



8699

DRIVETRAIN FUNDAMENTALS
AND SERVICE (11C)

30S/30E/30M

An Automotive Technology Course

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Course Description

A student wanting to develop skills in the automotive industry must have knowledge of the basic principles of the vehicle drivetrain. The student will develop an understanding of the different drivetrain configurations and their components. The student will be able to diagnose and repair a variety of drivetrain components. This course focuses on the following unit in the Apprenticeship Manitoba Level 1 technical training:

- Unit A9: Driveshafts and Axles

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

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

- SLO 11C.1.1.1 Adhere to safe practices and procedures for facilities, processes, materials, tools, and equipment.
- SLO 11C.1.1.2 Identify the process for reporting injuries.
- SLO 11C.1.1.3 Identify hazards and adhere to safe work practices pertaining to hoisting and lifting.
- SLO 11C.1.1.4 Create and maintain a safe and organized working environment.
- SLO 11C.1.1.5 Demonstrate the ability to follow safety information on supplier labels.
- SLO 11C.1.1.6 Demonstrate the ability to locate first aid and eyewash stations.
- SLO 11C.1.1.7 Identify safety and health requirements. (A2.1)
 - overview of *The Workplace Safety and Health Act*
 - rights and responsibilities of employees under the *Act*
 - rights and responsibilities of employers under the *Act*
 - rights and responsibilities of supervisors under the *Act*
 - fourteen (14) regulations
 - codes of practice
 - guidelines

- right to refuse
 - explanation of right to refuse process
 - rights and responsibilities of employees
 - rights and responsibilities of employers
 - rights and responsibilities of supervisors under the *Act*

SLO 11A.1.1.8 Identify personal protective equipment (PPE) and procedures. (A2.2) (TSA 16)

- employer and employee responsibilities as related to personal protective equipment
- standards: ANSI (U.S.A. standards), etc.
- work protective clothing and danger if it fits poorly
- gloves—importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
- headwear—appropriate protective headwear when required and the approved type of headwear
- eye protection—comparison and distinction of everyday eyeglasses, industrial safety glasses, and safety goggles
- foot protection—when required according to safety standards
- hearing protection
 - hazards of various noise levels (hearing protection must be worn)
 - laws
 - types of hearing protection
- respiratory protection—types, overview of proper selection
- fall protection—Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
- ladders and scaffolding
- safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

- SLO 11A.1.1.9 Outline the safety principles for working on and around electrical or energized equipment. (A2.3) (TSA 18)
- effects of electric current on the human body
 - three factors that affect the severity of an electric shock
 - the effects of ARC and blast on the human body and equipment
 - work with energized equipment
- SLO 11A.1.1.10 Identify fire safety and outline workplace fire safety principles. (A2.4) (TSA 19)
- types of fires
 - types of firefighting equipment
 - classifications of fire extinguishers (A, B, and C)
 - location of fire extinguishers and fire exits
 - fire alarms and drills
- SLO 11A.1.1.11 Identify ergonomics. (A2.5)
- definition of ergonomics and conditions that may affect the body
 - working postures
 - repetition
 - force
 - lifting
 - tools
 - identify tool and safety equipment
 - causes of hand-tool accidents
 - equipment
- SLO 11A.1.1.12 Recognize, report, and control hazards. (A2.6)
- safe-work practices
 - basic risk assessment
 - injury prevention and control measures
 - identification of hazards involved in pneumatic tool use and explanation of how to guard against them

SLO 11A.1.1.13 Identify the hazards in confined spaces and the preparation needed to work in them. (A2.7) (TSA 20)

- identification of a confined space
- hazards of a confined space
 - physical
 - biological
- working in a confined space
- emergency response plan
- self-contained breathing apparatus (SCBA)

SLO 11A.1.1.14 Identify first aid/CPR. (A2.8)

- overview of first-aid regulation
- obligations of employers regarding first aid
 - Who is certified to provide first aid?
 - What to do while waiting for help?
 - Where is the first-aid kit?
- describe basic first-aid requirements and techniques
 - scope and limits of first-aid intervention
 - specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - What is it?
 - interface with other services and agencies (e.g., Workers Compensation claims)
- describe basic CPR requirements and techniques
 - How do you get certified?
 - scope and limits of CPR intervention (include varieties of CPR certification)

SLO 11A.1.1.15 Identify the safety requirements as they apply to WHMIS with emphasis on: (A2.9) (TSA 13)

- WHMIS is a system
- provincial regulation under *The Workplace Safety and Health Act*
 - each province has a WHMIS regulation
- federal *Hazardous Products Act*
- WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace

- information found on supplier and workplace labeling using WHMIS
- hazardous materials in accordance with WHMIS
- compliance with government safety standards and regulations
- description of WHMIS (include varieties of WHMIS certification)
 - typology of WHMIS labels, symbols, and classifications
 - scope and use of Materials Safety Data Sheets (MSDS)

SLO 11A.1.1.16 Identify and control hazards. (A2.10)

- basic control measures (injury prevention)
- safe-work procedures
- explanation on the importance of industrial housekeeping
- employer responsibilities
- how and where to store materials
- safety measures related to walkways, stairs, and floor openings
- explanation of how to protect the worker and others when working in traffic paths

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 11C.2.1.1 Select, use, and manage tools and equipment used in drivetrain fundamentals and service.

SLO 11C.2.1.2 Identify hazards and describe safe work practices pertaining to the use of tools and equipment. (A3.1)

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 11C.3.1.1 Define terminology associated with driveshafts and axles. (A9.1)
- SLO 11C.3.1.2 Identify hazards and describe safe work practices pertaining to driveshafts and axles. (A9.2)
- SLO 11C.3.1.3 Identify tools and equipment relating to driveshafts and axles, and describe their applications and procedures for use. (A9.3)
 - dial indicators
 - inclinometer
- SLO 11C.3.1.4 Identify types of driveshafts and describe their composition. (A9.4)
 - front-wheel drive (CV shafts)
 - rear-wheel drive
- SLO 11C.3.1.5 Identify types of driveshaft components and describe their purpose and operation. (A9.5)
 - slip yokes and flanges
 - flex joints
 - single cardan joints
 - double cardan joints
 - support bearing
 - viscous coupling
- SLO 11C.3.1.6 Identify types of axles and describe their components and operation. (A9.6)
 - half shafts (independent suspension)
 - floating
 - semi-floating
- SLO 11C.3.1.7 Describe and demonstrate the importance of multiple piece driveshaft phasing and indexing. (A9.7)
- SLO 11C.3.1.8 Identify types of lubricants, fasteners, gaskets, seals, and sealants, and describe their applications. (A9.8)
- SLO 11C.3.1.9 Demonstrate an understanding of the location and function of clutch-assembly components.
- SLO 11C.3.1.10 Demonstrate an understanding of clutch action and common clutch problems.

- SLO 11C.3.1.11 Demonstrate an understanding of shift linkages and their adjustments.
 - SLO 11C.3.1.12 Demonstrate an understanding of types of transmissions and transaxles.
 - SLO 11C.3.1.13 Demonstrate an understanding of the operating principles and function of manual transmissions and transaxles.
 - SLO 11C.3.1.14 Demonstrate an understanding of types of gears and power flows, and calculate gear ratios on drivetrains.
 - SLO 11C.3.1.15 Demonstrate the ability to describe the basic operating principles and functions of automatic transmissions and transaxles.
 - SLO 11C.3.1.16 Demonstrate an understanding of the operation principles of drivetrain components (e.g., 4WD, AWD, CVTs).
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GLO 3.2: Inspect and diagnose automotive components and systems.

- SLO 11C.3.2.1 Demonstrate the ability to perform visual fluid analyses on drivetrain components.
 - SLO 11C.3.2.2 Demonstrate the ability to diagnose causes of fluid leaks and recommend repair options.
 - SLO 11C.3.2.3 Demonstrate the ability to demonstrate familiarity with proper clutch operation.
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GLO 3.3: Service and repair automotive components and systems.

- SLO 11C.3.3.1 Describe and demonstrate the procedures used to diagnose and repair driveshafts and axle systems. (A9.9)
 - SLO 11C.3.3.2 Demonstrate awareness of the diagnosis, adjustment, and replacement of clutch assemblies and related components.
 - SLO 11C.3.3.3 Demonstrate awareness of the inspection, servicing, and adjustment of shift mechanisms.
 - SLO 11C.3.3.4 Demonstrate awareness of the diagnosis, adjustment, and replacement of transmissions and transaxles.
 - SLO 11C.3.3.5 Demonstrate awareness of the diagnosis, adjustment, and replacement of differential assemblies.
 - SLO 11C.3.3.6 Demonstrate awareness of differential maintenance procedures.
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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**.

SLO 11C.4.1.1 Demonstrate the ability to use online and/or printed service manuals to locate, interpret, and apply service procedures.

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

SLO 11C.4.2.1 Demonstrate an understanding of science as it relates to drivetrains.

GLO 4.3: Read, interpret, and communicate information.

SLO 11C.4.3.1 Demonstrate the ability to read, interpret, and communicate automotive product information.

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 11C.5.1.1 Demonstrate knowledge of efficient material usage to reduce waste and its impact on the environment.

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

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

No applicable SLOs.

Goal 7: Demonstrate **employability skills**.

GLO 7.1: Demonstrate **employability skills**.

SLO 11C.7.1.1 Demonstrate problem-solving skills.

SLO 11C.7.1.2 Demonstrate critical-thinking skills.

SLO 11C.7.1.3 Demonstrate regular attendance and punctuality.

SLO 11C.7.1.4 Demonstrate accountability by taking responsibility for their actions.

SLO 11C.7.1.5 Demonstrate adaptability, initiative, and effort.

SLO 11C.7.1.6 Accept and follow direction and feedback.

SLO 11C.7.1.7 Demonstrate teamwork skills.

SLO 11C.7.1.8 Stay on task and use time effectively.

SLO 11C.7.1.9 Communicate respectfully and effectively.

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 11C.8.1.1 Demonstrate an understanding of the career and employment opportunities related to automotive technology.

SLO 11C.8.1.2 Demonstrate awareness of career paths related to the automotive service and repair industry.

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.

SLO 11C.9.1.1 Demonstrate awareness of the evolution, technological progression, and emerging trends in drivetrain fundamentals and service.
