1: Demonstrate an understanding of **educational and career opportunities**.

SLO 12C.8.1.1 Demonstrate an understanding of career and educational opportunities related to electric and hybrid-electric vehicles.

SLO 12C.8.1.2 Demonstrate an understanding of the evolution, technological progression, and emerging trends in vehicle systems.

Goal 9: Demonstrate awareness of the **evolution, technological progression, and emerging trends** in the automotive industry.

GLO 9.1: Demonstrate awareness of the **evolution, technological progression, and emerging trends** in the automotive industry.

No applicable SLOs.
