SKILLEDTRADESBC

PROGRAM OUTLINE

Automotive Service Technician – Foundation

Implementation date: September 1, 2024

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AUTOMOTIVE SERVICE TECHNICIAN
FOUNDATION PROGRAM OUTLINE

APPROVED BY INDUSTRY
FEBRUARY 2024

IMPLEMENTATION DATE
SEPTEMBER 1, 2024

THIS BC PROGRAM HAS BEEN HARMONIZED AND IS BASED ON RSOS 2023

Developed by
SkilledTradesBC
Province of British Columbia

TABLE OF CONTENTS

Section 1

INTRODUCTION

Automotive Service Technician - Foundation

Foreword

This revised Automotive Service Technician Foundation Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the 2023 Red Seal Occupational Standard (RSOS) and the Automotive Service Technician Occupational Analysis (2024) and British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Foundation Program Outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

The Foundation Program Outline was prepared with the advice and assistance of the Automotive Service Technician Review Committee and will form the basis for further updating of the British Columbia Automotive Service Technician Program by SkilledTradesBC.

Competencies are to be evaluated through written exams and practical assessments. A passing grade is achieved by getting an overall mark of 70%. See the Assessment Guidelines in the Appendix for more details. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Achievement Criteria are included for competencies that require a practical assessment. The intent of including Achievement Criteria in the Foundation Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measurable and that they reflect the skills spelled out in the competency as those required of a competent journeyperson. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

Industry and Instructor Subject Matter Experts retained to assist in the development and review of the 2024 Automotive Service Technician Program Outline from which this Foundation Program Outline is derived:

- Patrick Jones — Instructor, Camosun College
- Dale Baumel — Instructor, Vancouver Island University
- Adrian FitzPatrick — Automotive Service Technician
- Matthew Wilkie — Automotive Service Technician
- Russ Hunter — Instructor, BC Institute of Technology

Previous Contributors

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- Chris Wylie — Automotive Service Technician
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- Jeff Hoff — Automotive Service Technician
- Loi Truong — Automotive Service Technician
- Nic Nelson — Automotive Service Technician
- Robert Kunka — Instructor, Vancouver Community College
- Russ Hunter — Instructor, BC Insititute of Technology

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry and training provider representatives appointed to identify the training requirements of the Automotive Service Technician occupation.

How to Use this Document

This Foundation Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Appendix – Optional Training Topics	This content was taken from the Foundation Program Outline (2016), *Optional Training Topics*. Use of this content is at the discretion of the training provider.			
Appendix – Glossary			Defines program specific terminology and acronyms	

Note: Automotive Service Technician Foundation Programs must cover the outcomes of the Level 1 program that is in effect. Content that exceeds the Level 1 outcomes is added at the discretion of the training provider. Please see ***Appendix A*** for sample optional content.

Section 2

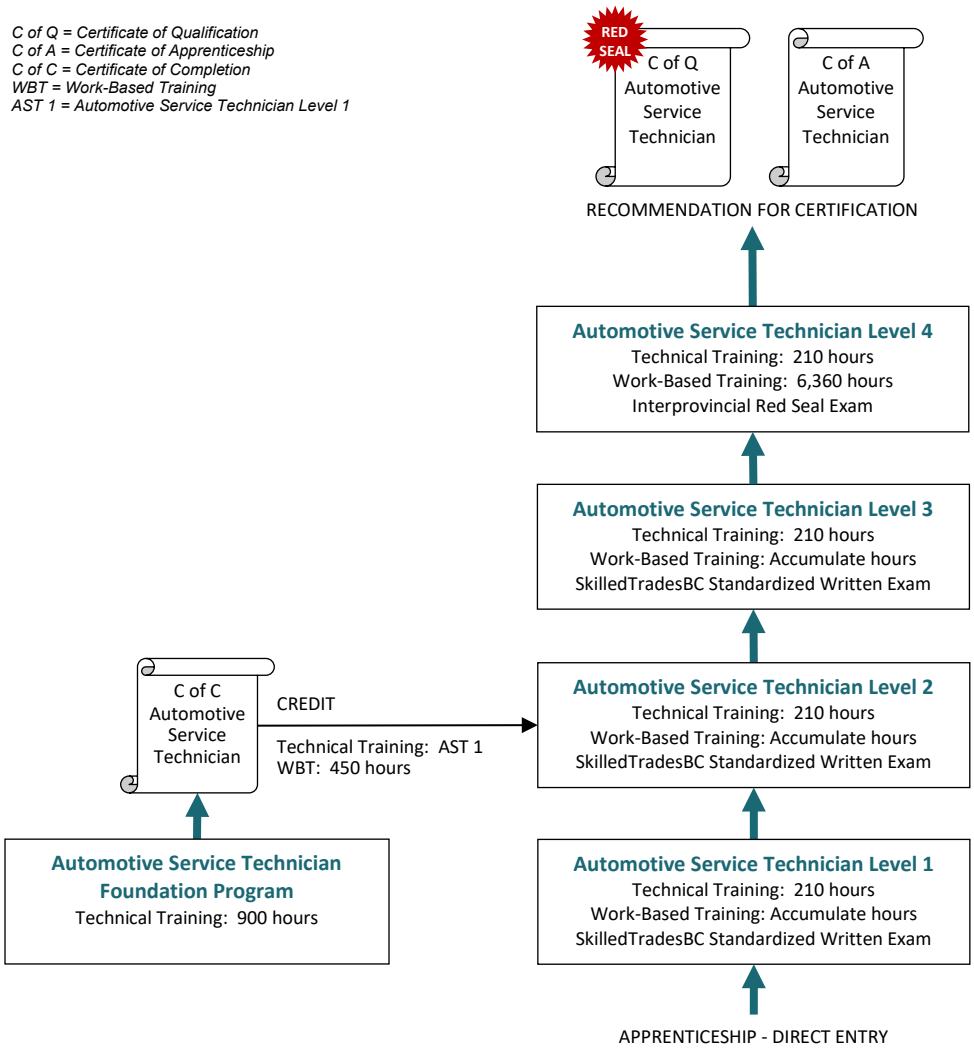
PROGRAM OVERVIEW

Automotive Service Technician

Program Credentialing Model

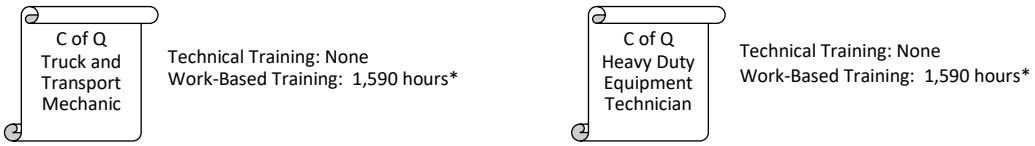
Apprenticeship Pathway

This graphic provides an overview of the Automotive Service Technician apprenticeship pathway.



CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of these programs:



**Individuals who are holders of both certificates will only be awarded credit for 1,590 WBT hours total*

Occupational Analysis Chart

AUTOMOTIVE SERVICE TECHNICIAN

Occupation Description: "Automotive Service Technicians" possess the full range of knowledge and abilities required to perform preventative maintenance, diagnose faults, and repair automotive vehicles, light trucks, and hybrid and electric vehicle systems. These systems include engines, vehicle management, steering, braking, tires, wheels, drivetrains, suspension, electrical, advanced driver assistance systems (ADAS), electronics, heating, ventilation, and air conditioning (HVAC), restraints, trim, and accessories.

PERFORM SAFETY-RELATED FUNCTIONS **A**	Maintain a safe work environment A1					Use personal protective equipment (PPE) and safety equipment A2								
	1				F	1				F				
USE TOOLS, EQUIPMENT, AND DOCUMENTATION **B**	Use tools and equipment B1					Use fasteners, tubing, hoses, and fittings B2					Use hoisting and lifting equipment B3					Use technical information B4				
	1				**F**	1				**F**	1				**F**	1				**F**
USE COMMUNICATION AND MENTORING TECHNIQUES **C**	Use communication techniques C1					Use mentoring techniques C2														
	1				F				4											
DIAGNOSE AND REPAIR ENGINE SYSTEMS **D**	Diagnose and repair cooling systems D1					Diagnose and repair lubricating systems D2					Diagnose and repair engine assembly D3					Diagnose and repair accessory drive systems D4				
		2					2					2					2			
DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS **E**	Diagnose and repair advanced wiring and electronics E1					Diagnose and repair gasoline fuel delivery and injection systems E2					Diagnose and repair gasoline ignition systems E3					Diagnose and repair engine management systems E4					Diagnose and repair gasoline intake and exhaust systems E5					Diagnose and repair gasoline emissions control systems E6				
			3					3					3					3					3			

DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS F	Diagnose and repair diesel fuel delivery and injection systems F1	Diagnose and repair diesel intake and exhaust systems F2	Diagnose and repair diesel emission control systems F3		
	4	4	4		
DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS G	Describe networking systems G1	Diagnose and repair networking systems G2			
	3	4			
DIAGNOSE AND REPAIR DRIVELINE SYSTEMS H	Diagnose and repair drive shafts and axles H1	Diagnose and repair manual transmissions and transaxles H2	Diagnose and repair automatic transmissions and transaxles H3	Diagnose and repair clutches H4	Diagnose and repair all-wheel drive (AWD) systems H5	Diagnose and repair final drive assemblies H6
	1 F	2	4	2	4	2
DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS I	Diagnose and repair basic wiring and electrical systems I1	Diagnose and repair 12-volt batteries, starting, and charging systems I2	Diagnose and repair lighting and wiper systems I3	Diagnose and repair electrical options and accessories I4	Diagnose and repair instrumentation, entertainment systems, and displays I5	
	1 F	1 2 F	2	3	4	
DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS J	Diagnose and repair air flow control and heating systems J1	Diagnose and repair refrigerant systems J2				
	4	4				
DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS K	Diagnose and repair tires, wheels, hubs, and wheel bearings K1	Diagnose and repair suspension and control systems K2	Diagnose and repair steering and control systems K3	Diagnose and repair braking and control systems K4	Diagnose and repair advanced driver assistance systems (ADAS) K5	
	1 F	1 2 F	1 2 F	1 2 F	3	

DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM L	Diagnose and repair restraint systems L1	Diagnose and repair wind noises, rattles, and water leaks L2	Diagnose and repair interior and exterior components, accessories, and trim L3	Diagnose and repair latches, locks and movable glass L4
		1	1	1
	4			
		F	F	F

DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV) M	Implement specific safety protocols for hybrid and electric vehicles (EV) M1	Diagnose and repair hybrid and electric vehicle (EV) systems M2	Diagnose and repair hybrid and electric vehicle (EV) temperature management systems M3
	1		
		4	4
	F		

Training Topics and Suggested Time Allocation: Foundation

AUTOMOTIVE SERVICE TECHNICIAN –FOUNDATION

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**PERFORM SAFETY-RELATED FUNCTIONS**	**4%**	**70%**	**30%**	**100%**
A1	Maintain a safe work environment		✓		
A2	Use personal protective equipment (PPE) and safety equipment		✓	✓	
Line B	**USE TOOLS, EQUIPMENT, AND DOCUMENTATION**	**14%**	**40%**	**60%**	**100%**
B1	Use tools and equipment		✓	✓	
B2	Use fasteners, tubing, hoses, and fittings		✓		
B3	Use hoisting and lifting equipment		✓	✓	
B4	Use technical information		✓		
Line C	**USE COMMUNICATION AND MENTORING TECHNIQUES**	**1%**	**100%**	**0%**	**100%**
C1	Use communication techniques		✓		
Line H	**DIAGNOSE AND REPAIR DRIVELINE SYSTEMS**	**4%**	**50%**	**50%**	**100%**
H1	Diagnose and repair drive shafts and axles		✓	✓	
Line I	**DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS**	**23%**	**50%**	**50%**	**100%**
I1	Diagnose and repair basic wiring and electrical systems		✓	✓	
I2	Diagnose and repair 12-volt batteries, starting, and charging systems		✓	✓	
Line K	**DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS**	**50%**	**50%**	**50%**	**100%**
K1	Diagnose and repair tires, wheels, hubs and wheel bearings		✓	✓	
K2	Diagnose and repair suspension and control systems		✓	✓	
K3	Diagnose and repair steering and control systems		✓	✓	
K4	Diagnose and repair braking and control systems		✓	✓	
Line L	**DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM**	**2%**	**80%**	**20%**	**100%**
L2	Diagnose and repair wind noises, rattles, and water leaks		✓		
L3	Diagnose and repair interior and exterior components, accessories, and trim		✓	✓	
L4	Diagnose and repair latches, locks, and movable glass		✓		
Line M	**DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)**	**2%**	**100%**	**0%**	**100%**
M1	Implement specific safety protocols for hybrid and electric vehicles (EV)		✓		
	Total Percentage for Automotive Service Technician Foundation	**100%**			

Section 3

PROGRAM CONTENT

Automotive Service Technician

Foundation
Automotive Service Technician

Line (GAC): A PERFORM SAFETY-RELATED FUNCTIONS

Competency: A1 Maintain a safe work environment

Objectives

To be competent in this area, the individual must be able to:

- Apply safe work practices.

LEARNING TASKS	CONTENT

1. Describe WorkSafeBC and OHS regulations	• Rights and responsibilities
	  ○ Right to refuse work
	  ○ Reporting accidents
	  ○ Investigations
	• Personal Protective Equipment (PPE)

2. Describe safe work practices	• Safe vehicle operation
	  ○ Speed limit
	  ○ Parking on a hoist
	  ○ Road test
	• Clean and organized work area
	• Correct use of tools and equipment
	  ○ Maintenance
	  ○ Function
	  ○ Operation
	• Lockout procedures
	• Flammable, explosion, and electrical hazards
	• Using compressed air

3. Describe fire safety procedures	• Component and causes of fire
	  ○ Fuel
	  ○ Heat
	  ○ Oxygen
	• Flammability
	  ○ Flash points
	• Types of fires
	  ○ Class A, B, C and D fires
	• Use of fire extinguishers
	• Fire prevention equipment
	  ○ Emergency fire blanket
	• Precautions when working with flammable substances
	• Storage of flammable materials
	  ○ Gasoline
	  ○ Oily rags

LEARNING TASKS	CONTENT

4. Use Workplace Hazardous Materials Information System (WHMIS)	• WHMIS
	  ○ Right to know
	  ○ Worker education
	  ○ Product identification
	• Roles and responsibilities
	  ○ Employers
	  ○ Suppliers
	  ○ Workers
	• Labelling
	  ○ Symbols
	• SDS
	  ○ Hazards
	  ○ Handling
	  ○ Ingredients
	• Storage

Line (GAC): A PERFORM SAFETY-RELATED FUNCTIONS

Competency: A2 Use personal protective equipment (PPE) and safety equipment

Objectives

To be competent in this area, the individual must be able to:

- Use personal protective equipment (PPE).
- Describe shop emergency equipment and procedures.

LEARNING TASKS	CONTENT

1. Apply personal safety protocols	• Personal apparel
	• Personal protective equipment (PPE)
	  ○ Safety glasses
	  ○ Boots
	  ○ Face shield
	• Exhaust extraction
	• Hazard awareness
	• Ergonomic lifting

2. Describe shop emergency equipment and procedures	• Emergency shutoffs • Fire control • Eye-wash facilities • Spill kit • Emergency exits • First aid facilities • Muster point

Achievement Criteria

Performance	The learner will wear PPE as needed for each task.
Conditions	The learner will be given • Access to PPE
Criteria	The learner will be evaluated on • PPE selection • PPE fit • Consistency of usage

Line (GAC): B USE TOOLS, EQUIPMENT, AND DOCUMENTATION

Competency: B1 Use tools and equipment

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment.
- Demonstrate safe use of welding equipment.

LEARNING TASKS	CONTENT

1. Use hand tools	• Types
	  ○ Wrenches
	  ○ Sockets
	  ○ Pliers
	• Special application tools
	  ○ Chisels and punches
	  ○ Tap and die
	• Safety
	• Storage
	• Cleaning and maintenance

2. Use measuring tools	• Types
	  ○ Vernier calipers
	  ○ Micrometers
	  ○ Feeler gauges
	• Safety
	• Storage
	• Cleaning and maintenance

3. Use power tools	• Types
	  ○ Impact wrench
	  ○ Grinders
	  ○ Drills
	  ○ Pnuematic
	  ○ Electric
	• Safety
	• Storage
	• Cleaning and maintenance

4. Use shop equipment	• Types
	  ○ Presses and pullers
	  ○ Solvent tank
	• Safety

LEARNING TASKS	CONTENT
	• Storage • Cleaning and maintenance
5. Use scan tools	• Functional testing • Code retrieval • Relearning
6. Describe oxyacetylene components	• Safety • Gases • Cylinders, regulators and hoses • Torches
7. Demonstrate oxyacetylene procedures	• Set up • Lighting • Heating and cutting • Shut down • Storage • Inspection and maintenance
8. Describe MIG (GMAW) welding components and methods	• Gas Metal Arc Welding (GMAW) • Safety • Gases • Cylinders, regulator and hose • Ground terminal
9. Demonstrate MIG (GMAW) welding procedures	• Set up • Welding • Shut down • Storage • Inspection and maintenance

Achievement Criteria

Performance — The learner will select and use tools as needed for each task.

Conditions — The learner will be given
- Access to tools

Criteria — The learner will be evaluated on
- Safety
- Tool selection
- Tool usage

Line (GAC): B USE TOOLS, EQUIPMENT, AND DOCUMENTATION

Competency: B2 Use fasteners, tubing, hoses, and fittings

Objectives

To be competent in this area, the individual must be able to:

- Use fasteners.
- Describe tubing, hoses, fluids, fittings, and belts.

LEARNING TASKS	CONTENT

1. Describe fasteners	• Types
	  ○ Bolts
	  ○ Studs
	  ○ Nuts
	  ○ Washers
	  ○ Keys
	  ○ Snap rings

2. Use fasteners	• Selection
	  ○ Imperial
	  ○ Metric
	• Torquing
	  ○ Sequence
	  ○ Torque to yield
	• Repair
	  ○ Extraction
	  ○ Helicoils

3. Identify lubricants and fluids	• Types
	  ○ Greases
	  ○ Engine oil
	  ○ Transmission fluids
	  ○ Brake fluids
	  ○ Anti-freeze
	  ○ Shop fluids
	• Cleaners/detergents
	• Penetrating fluids
	  • Selection
	  • Recycling

4. Describe tubing, hoses and fittings	• Selection • Types • Materials • Bending, cutting, flaring

5. Describe accessory drive belts	• Types
	  ○ Serpentine
	  ○ Stretch
	  ○ V-belt
	• Inspection and maintenance
	• Installation

Line (GAC): B USE TOOLS, EQUIPMENT, AND DOCUMENTATION

Competency: B3 Use hoisting and lifting equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe hoisitng and lifting safety.
- Use hoisting and lifting equipment.

LEARNING TASKS	CONTENT
1. Describe hoisting and lifting safety procedures	• Capacities • Operation • Lock out

2. Use hoisting and lifting equipment	• Types of jacks
	  ○ Mechanical
	  ○ Hydraulic
	  ○ Pneumatic
	• Types of hoists
	  ○ 2-post
	  ○ 4-post
	• Stands
	• Engine hoists
	• Inspection
	• Vehicle lifting points
	• Required adapters and extensions

Line (GAC): B USE TOOLS, EQUIPMENT, AND DOCUMENTATION

Competency: B4 Use documentation and technical information

Objectives

To be competent in this area, the individual must be able to:

- Use technical information.
- Describe use of documentation.

LEARNING TASKS	CONTENT

1. Describe technical information	• Types
	  ○ Electronic
	  ○ Print

2. Use technical information	• Navigation
	• Manufacturer's specifications
	• Manufacturer's recalls
	• Repair procedures
	  ○ Labour times
	  ○ Technical service bulletins (TSBs)
	• Safety concerns
	• Description of operations and parts
	• Diagrams

3. Describe use of documentation	• Shop management software • Digital vehicle inspections • Service history

Line (GAC): C USE COMMUNICATION AND MENTORING TECHNIQUES

Competency: C1 Use communication techniques

Objectives

To be competent in this area, the individual must be able to:

- Use communication techniques.
- Describe shop personnel.

LEARNING TASKS	CONTENT

1. Demonstrate two-way communication	• Verbal and written communication
	  ○ Customer
	  ○ Coworker
	• Records
	  ○ Service/work orders
	  ○ Technical reports
	  ○ Digital Vehicle Inspection (DVI)
	  ▪ Quality of language
	  ▪ Quality of images
	  ○ Parts requisition
	• Trade terminology
	• Constructive feedback

2. Use active listening	• Attention • Open-ended questions • Checking for understanding • Clarification

3. Use digital communication technologies	• Modes of communication
	  ○ Emails
	  ○ Instant messaging
	  ○ Text messaging

4. Describe shop personnel	• Service advisor
	  ○ Customer service
	  ○ Repair orders
	• Service manager
	  ○ Sales production
	  ○ Advisor mentor
	• Foreman
	  ○ Shop production
	  ○ Training advisor
	• Parts person
	  ○ Ordering
	  ○ Shop supplies

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H1 Diagnose and repair drive shafts and axles

Objectives

To be competent in this area, the individual must be able to:

- Describe drive shafts and axle shafts.
- Diagnose drive shafts and axle shafts.
- Repair drive shafts.

LEARNING TASKS	CONTENT

1. Describe drive shafts and axle shafts	• Types
	  ○ Front-wheel drive
	  ○ Rear-wheel drive
	• Components
	  ○ Constant velocity (CV) axles
	  ○ Universal joints
	  ○ Mounts and supports
	• Operation

2. Diagnose drive shafts and axle shafts	• Inspection and testing
	  ○ Sensory
	  ○ Run out
	  ○ Working angle

3. Repair drive shafts	• Safety
	• Component service
	  ○ Phasing
	  ○ Joint replacement

Achievement Criteria

Performance	The learner will replace a universal joint.
Conditions	The learner will be given • Tools and equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): I DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS

Competency: I1 Diagnose and repair basic wiring and electrical systems

Objectives

To be competent in this area, the individual must be able to:

- Describe the fundamentals of electrical circuits and components.
- Use electrical test equipment.
- Diagnose electrical faults.
- Repair electrical faults.

LEARNING TASKS	CONTENT

1. Describe electrical fundamentals	• Terminology
	• Theories
	  ○ Ohm's law
	  ○ Magnetism

2. Describe electrical circuits and components	• Types of circuits
	• Faults
	  ○ Opens
	  ○ Shorts
	  ○ Grounds
	• Components
	  ○ Switches
	  ○ Circuit protection
	  ○ Relays

3. Interpret wiring diagrams	• Symbols • Colours • Identification numbers • Power flows

4. Use electrical test equipment	• Types
	  ○ Test lights
	  ○ Power (logic) probes
	  ○ Digital Volt Ohm meter (DVOM)
	• Measuring values
	  ○ Voltage
	  ○ Amperage
	  ○ Resistance
	• Units of measurement
	• Voltage drop

LEARNING TASKS	CONTENT

5. Use scan tools	• Types
	  ○ Tools
	  ○ Codes
	• On-board diagnostics
	• Basic operation

6. Diagnose electrical faults	• Faults
	  ○ Opens
	  ○ Shorts
	  ○ Grounds
	• Components
	  ○ Switches
	  ○ Circuit protection
	  ○ Relays

7. Repair electrical faults	• Repair methods

Achievement Criteria

Performance — The learner will perform various electrical measurements on circuits.

Conditions — The learner will be given
- A circuit
- Multi-meter

Criteria — The learner will be evaluated on
- Safety
- Tool usage
- Procedures
- Accuracy of results

Line (GAC): I DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS

Competency: I2 Diagnose and repair 12-volt batteries, starting, and charging systems

Objectives

To be competent in this area, the individual must be able to:

- Describe 12-volt batteries.
- Diagnose 12-volt batteries.
- Repair 12-volt batteries.

LEARNING TASKS	CONTENT
1. Describe 12-volt batteries	• Safety • Construction • Types • Ratings

2. Diagnose 12-volt batteries	• Inspection
	• Tests
	  ○ Load
	  ○ Conductance
	  ○ Parasitic
	• Test results

3. Repair 12-volt batteries	• Safety
	• Cleaning
	• Maintenance
	• Installation
	• Charging
	  ○ Size
	  ○ Type
	  ○ Rate
	• Recycling

Achievement Criteria

Performance: The learner will test a 12-volt battery.

Conditions: The learner will be given

- A 12-volt battery
- Test equipment

Criteria: The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS

Competency: K1 Diagnose and repair tires, wheels, hubs, and wheel bearings

Objectives

To be competent in this area, the individual must be able to:

- Describe tires, wheels, hubs, and wheel bearings.
- Diagnose tires and wheels.
- Repair tires and wheels.
- Diagnose hubs and bearings.
- Repair hubs and bearings.
- Repair Tire Pressure Monitoring System (TPMS).

LEARNING TASKS	CONTENT

1. Describe tires and wheels	• Tires
	  ○ Types
	  ○ Ratings
	  ○ Side wall markings
	• Wheel
	  ○ Types
	  ○ Offset
	  ○ Fasteners

2. Diagnose tires and wheels	• Inspection
	  ○ Wear patterns
	  ○ Damage
	  ○ Pulls and vibration
	• Run out

3. Repair tires and wheels	• Service
	  ○ Rotation
	  ○ Mounting and balancing
	  ▪ Flat repair
	  ▪ Road force

4. Describe Tire Pressure Monitoring System (TPMS)	• Types
	  ○ Direct
	  ○ Indirect
	• Codes and data

5. Repair Tire Pressure Monitoring System (TPMS)	• Sensor replacement
	• System service
	  ○ Reset
	  ○ Reprogram

LEARNING TASKS	CONTENT

6. Describe wheel bearings and hubs	• Wheel bearing types
	  ○ Serviceable
	  ▪ Tapered
	  ○ Non-serviceable
	• Components
	  ○ Hub
	  ○ Seal
	  ○ Spindle
	• Loading principles

7. Diagnose wheel bearings and hubs	• Inspection
	  ○ Sensory
	  ○ Measurements

8. Repair wheel bearings and hubs	• Lubrication • Removal and installation • Adjustments

Achievement Criteria

Performance	The learner will mount and balance a tire.
Conditions	The learner will be given • A vehicle • Tire mounting and balancing equipment
Criteria	The learner will be evaluated on • Safety • Equipment usage • Procedure • Accuracy of balance

Line (GAC): **K** **DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS**

Competency: **K2** **Diagnose and repair suspension and control systems**

Objectives

To be competent in this area, the individual must be able to:

- Describe suspension and frame systems.
- Diagnose suspension systems.
- Repair suspension systems.

LEARNING TASKS	CONTENT

1. Describe frame designs	• Types
	  ○ Unibody
	  ○ Body-over-frame
	• Accident crumple zones
	• Construction

2. Describe suspension systems	• Front
	  ○ Solid
	  ○ Independent
	  • Strut
	  • Short and long arm
	  • Multi-link
	• Rear
	  ○ Rigid
	  ○ Independent
	• Strut
	• Multi-link
	• Semi-rigid
	• Components
	  ○ Springs Types
	  ○ Shocks and struts
	  ○ Ball joints
	  ▪ Loaded
	  ▪ Follower
	  ○ Sway bar
	  ○ Rubber bushings
	  ○ Mounting points
	• Dynamics
	  ○ Forces
	  ○ Body roll
	• Faults

LEARNING TASKS	CONTENT

3. Diagnose suspension systems	• Inspection
	  ○ Sensory
	• Tests
	  ○ Road test
	  ○ Ride height
	  ○ Measurements

4. Repair suspension systems	• Safety • Removal and replacement • Measurements • Alignment • Faults

Achievement Criteria

Performance	The learner will identify and inspect suspension systems.
Conditions	The learner will be given • A vehicle • Measuring equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Testing procedure • Accuracy of component identifications • Accuracy of inspection

Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS

Competency: K3 Diagnose and repair steering and control systems

Objectives

To be competent in this area, the individual must be able to:

- Describe occupant restraint system safety.
- Describe mechanical and hydraulic steering systems.
- Diagnose mechanical and hydraulic steering systems.
- Repair mechanical and hydraulic steering systems.
- Perform wheel alignment.

LEARNING TASKS	CONTENT

1. Describe occupant restraints	• Safety
	• Types
	  ○ Driver
	  ○ Passenger
	  ○ Seat belt pre-tensioner
	• Air bag wiring

2. Describe steering columns, steering linkage, and steering gears	• Column types
	  ○ Tilt
	  ○ Telescoping
	• Column components
	  ○ Shafts
	  ○ universal joints
	  ○ coupling
	  ○ splines
	  ○ Clockspring
	• Steering wheel lock
	• Combination switch
	• Linkage types
	  ○ Parallelogram
	  ○ Cross steer
	  ○ Rack and pinion
	• Linkage
	• Tie rods
	• Gear types
	  ○ Rack and pinion
	  ○ Steering box

3. Diagnose steering columns, steering linkage, and	• Inspection

LEARNING TASKS	CONTENT
steering gears	○ Sensory ○ Measurements • Steering column tests ○ Functional ○ Codes and data • Steering linkage and gear tests ○ Road test ○ Steering wheel free play ○ Dry park test • Collapsing function • Electrical connections • Leakage • Wear
4. Repair steering columns, steering linkage, and steering gears	• Safety ○ Disarm • Precautions ○ Handling ○ Storage • Removal and replacement ○ Airbag ○ Column ○ Gear assemblies ○ Tie rods ○ Boots ○ Bushings
5. Describe power steering	• Fluids • Pump • Hoses • Valves
6. Diagnose power steering	• Fluid level and condition ○ Leaks • Belts • Inspection ○ Sensory ○ Pressure ○ Volume
7. Repair power steering	• Removal and replacement ○ Belts ○ Pump ○ Gear • Procedures

LEARNING TASKS		CONTENT
		○ Bleeding
8.	Describe wheel alignment	• Steering geometry ○ Caster, camber, and toe ○ Steering axis inclination ○ Thrust angle • Equipment • Adjustments
9.	Diagnose wheel alignment	• Pre-checks ○ Inspection ○ Road test ○ Tire wear
10.	Perform wheel alignment	• Alignment procedure ○ Adjustments • Steering wheel centre check • Steering sensor re-calibration • Repair verification

Achievement Criteria 1

Performance	The learner will perform a steering inspection.
Conditions	The learner will be given • A vehicle • Measuring equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Testing procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will perform a wheel alignment.
Conditions	The learner will be given • A vehicle • Wheel alignment equipment
Criteria	The learner will be evaluated on • Safety • Procedure • Tool and equipment usage • Accuracy of adjustments

Achievement Criteria 3

Performance	The learner will remove and reinstall an air bag.
Conditions	The learner will be given • A vehicle • Tools • Access to technical information
Criteria	The learner will be evaluated on • Safety • Procedure • Tool usage • Completion of task

Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS

Competency: K4 Diagnose and repair braking and control systems

Objectives

To be competent in this area, the individual must be able to:

- Describe hydraulic brake and power assist systems.
- Diagnose hydraulic brake systems.
- Repair hydraulic brake systems.
- Diagnose power assist systems.
- Repair power assist systems.

LEARNING TASKS	CONTENT

1. Describe hydraulic brake systems	• Principles
	  ○ Hydraulic
	  • Pascal's law
	  ○ Friction
	• Types
	  ○ Disc
	  ○ Drum
	• Components
	  ○ Cylinders
	  ○ Calipers
	  ○ Valves
	• Machining
	• Faults

2. Diagnose hydraulic brake systems	• Inspection
	  ○ Sensory
	  ○ Leaks
	• Tests
	  ○ Road test
	  ○ Measurements

3. Repair hydraulic brake systems	• Adjustment • Replacement • Bleeding/exchange • Faults

4. Describe power assist systems	• Principles
	• Types
	  ○ Vacuum
	  ○ Hydraulic

LEARNING TASKS	CONTENT

5. Diagnose power assist systems	• Components
	• Faults
	• Fluids
	• Belts and hoses
	• Vacuum
	• Tests
	  ○ Functional
	  ○ Pressure
	  ○ Vacuum

6. Repair power assist systems	• Replacement • Adjustment ○ Brake pedal free play • Faults

Achievement Criteria

Performance	The learner will inspect front disc brakes.
Conditions	The learner will be given • A vehicle • Measuring equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Accuracy of inspection • Accuracy and interpretation of measurements

Line (GAC): L DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM

Competency: L2 Diagnose and repair wind noises, rattles, and water leaks

Objectives

To be competent in this area, the individual must be able to:

- Describe wind noises, rattles, and water leaks.
- Describe diganoses of wind noises, rattles, and water leaks.
- Describe repair of wind noises, rattles, and water leaks.

LEARNING TASKS	CONTENT
1. Describe wind noises, rattles, and water leaks	• Common areas • Seals • Diagnostic tools ○ Smoke machine ○ Chassis ears ○ Water hose
2. Describe diagnoses of wind noises, rattles, and water leaks	• Inspection ○ Sensory • Test ○ Smoke ○ Sound ○ Water
3. Describe repair of wind noises, rattles, and water leaks	• Component replacement • Adjustments • Repair verification

Line (GAC): L DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM

Competency: L3 Diagnose and repair interior and exterior components, accessories, and trim

Objectives

To be competent in this area, the individual must be able to:

- Describe interior and exterior components and trim.
- Diangose interior and exterior components and trim.
- Repair interior and exterior components and trim.

LEARNING TASKS	CONTENT

1. Describe interior and exterior body components and trim	• Exterior components
	  ○ Mirrors
	  ○ Roof rack
	• Interior components
	  ○ Seats
	  ○ Dashboard
	• Accessories
	  ○ Running boards
	  ○ Bug shield

2. Diagnose interior and exterior components and trim	• Inspection ○ Sensory

3. Repair interior and exterior components and trim	• Repair parts and materials
	  ○ Adhesives
	  ○ Gaskets
	  ○ Sealants
	  ○ Fastening devices
	• Tools
	  ○ Trim tools
	  ○ Hand tools
	• Removal and replacement
	• Adjustments
	• Repair verification

Line (GAC): L DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM

Competency: L4 Diagnose and repair latches, locks, and movable glass

Objectives

To be competent in this area, the individual must be able to:

- Describe latches, locks and movable glass.
- Describe diagnoses of latches, locks, and movable glass.
- Describe repair of latches, locks, and movable glass.

LEARNING TASKS	CONTENT

1. Describe latches, locks, and movable glass	• Components
	  ○ Lock
	  ○ Cable
	  ○ Regulator
	  ○ Sensor/switches
	  ○ Actuator

2. Describe diagnoses of latches, locks, and movable glass	• Inspection
	  ○ Sensory
	• Tests
	  ○ Functional
	  ○ Codes and data

3. Describe repair of latches, locks, and movable glass	• Component replacement

Line (GAC): M DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)

Competency: M1 Implement specific safety protocols for hybrid and electric vehicles (EV)

Objectives

To be competent in this area, the individual must be able to:

- Describe hybrid and electric vehicle safety.
- Use high voltage PPE.

LEARNING TASKS	CONTENT
1. Identify high voltage components	• High voltage battery • Inverter • Motor/generator • Wiring

2. Describe hybrid and electric vehicle safety precautions and protocols	• Safety
	  ○ Personal protective equipment (PPE)
	  ○ Shop set up
	• Cones / stanchions
	• Caution signs
	  ○ Precautions
	• Pushing/ towing
	• Auto start
	• High voltage disconnect procedures
	  ○ High voltage contactor
	  ○ Shut-down service plug

3. Apply high voltage safety protocols	• Safety perimeter
	  ○ Cones / stanchions
	  ○ Caution signs
	• Personal protective equipment (PPE)
	  ○ Gloves
	  ▪ Testing

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/air conditioning for comfort all year round
- In-room temperature regulation and ventilation to ensure comfortable room temperature
- Acoustics in the room must allow the instructor to be heard
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

Shop Area

- Compliance with all local and national fire code and occupational safety requirements
- Ventilation and vehicle exhaust extraction as per WorkSafeBC Standards
- Compliance with Municipal and Provincial bylaws
- Ceiling shall be a minimum height of 16’ or as varied by good engineering practices and code
- Appropriate lifting devices (hoists) used in industry
- Adequate hoist to student ratio
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Refuse and recycling bins for used shop materials
- First-aid facilities
- Computer terminals

Lab Requirements

- This section does not apply.

Student Facilities

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

Instructor’s Office Space

- Desk and filing space
- Computer

Other

- WiFi

Tools and Equipment: Common to All Levels

Required Shop Tools and Equipment

- Acetylene torches
- Air compressor – hoses – inline filter and water separators
- Air or electric drills/tools
- Air or electric hammer/chisel
- Air or electric ratchet
- Antifreeze tester
- Battery charger/boosting equipment
- Bench grinders
- Bench vises
- Blow gun
- Bolt extractor set (easy outs)
- Brake pedal depressor
- Centre punch
- Chisels, punches
- Computer stations or terminals
- Creeper/fender covers
- Crowfoot wrenches (flare and std, SAE and metric)
- Die grinder
- Drill and bits
- Drill gauge
- Drill press
- Feeler gauges – SAE and metric
- Files – bastard cut/half round/mill cut/square and thread file
- Filter wrenches
- Flare nut wrenches – SAE and metric
- Flash lights
- Floor jack
- Grease gun and fluid suction pump
- Hacksaw
- Hammers – ball peen/dead blow/rubber
- Heat gun
- Hex keys – SAE and metric
- High voltage safety gloves (certified class 0 rated 1000v)
- High voltage warning signs
- Hydraulic press
- Impact driver and bits
- Impact wrench and impact socket set – SAE and metric
- Infrared thermometer
- Inspection mirror
- Jack stands and supports
- Jumper lead
- Logic (power) probe
- Magnetic pick up tool
- Mallet/soft face
- Mechanic's pick set
- Multimeter DVOM
- Oil drain barrels and disposal system
- Parts washers
- Pliers – slip joint, needle nose, adjustable, wheel weight, side cutter, snap ring, locking, hog ring and battery types
- Pry bar
- Ratchet and sockets – 1/4, 3/8 and 1/2 drive – SAE and metric, swivel, spark plug, extensions and adapters
- Scan tools (up-to-date with factory functions)
- Scraper (gasket and carbon)
- Screwdriver set
- Seal drivers and extractors
- Soldering tools
- Spring compressors – coil spring and strut
- Standard test leads and probes
- Steel rule
- Stethoscope
- Straight edge
- Stud extractor
- Tamper-proof torx set
- Tap and die set – SAE and metric
- Tap extractor
- Tape and ruler

- Terminal remover tools
- Test lamp – electronics safe (powered and non-powered)
- Thread files
- Thread pitch gauge
- Tin snips – centre, left and right cut
- Tire pressure gauge
- Tool box
- Torque angle meter/indicator
- Torque wrenches – 3/8 and ½
- Torx bits
- Vacuum pump/gauge
- Vehicle lifts (safety certified)
- Vehicle service information system
- Vernier caliper – SAE and metric
- Vise grips
- Water hose
- Welding equipment – GMAW welder and oxy fuelled
- Wire brush
- Wire stripper/crimping tool
- Work benches
- Wrench set – SAE and metric/various designs

Student Tools and Equipment

During attendance and completion of the technical training sessions, apprentices may be responsible for having specific equipment and tools. If equipment and tools are required, a list will be given to each apprentice at the beginning of the technical training session.

Tools and Equipment: Foundation

Required Shop Tools and Equipment

- Alignment lift and equipment- 4 wheel
- Angle grinder
- Axle boot clamp tool
- Ball joint press and adapters
- Battery post service and reshape tool
- Battery tester
- Belt tension release tool
- Brake bleeder wrenches
- Brake drum gauge (for brake shoe adjusting)
- Brake drum micrometer
- Brake fluid moisture tester
- Brake rotor gauge/micrometer
- Brake service tools (adjusters, spring removal, installation and caliper tools)
- Brake system bleeder
- Caliper tools for rear-wheel disc
- Dial indicator set
- Door trim tools
- Flaring tool (SAE, metric, and ISO)
- Tread depth gauge (for tires and brakes)
- Tube bending tool
- Tube cutters
- Universal joint press
- Vacuum gauge
- Wheel stud installer
- Heli-coil kits
- Hub service kit
- Leak detection tank (tires)
- Pickle-fork tool set
- Pitman arm pullers
- Pullers – gear, pulley and steering wheel
- Rivet gun
- Slide hammer
- Spreaders (tire
- Steering wheel holder
- Steering wheel puller set
- Stretch belt removal and installation tool
- Tie-rod end puller
- Tie-rod sleeve tools
- Tire balancer equipment (road-force type recommended)
- Tire changing machine (preferred run-flat capable
- Tire repair equipmen
- TPMS system service tools

Reference Materials

Recommended Reference Materials

Level One / Foundation

- CDX, *Fundamentals of Automotive Technology.*
- Erjavec, J., *Automotive technology: A systems approach*.
- Halderman, J. D., *Advanced Automotive Electrical and Electronics.*
- Trade Secrets Alberta, *Individual Learning Modules* (first period).

Suggested Reference Material

- CDX, *Light Duty, Hybrid, and Electric Vehicles.*
- CDX, *Light Vehicle Diesel Engines*.
- Halderman, J. D., *Automotive Technology: Principles, Diagnosis, and Service.*

Appendices

Appendix A
Optional Training Topics

Line 1	**EMPLOYABILITY SKILLS**
1.1	Demonstrate employment readiness skills
Line 2	**TOOLS AND EQUIPMENT**
2.1	Use diagnostic equipment
Line 3	**GENERAL AUTOMOTIVE MAINTENANCE**
3.1	Perform general automotive maintenance
3.2	Perform exhaust system maintenance
Line 4	**GENERAL AUTOMOTIVE PRINCIPLES**
4.1	Describe fuel delivery systems
4.2	Describe internal combustion engines
4.3	Describe ignition and engine management systems
4.4	Describe hybrid and electric vehicles (EV)

Line: 1 EMPLOYABILITY SKILLS

Competency: 1.1 Demonstrate employment readiness skills

Objectives

- Demonstrate the skills required to obtain employment

LEARNING TASKS	CONTENT

1. Prepare a resume	• Gathering information
	  ○ Goals
	  ○ Skills
	  ○ Education
	  ○ Experience
	  ○ Activities
	  ○ References
	• Types of resumes

2. Prepare a cover letter	• Not to exceed one page • Highlight important accomplishments in same order as they appear in the job posting
3. Identify job search resources	• Internet • Industry networking • Industry publications • Direct approach
4. Prepare for an interview	• Organization research • Job qualification review • Prepare for broad personal questions • Resume review • Interview practice • Arriving ahead of time • Appropriate dress

Achievement Criteria:

Given a written and/or a practical assessment on employment readiness skills the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 2 TOOLS AND EQUIPMENT

Competency: 2.1 Use diagnostic equipment

Objectives

- Use diagnostic equipment

LEARNING TASKS	CONTENT

1. Use mechanical diagnostic equipment	• Gauges
	  ○ Compression
	  ○ Vacuum
	  ○ Fuel pressure
	  ○ Oil pressure
	  ○ Coolant tester
	  ○ Tire pressure
	  ○ Temperature

2. Use electrical diagnostic equipment	• Digital volt ohm meter (DVOM)
	  ○ Units of measurement
	  ○ Measure electrical signals
	• Test light
	• Power probe

3. Use scan tools	• Scan tools
	  ○ Describe generic and OEM scan tools
	  ○ Types of codes
	  ○ On board diagnostics
	  ○ Data stream information
	  ○ Code retrieval
	  ○ Clearing fault codes

Achievement Criteria

Given a written and/or a practical assessment on diagnostic equipment, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 3 GENERAL AUTOMOTIVE MAINTENANCE

Competency: 3.1 Perform general automotive maintenance

Objectives

- Describe general automotive maintenance
- Perform general automotive maintenance

LEARNING TASKS	CONTENT

1. Describe engine and driveline fluids	• Types
	  ○ Engine oils
	  ○ Coolants
	  ○ Transfer case oils
	  ○ Transmission oils
	  ○ Gear oils
	• Additives
	• Gaskets and seals
	• Service intervals

2. Perform engine and driveline fluid service	• Drain and refill • Flush equipment • Filters
3. Describe air filters, cabin filters, and wiper blades	• Types • Inspection • Service intervals
4. Perform air filter, cabin filter, and wiper blade service	• Removal and replacement
5. Describe vehicle inspection and maintenance resets	• Inspection reports • Procedures — Maintenance reset
6. Perform vehicle inspection and maintenance resets	• Inspection reports • Procedures — Maintenance reset

Achievement Criteria:

Given a written and/or a practical assessment on cooling system maintenance, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 3 GENERAL AUTOMOTIVE MAINTENANCE

Competency: 3.2 Perform exhaust system maintenance

Objectives

- Describe exhaust system
- Service exhaust system

LEARNING TASKS	CONTENT
1. Describe exhaust system	• Manifold and headers • Catalytic converter • Muffler and resonator • Pipes • Hangers
2. Service exhaust systems	• Inspection ○ Sensory • Thread repair • Component removal • Cutting procedures • Component installation

Achievement Criteria:

Given a written and/or a practical assessment on exhaust system maintenance, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 4 GENERAL AUTOMOTIVE PRACTICES

Competency: 4.1 Describe fuel delivery systems

Objectives

- Describe fuel delivery systems

LEARNING TASKS

1. Describe fuel delivery systems

CONTENT

- Systems
- Components
  - Filter
  - Fuel tank
  - Fuel lines
  - Pump
  - Fuel injectors

Achievement Criteria:

Given a written and/or a practical assessment on fuel delivery systems, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 4 GENERAL AUTOMOTIVE PRACTICES

Competency: 4.2 Describe internal combustion engines

Objectives

- Describe internal combustion engines

LEARNING TASKS

1. Describe internal combustion engines

CONTENT

- Types
  - Diesel
  - Gasoline
- Components
  - Short block assembly
  - Cylinder head assembly
  - Associated parts and fastners
- Lubrication
- Cooling
- Gaskets and seals
- Construction design and materials
- Engine configurations
- Variable valve timing
- Emissions

Achievement Criteria:

Given a written and/or a practical assessment on internal combustion engines, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 4 GENERAL AUTOMOTIVE PRINCIPLES

Competency: 4.3 Describe ignition and engine management systems

Objectives

- Describe ignition systems
- Describe engine management systems

LEARNING TASKS	CONTENT

1. Describe ignition systems	• Purpose
	• Components
	  ○ Spark plugs
	  ○ Coils
	• Maintenance

2. Describe engine management systems	• Purpose
	  ○ Performance
	  ○ Fuel economy
	  ○ Emissions
	• Components
	  ○ Modules and wiring
	  ○ Sensors
	  ○ Actuators
	• Onboard diagnostic systems

Achievement Criteria:

Given a written and/or a practical assessment on ignition and engine management systems, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Line: 4 GENERAL AUTOMOTIVE PRINCIPLES

Competency: 4.4 Describe hybrid and electric vehicles (EV)

Objectives

- Describe hybrid and electric vehicles (EV)

LEARNING TASKS	CONTENT

1. Describe hybrid vehicles	• Types
	  ○ Hybrid
	  ○ Plug-in
	• Fundamentals of operation
	• Components
	  ○ Internal combustion engine (ICE)
	  ○ High voltage battery pack
	• Modes of operation
	  ○ Ready mode
	• Driveline systems

2. Describe electric vehicles (EV)	• Fundamentals of operation
	• Components
	  ○ Electric vehicle supply equipment (EVSE)
	  ○ Charging indicator
	  ○ Drive motor
	  ○ High voltage battery pack
	• Modes of operation
	  ○ Ready mode
	  ○ Regenerative braking
	• Driveline systems

Achievement Criteria:

Given a written and/or a practical assessment on hybrid and electric vehicles (EV), the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.

Appendix B
Glossary

Accessories	Features that are not originally equipped by the manufacturer
Adjustment	A minor change so that something works better, such as changing park position of a wiper.
CAN	Controller area network; a protocol for communication between electronic/computer modules.
Describe	To explain or give an account of an item or concept. This means an introduction to a topic area that will include terminology, safety as it pertains to the topic, types and uses of the item. For example, describing steering columns will include types, such as tilt and telescoping, steering wheel locks and combination switches.
DVOM	Digital voltage ohmmeter; meter for measuring voltage, amperage, resistance (ohms) and is digital in its operation.
Identify	Establish or indicate what something is. This is the most basic level of learning and typically precedes all others, including describing. In the case of a lengthy learning period (such as an apprenticeship), it is often adequate to identify a tool or procedure well in advance of actually describing and using the tool.
Interpret	To explain or understand the meaning of something. This primarily refers to using wiring diagrams and data.
Maintain	To keep a tool in good condition by performing regular maintenance such as lubrication or cleaning, as well as making repairs and correcting problems.
Micrometer	A precision measuring device for small distances.
OBD	On board diagnostics; part of a vehicle's engine management software used to monitor system performance.
Ohm's law	The relationship between current, resistance and voltage in any electrical circuit.
Options	Features that are originally equipped at time of manufacture.
Pascal's law	Fluid pressure exerted in a sealed vessel is equal and undiminished in all directions.
Pneumatic	Operated by compressed air.
Sensory inspection	Using one or more of the five senses to perform an inspection.
Systems	A set of components working together as parts of a mechanism or an interconnecting network.
Use	The act of using something. This typically involves the safe and proper operation of a tool or system.

Appendix C
Summary of Achievement Criteria

Achievement Criteria are included for competencies that require a practical assessment. The intent of including Achievement Criteria in the Foundation Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measurable and that they reflect the skills spelled out in the competency. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

The following tables summarize the practical assessments for each level. **For details, please refer to the Achievement Criteria following the competency in the Program Content section.**

AUTOMOTIVE SERVICE TECHNICIAN – FOUNDATION SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	**ACHIEVEMENT CRITERIA TASK**
A2 Use personal protective equipment (PPE) and safety equipment	The learner will wear PPE as needed for each task.
B1 Use tools and equipment	The learner will select and use tools as needed for each task.
H1 Diagnose and repair drive shafts and axles	The learner will replace a universal joint.
I1 Diagnose and repair basic wiring and electrical systems	The learner will perform various electrical measurements on circuits.
I2 Diagnose and repair 12-volt batteries, starting, and charging systems	The learner will test a 12-volt battery.
K1 Diagnose and repair tires, wheels, hubs, and wheel bearings	The learner will mount and balance a tire.
K2 Diagnose and repair suspension and control systems	The learner will identify and inspect suspension systems.
K3 Diagnose and repair steering and control systems	1. The learner will perform a steering inspection. 2. The learner will perform a wheel alignment. 3. The learner will remove and reinstall an air bag.
K4 Diagnose and repair braking and control systems	The learner will inspect front disc brakes.

AUTOMOTIVE SERVICE TECHNICIAN – FOUNDATION OPTIONAL TRAINING TOPICS SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	**ACHIEVEMENT CRITERIA TASK**
1.1 Demonstrate employment readiness skills	Given a written and/or a practical assessment on employment readiness skills, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
2.1 Use diagnostic equipment	Given a written and/or a practical assessment on diagnostic equipment, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
3.1 Perform general automotive maintenance	Given a written and/or a practical assessment on cooling system maintenance, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
3.2 Perform exhaust system maintenance	Given a written and/or a practical assessment on exhaust system maintenance, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
4.1 Describe fuel delivery systems	Given a written and/or a practical assessment on fuel delivery systems, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
4.2 Describe internal combustion engines	Given a written and/or a practical assessment on internal combustion engines, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
4.3 Describe ignition and engine management systems	Given a written and/or a practical assessment on ignition and engine management systems, the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.
4.4 Describe hybrid and electric vehicles (EV)	Given a written and/or a practical assessment on hybrid and electric vehicles (EV), the learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of instructor assessment.