SKILLEDTRADES BC

PROGRAM OUTLINE

Automotive Service Technician

Implementation date: September 1, 2024

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AUTOMOTIVE SERVICE TECHNICIAN
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

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Section 1

INTRODUCTION

Automotive Service Technician

Foreword

This revised Automotive Service Technician 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 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 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 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 this Program Outline:

- Patrick Jones — Instructor, Camosun College
- Dale Baumel — Instructor, Vancouver Island University
- Adrian FitzPatrick — Automotive Service Technician
- Matthew Wilkie — Automotive Service Technician
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Previous Contributors

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- Nic Nelson — Automotive Service Technician
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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 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, measureable 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
Appendix – Glossary			Defines program specific terminology and acronyms	

Section 2

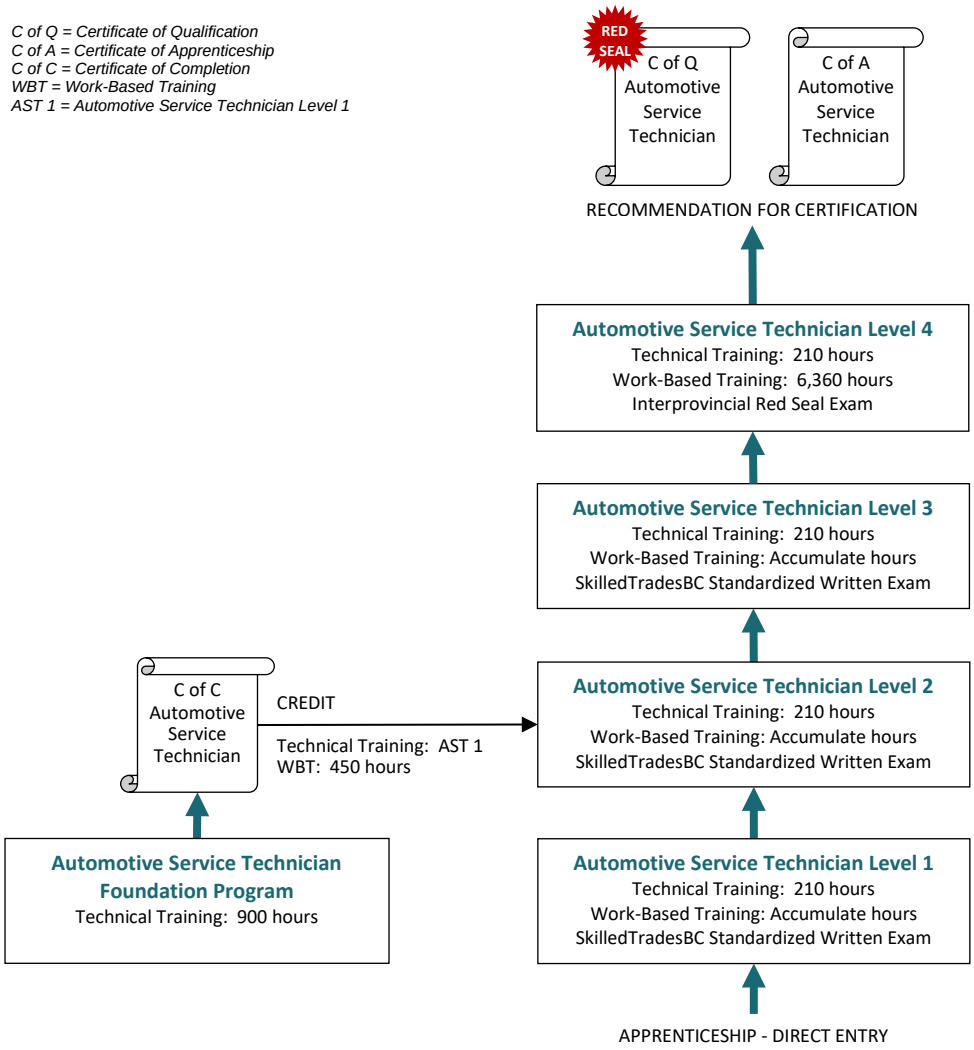
PROGRAM OVERVIEW

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:

C of Q Truck and Transport Mechanic

Technical Training: None
Work-Based Training: 1,590 hours*

C of Q Heavy Duty Equipment Technician

Technical Training: None
Work-Based Training: 1,590 hours*

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

Training Topics and Suggested Time Allocation: Level 1

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 1

			% 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 Level 1	**100%**			

Training Topics and Suggested Time Allocation: Level 2

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 2

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line D	**DIAGNOSE AND REPAIR ENGINE SYSTEMS**	**38%**	**40%**	**60%**	**100%**
D1	Diagnose and repair cooling systems		✓		
D2	Diagnose and repair lubricating systems		✓		
D3	Diagnose and repair engine assembly		✓	✓	
D4	Diagnose and repair accessory drive systems		✓		
Line H	**DIAGNOSE AND REPAIR DRIVELINE SYSTEMS**	**25%**	**60%**	**40%**	**100%**
H2	Diagnose and repair manual transmissions and transaxles		✓		
H4	Diagnose and repair clutches		✓		
H6	Diagnose and repair final drive assemblies		✓	✓	
Line I	**DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS**	**17%**	**50%**	**50%**	**100%**
I2	Diagnose and repair 12-volt batteries, starting, and charging systems		✓	✓	
I3	Diagnose and repair lighting and wiper systems		✓	✓	
Line K	**DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS**	**20%**	**60%**	**40%**	**100%**
K2	Diagnose and repair suspension and control systems		✓		
K3	Diagnose and repair steering and control systems		✓	✓	
K4	Diagnose and repair braking and control systems		✓	✓	
	Total Percentage for Automotive Service Technician Level 2	**100%**			

Training Topics and Suggested Time Allocation: Level 3

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 3

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line E	**DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS**	**80%**	**60%**	**40%**	**100%**
E1	Diagnose and repair advanced wiring and electronics		✓	✓	
E2	Diagnose and repair gasoline fuel delivery and injection systems		✓	✓	
E3	Diagnose and repair gasoline ignition systems		✓	✓	
E4	Diagnose and repair engine management systems		✓	✓	
E5	Diagnose and repair gasoline intake and exhaust systems		✓		
E6	Diagnose and repair gasoline emissions control systems		✓	✓	
Line G	**DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS**	**3%**	**100%**	**0%**	**100%**
G1	Describe networking systems		✓		
Line I	**DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS**	**7%**	**40%**	**60%**	**100%**
I4	Diagnose and repair electrical options and accessories		✓	✓	
Line K	**DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS**	**10%**	**50%**	**50%**	**100%**
K5	Diagnose and repair advanced driver assistance systems (ADAS)		✓	✓	
	Total Percentage for Automotive Service Technician Level 3	**100%**			

Training Topics and Suggested Time Allocation: Level 4

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 4

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line C	**USE COMMUNICATION AND MENTORING TECHNIQUES**	**1%**	**100%**	**0%**	**100%**
C2	Use mentoring techniques		✓		
Line F	**DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS**	**11%**	**60%**	**40%**	**100%**
F1	Diagnose and repair diesel fuel delivery and injection systems		✓	✓	
F2	Diagnose and repair diesel intake and exhaust systems		✓		
F3	Diagnose and repair diesel emission control systems		✓		
Line G	**DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS**	**10%**	**60%**	**40%**	**100%**
G2	Diagnose and repair networking systems		✓	✓	
Line H	**DIAGNOSE AND REPAIR DRIVELINE SYSTEMS**	**35%**	**60%**	**40%**	**100%**
H3	Diagnose and repair automatic transmissions and transaxles		✓	✓	
H5	Diagnose and repair all-wheel drive (AWD) systems		✓	✓	
Line I	**DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS**	**4%**	**80%**	**20%**	**100%**
I5	Diagnose and repair instrumentation, entertainment systems, and displays		✓	✓	
Line J	**DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS**	**17%**	**60%**	**40%**	**100%**
J1	Diagnose and repair air flow control and heating systems		✓	✓	
J2	Diagnose and repair refrigerant systems		✓	✓	
Line L	**DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM**	**7%**	**70%**	**30%**	**100%**
L1	Diagnose and repair restraint systems		✓	✓	
Line M	**DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)**	**15%**	**60%**	**40%**	**100%**
M2	Diagnose and repair hybrid and electric vehicle (EV) systems		✓	✓	
M3	Diagnose and repair hybrid and electric vehicle (EV) temperature management systems		✓	✓	
	Total Percentage for Automotive Service Technician Level 4	**100%**			

Section 3

PROGRAM CONTENT

Automotive Service Technician

Level 1
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
	  o Right to refuse work
	  o Reporting accidents
	  o Investigations
	• Personal Protective Equipment (PPE)

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

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

LEARNING TASKS	CONTENT
4. Use Workplace Hazardous Materials Information System (WHMIS)	• WHMIS o Right to know o Worker education o Product identification • Roles and responsibilities o Employers o Suppliers o Workers • Labelling o Symbols • SDS o Hazards o Handling o 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)
	  o Safety glasses
	  o Boots
	  o 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
	  o Wrenches
	  o Sockets
	  o Pliers
	• Special application tools
	  o Chisels and punches
	  o Tap and die
	• Safety
	• Storage
	• Cleaning and maintenance

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

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

4. Use shop equipment	• Types
	  o Presses and pullers
	  o 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
	  o Bolts
	  o Studs
	  o Nuts
	  o Washers
	  o Keys
	  o Snap rings

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

3. Identify lubricants and fluids	• Types
	  o Greases
	  o Engine oil
	  o Transmission fluids
	  o Brake fluids
	  o Anti-freeze
	  o 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
	  o Serpentine
	  o Stretch
	  o 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
	  o Mechanical
	  o Hydraulic
	  o Pneumatic
	• Types of hoists
	  o 2-post
	  o 4-post
	• Stands
	• Engine hoists
	• Inspection
	• Vehicle lifting points
	• Required adapters and extensions

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

Competency: B4 Use 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
	  o Electronic
	  o Print

2. Use technical information	• Navigation
	• Manufacturer's specifications
	• Manufacturer's recalls
	• Repair procedures
	  o Labour times
	  o 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
	  o Customer
	  o Coworker
	• Records
	  o Service/work orders
	  o Technical reports
	  o Digital Vehicle Inspection (DVI)
	  ▪ Quality of language
	  ▪ Quality of images
	  o 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
	  o Emails
	  o Instant messaging
	  o Text messaging

4. Describe shop personnel	• Service advisor
	  o Customer service
	  o Repair orders
	• Service manager
	  o Sales production
	  o Advisor mentor
	• Foreman
	  o Shop production
	  o Training advisor
	• Parts person
	  o Ordering
	  o 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
	  o Front-wheel drive
	  o Rear-wheel drive
	• Components
	  o Constant velocity (CV) axles
	  o Universal joints
	  o Mounts and supports
	• Operation

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

3. Repair drive shafts	• Safety
	• Component service
	  o Phasing
	  o 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
	  o Ohm's law
	  o Magnetism

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

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

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

5. Use scan tools	• Types

LEARNING TASKS	CONTENT
	○ 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
	  o Load
	  o Conductance
	  o Parasitic
	• Test results

3. Repair 12-volt batteries	• Safety
	• Cleaning
	• Maintenance
	• Installation
	• Charging
	  o Size
	  o Type
	  o 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
	  o Types
	  o Ratings
	  o Side wall markings
	• Wheel
	  o Types
	  o Offset
	  o Fasteners

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

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

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

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

LEARNING TASKS	CONTENT

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

7. Diagnose wheel bearings and hubs	• Inspection
	  o Sensory
	  o 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
	  o Unibody
	  o Body-over-frame
	• Accident crumple zones
	• Construction

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

LEARNING TASKS	CONTENT

3. Diagnose suspension systems	• Inspection
	  o Sensory
	• Tests
	  o Road test
	  o Ride height
	  o 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
	  o Driver
	  o Passenger
	  o Seat belt pre-tensioner
	• Air bag wiring

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

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

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

LEARNING TASKS	CONTENT
8. Describe wheel alignment	o Bleeding • Steering geometry o Caster, camber, and toe o Steering axis inclination o Thrust angle • Equipment • Adjustments
9. Diagnose wheel alignment	• Pre-checks o Inspection o Road test o Tire wear
10. Perform wheel alignment	• Alignment procedure o 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
	  o Hydraulic
	  ▪ Pascal's law
	  o Friction
	• Types
	  o Disc
	  o Drum
	• Components
	  o Cylinders
	  o Calipers
	  o Valves
	• Machining
	• Faults

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

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

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

LEARNING TASKS	CONTENT

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

6. Repair power assist systems	• Replacement • Adjustment o 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 o Smoke machine o Chassis ears o Water hose
2. Describe diagnoses of wind noises, rattles, and water leaks	• Inspection o Sensory • Test o Smoke o Sound o 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
	  o Mirrors
	  o Roof rack
	• Interior components
	  o Seats
	  o Dashboard
	• Accessories
	  o Running boards
	  o Bug shield

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

3. Repair interior and exterior components and trim	• Repair parts and materials
	  o Adhesives
	  o Gaskets
	  o Sealants
	  o Fastening devices
	• Tools
	  o Trim tools
	  o 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
	  o Lock
	  o Cable
	  o Regulator
	  o Sensor/switches
	  o Actuator

2. Describe diagnoses of latches, locks, and movable glass	• Inspection
	  o Sensory
	• Tests
	  o Functional
	  o 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
	  o Personal protective equipment (PPE)
	  o Shop set up
	  ▪ Cones / stanchions
	  ▪ Caution signs
	  o Precautions
	  ▪ Pushing/ towing
	  ▪ Auto start
	• High voltage disconnect procedures
	  o High voltage contactor
	  o Shut-down service plug

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

Level 2

Automotive Service Technician

Line (GAC): D DIAGNOSE AND REPAIR ENGINE SYSTEMS

Competency: D1 Diagnose and repair cooling systems

Objectives

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

- Describe cooling systems.
- Diagnose cooling systems faults.
- Repair cooling systems.

LEARNING TASKS	CONTENT

1. Describe cooling systems	• Operation
	• Coolant and additive properties
	• Components
	  o Radiator
	  o Thermostat
	  o Water pump
	  o Sensors and switches
	• Secondary or auxiliary cooling systems

2. Diagnose cooling systems	• Inspection
	  o Sensory
	  o Codes and data
	• Testing
	  o Pressure
	  o Air flow
	  o Temperature
	  o Coolant
	  ▪ Temperature
	  ▪ Additives

3. Repair cooling systems	• Safety
	• Depressurization
	• Service
	  o Fluid exchange
	  o Bleeding
	• Removal and installation techniques
	• Faults

Line (GAC): D DIAGNOSE AND REPAIR ENGINE SYSTEMS

Competency: D2 Diagnose and repair lubricating systems

Objectives

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

- Describe lubrication systems.
- Diagnose lubricating systems.
- Repair lubricating systems.

LEARNING TASKS	CONTENT

1. Describe lubrication systems	• Oil
	  o Grades
	  o Types
	  o Synthetics
	• Pumps
	  o Gerotor
	  o Vane
	  o Gear
	• Filters
	• Sensors
	• Oil galleries
	• Crank case ventilation systems
	• Sumps and strainers
	• Coolers
	• Associated plumbing and hardware
	• Gauges
	• Valvetrain controls
	  o Variable valve timing
	  o Cylinder deactivation
	• Faults

2. Diagnose lubrication systems	• Inspection
	  o Sensory
	  o Codes and data
	• Testing
	  o Pressure testing
	  o Leak detection

3. Repair lubrication systems	• Service
	  o Filter
	  o Seals and gaskets
	  o Components
	  o Maintenance
	• Priming
	• Faults

Line (GAC): D DIAGNOSE AND REPAIR ENGINE SYSTEMS

Competency: D3 Diagnose and repair engine assembly

Objectives

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

- Describe gasoline and diesel engines.
- Diagnose engine assembly.
- Repair engine assembly.

LEARNING TASKS	CONTENT

1. Describe gasoline internal combustion engines components	• Short block assembly
	  o Crank shaft
	  o Pistons
	  o Connecting rods
	• Cylinder head assembly
	  o Cam shaft
	  o Valves
	  o Valvetrain
	• Variable valve timing
	  o Cam actuators
	  o Sensors
	• Cylinder deactivation systems

2. Describe gasoline internal combustion engines	• Four stroke cycle
	• Construction design and materials
	• Engine configurations
	  o Inline
	  o V
	  o Opposed
	• Engine dimensions
	  o Stroke x bore
	• Engine measurements
	  o Horse power
	  o Torque
	  o Volumetric efficiency

3. Describe diesel engines	• Construction design and materials
	  o Compression ignition
	  o Compression ratio

4. Diagnose engine mechanical condition	• Test types
	  o Gasoline
	  o Diesel
	• Sensory
	• Cylinder pressure testing

LEARNING TASKS	CONTENT
	o Spark ignition o Compression ignition • Cylinder leak down • Power balance • Leak detection o Dye/Black light
5. Diagnose variable valve timing and cylinder deactivation systems	• Codes and data • Functional tests o Cam and crank correlation
6. Describe engine removal and installation	• Safety o Jacking and hoisting o Weight distribution • Procedures o Removal o Installation
7. Perform engine disassembly	• Disassembly and removal o Cylinder head o Pistons o Camshaft o Bearings • Cleaning • Measuring and evaluating o Piston fitting o Bearing installation o Mating surfaces o Crankshaft o Camshaft o Valvetrain
8. Perform engine assembly procedures	• Preassembly cleaning • Fitting parts • Measuring and torquing • Install cylinder head • Assemble valvetrain o Sprockets o Belt o Chain o Tensioners o Balance shafts • Mechanical engine timing • Assemble associated parts and fasteners • Gaskets and sealants • Seal installation • Start up/break in procedures

Achievement Criteria

Performance	The learner will perform engine assessment.
Conditions	The learner will be given • Vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Procedure • Tool usage • Accuracy of results

Line (GAC): D DIAGNOSE AND REPAIR ENGINE SYSTEMS

Competency: D4 Diagnose and repair accessory drive systems

Objectives

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

- Describe accessory drive systems.
- Diagnose accessory drive systems.
- Repair accessory drive systems.

LEARNING TASKS	CONTENT

1. Describe accessory drive components	• Components
	  o Tensioners
	  o Pulleys

2. Diagnose accessory drive systems	• Inspection
	  o Sensory
	  o Alignment
	  o Tensioner
	  o Belt

3. Repair accessory drive systems	• Installation • Faults

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H2 Diagnose and repair manual transmissions and transaxles

Objectives

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

- Describe manual transmissions and transaxles.
- Describe removal and installation of manual transmissions and transaxles.
- Describe diagnosis of transmissions and transaxles.

LEARNING TASKS	CONTENT
1. Describe manual transmission and transaxle components	• Gears and shafts • Synchronizers • Bearings and bushings • Linkage o Interlock and detents • Final drive • Switches, solenoids and sensors
2. Describe manual transmissions and transaxles	• Torque multiplication and reduction • Simple and compound • Synchronization • Final drive • Lubricants and additives

3. Describe removal and installation of transmissions and transaxles	• Safety
	  o Jacking and hoisting
	  o Weight distribution
	• Procedures

4. Describe diagnosis of manual transmission and transaxles	• Inspection
	  o Sensory
	  o Internal component wear
	  ▪ Synchronizer components
	  ▪ Shaft wear
	  ▪ Gear end play
	• Transmission and transaxle faults
	• Shifter mechanism
	• Adjustments

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H4 Diagnose and repair clutches

Objectives

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

- Describe clutch systems.
- Diagnose clutch systems.
- Repair clutch systems.

LEARNING TASKS	CONTENT

1. Describe clutch components	• Types of clutch systems
	  o Conventional
	  o Dual disc clutch
	• Flywheel
	  o Conventional
	  o Dual mass
	• Pressure plates
	• Friction discs
	• Bearings and bushings
	• Safety switches
	• Operating hardware
	  o Clutch release

2. Diagnose clutch components	• Inspection o Sensory • Clutch faults
3. Repair clutch components	• Removal • Replacement • Maintenance o Bleeding

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H6 Diagnose and repair final drive assemblies

Objectives

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

- Diagnose final drive (differentials) assemblies.
- Repair final drive (diffrentials) assemblies.

LEARNING TASKS	CONTENT

1. Describe final drives (differentials)	• Housings and mounts
	  o Integral
	  o Removable
	• Gears, shafts and bearings
	• Axles
	  o Full floating
	  o Semi floating
	• Limited slip and locking differentials
	  o Torque bias
	• Sensors
	• Lubricants and additives
	• Gaskets and seals
	• Power flow
	• Gear ratio

2. Diagnose final drive assemblies (differentials)	• Inspection o Sensory

3. Repair final drive assemblies (differentials)	• Adjustments
	  o Gear tooth contact patterns
	  o Backlash
	  o Bearing pre-load
	  o Pinion depth
	• Procedures
	  o Disassembly
	  o Reassembly

Achievement Criteria

Performance	The learner will perform backlash measurement.
Conditions	The learner will be given • Final drive assembly • Measuring tools • 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: 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 starting and charging systems.
- Diagnose starting sytems.
- Repair starting sytems.
- Diagnose charging sytems.
- Repair charging sytems.

LEARNING TASKS	CONTENT

1. Describe starting systems	• Theoretical principles
	  o Magnetism
	• Components
	  o Starter
	  o Solenoids and relays
	  o Ring gear
	  o Ignition switch
	  ▪ Conventional
	  ▪ Push button start
	  ▪ Remote start
	• Operation
	• Wiring and controls
	  o Computer controlled
	  o Idle start stop
	• Faults

2. Diagnose starting systems	• Inspection
	  o Sensory
	  o Electrical
	  o Mechanical
	• Tests
	  o Functional
	  o Codes and data

3. Repair starting systems	• Component removal and replacement • Faults

4. Describe charging systems	• Theoretical principles
	  o Induction
	• Electronics
	  o Diodes and transformers
	• Components
	  o Alternators
	  ▪ Over-running pulleys
	  o Regulators and controls
	  o Gauges and indicators
	  o Sensors
	• Operation
	• Wiring and controls
	  o Computer controlled
	• Faults

5. Diagnose charging systems	• Inspection
	  o Sensory
	  o Electrical
	  o Mechanical
	• Tests
	  o Functional
	  o Codes and data

6. Repair charging systems	• Component removal and replacement • Faults

Achievement Criteria 1

Performance	The learner will test a starting system.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will test a charging system.
Conditions	The learner will be given • A vehicle • Test 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: I3 Diagnose and repair lighting and wiper systems

Objectives

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

- Describe lighting and wiper systems.
- Diagnose lighting and wiper systems.
- Repair lighting and wiper systems.

LEARNING TASKS	CONTENT

1. Describe lighting systems	• Safety
	• Types
	  o Conventional
	  o Adaptive
	  o High intensity discharge (HID)
	  o Light emmitting diode (LED)
	• Wiring and controls
	• Sensors and switches
	• Faults

2. Diagnose lighting systems	• Inspection
	  o Sensory
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data
	• Wiring diagrams

3. Repair lighting systems	• Removal and replacement
	• Adjustments
	  o Aiming
	  o Relearning
	• Faults

4. Describe wiper systems	• Mechanical
	  o Motors
	  o Linkage/transmissions
	• Wiring and controls
	  o Manual
	  o Automatic
	• Sensors and switches
	• Pump and washer systems
	• Faults

5. Diagnose wiper systems	• Inspection
	  o Sensory
	  o Mechanical

LEARNING TASKS	CONTENT
6. Repair wiper systems	○ Electrical • Tests ○ Functional ○ Codes and data • Wiring diagrams • Removal and replacement • Adjustments ○ Relearning • Faults

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 electronic suspension systems.
- Describe diagnoses of electronic suspension systems.
- Describe repair of electronic suspension systems.

LEARNING TASKS	CONTENT
1. Describe electronic suspension systems	• Electrically controlled shocks • Load levelling system • Air springs/struts • Electronic/computer controlled dynamic systems • Sensors and actuators • Wiring and controls • Faults

2. Describe diagnoses of electronic suspension systems	• Safety
	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Functional
	  o Air system leak
	  o Codes and data
	• Wiring diagrams

3. Describe repair of electronic suspension systems	• Procedures
	  o Removal and replacement
	  o Relearning ride height
	  o Sensor adjustments
	  o Alignment
	• Faults

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 electronic steering systems.
- Diagnose electronic power steering.
- Repair electronic power steering.

LEARNING TASKS	CONTENT

1. Describe electronic steering systems	• Types
	  o Column
	  o Rack
	• Sensors
	  o Steering angle
	  o Torque
	• Wiring and controls
	• Faults

2. Diagnose electronic steering systems	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data
	• Wiring diagrams

3. Repair electronic steering systems	• Service procedures
	  o Replacement
	  ▪ Rack
	  ▪ Column
	  ▪ Sensors
	  o Alignment
	  ▪ Relearning
	• Faults

Achievement Criteria

Performance The learner will relearn a steering angle sensor.

Conditions The learner will be given

- A vehicle
- Scan tool
- Access to technical information

Criteria The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Completion/accuracy 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 anti-lock braking systems (ABS) and related systems.
- Describe automatic emergency braking systems (AEB).
- Diagnose anti-lock braking systems (ABS).
- Repair anti-lock braking systems (ABS).

LEARNING TASKS	CONTENT

1. Describe anti-lock braking systems (ABS)	• Operation
	• Components
	  o Wheel speed sensors
	  o Hydraulic modulator
	  o Control module
	• Wiring and controls
	• Faults
	• Related systems
	  o Electronic brake force distribution
	  o Traction control
	  o Stability control

2. Diagnose anti-lock braking systems (ABS)	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Signals
	  o Functional
	  o Codes and data
	• Wiring diagrams

3. Repair anti-lock braking systems (ABS)	• Procedures
	  o Component replacement
	  o Software
	  o Power bleeding
	• Faults

4. Describe automatic emergency braking systems (AEB)	• Application o EVs and hybrids

LEARNING TASKS

CONTENT

- Autonomous
- Adaptive cruise control

- Operation
- Components
  - Master cylinder
  - Motor
  - Accumulator
  - Valves
  - Sensors
- Hydraulic controls
- Wiring and controls
- Faults

Achievement Criteria

Performance	The learner will test a wheel-speed sensor.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Level 3

Automotive Service Technician

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E1 Diagnose and repair advanced wiring and electronics

Objectives

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

- Apply advanced electrical and electronic principles.
- Use advanced wiring diagrams.
- Use advanced electrical test equipment.

LEARNING TASKS	CONTENT

1. Describe advanced electrical and electronic principles	• Components
	  o Diodes
	  o Transistors
	  o Capacitors
	  o Photonic semiconductors
	• Operation
	• Electrical signal types
	  o Pulse width modulation (PWM)
	  o Frequency
	  o Duty cycle

2. Interpret advanced wiring diagrams	• Symbols and components
	  o Conventional
	  o Computer controlled circuit
	• Types
	  o North American
	  o European

3. Use advanced electrical test equipment	• Types
	  o Graphing multi-meter
	  o Lab scope/Digital Storage Oscilloscope (DSO)
	  o Scan tool
	• Operation
	  o Set up
	  o Functionality

4. Describe computer control systems

- Computer fundamentals
- Operation
  - Inputs
  - Process
  - Outputs
- Memory
- Adaptions
- Software
  - Programming
  - Relearning
  - Updating and reflashing
- Faults

Achievement Criteria 1

Performance	The learner will use lab scope to test a component.
Conditions	The learner will be given • A vehicle or simulation board • Lab scope • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will use an advanced wiring diagram to diagnose a fault.
Conditions	The learner will be given • A system fault • Access to technical information
Criteria	The learner will be evaluated on • Procedure • Accuracy of results

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E2 Diagnose and repair gasoline fuel delivery and injection systems

Objectives

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

- Describe fuel delivery, fuel injection, and gasoline direct injection (GDI) systems.
- Diagnose fuel delivery and injection systems.
- Repair fuel delivery and injection systems.
- Diagnose gasoline direct injection (GDI) systems.
- Repair gasoline direct injection (GDI) systems.

LEARNING TASKS	CONTENT

1. Identify fuel types	• Safety
	• Gasoline
	  o Ethanol
	• Characteristics
	  o Ratings
	  o Properties
	  o Additives
	• Alternate types
	  o Liquid petroleum gas
	  o Compressed natural gas

2. Describe fuel delivery systems	• Components
	  o Fuel tank
	  o Fuel pump assembly
	  o Fuel pressure regulator
	  o Associated lines and fittings
	• Operation
	• Wiring and control
	  o Computer control
	• Faults

3. Describe fuel injection systems	• Safety
	• Components
	  o Fuel injectors
	  o Rail and associated fittings
	• Operation
	• Wiring and controls
	  o Computer control
	  o Driver types
	  o Sensors
	• Faults

4. Diagnose fuel delivery and injection systems
   - Inspection and testing
     - Sensory
     - Pressure
     - Volume
     - Electrical
   - Tests
     - Signals
     - Functional
     - Codes and data
5. Repair fuel delivery and injection systems
   - Safety
   - Component replacement
   - Fuel system cleaning
   - Faults
6. Describe gasoline direct injection (GDI) systems
   - Safety
   - High pressure components
     - Pump
     - Regulator
     - Injectors
       - Type
       - Timing
     - Lines and fittings
   - Operation
     - Modes
     - Homogenous
     - Stratified
   - Faults
   - Wiring and controls
     - Computer controlled
     - Sensors
7. Diagnose GDI systems
   - Inspection and testing
     - Sensory
     - Pressure
     - Volume
     - Electrical
   - Tests
     - Signals
     - Functional
     - Codes and data
8. Repair GDI systems
   - Safety
     - High pressure
   - Component replacement
   - System cleaning
   - Faults

Achievement Criteria 1

Performance	The learner will perform a fuel pressure test.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will test a fuel injector.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E3 Diagnose and repair gasoline ignition systems

Objectives

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

- Describe electronic ignition systems.
- Diagnose electronic ignition systems.
- Repair electronic ignition systems.

LEARNING TASKS	CONTENT

1. Describe electronic ignition systems	• Theoretical principles
	  o Primary/secondary circuits
	  o Timing
	  ▪ Advance
	  ▪ Retard
	  o Induction
	• Components
	  o Ignition coils
	  o Spark plugs
	  ▪ Electrode design
	  ▪ Temperature
	  o Sensors
	• Types
	  o Waste spark
	  o Coil on plug
	• Operation
	• Faults
	• Wiring and controls
	  o Computer control
	  o Sensors

2. Diagnose electronic ignition systems	• Inspection and testing
	  o Sensory
	  o Electrical
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

3. Repair electronic ignition systems	• Safety • Component replacement • Maintenance • Faults

Achievement Criteria 1

Performance	The learner will test an ignition coil.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will test a crank shaft position sensor.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E4 Diagnose and repair engine management systems

Objectives

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

- Describe engine management systems.
- Diagnose engine management systems.
- Repair engine management systems.
- Access and interpret system data.

LEARNING TASKS	CONTENT
1. Describe engine management	• Power train control module responsibilities o Ignition systems o Fuel systems o Air management (induction) systems o Emissions systems
2. Describe engine management inputs	• Principles o Speed density o Mass air flow o Feedback • Types of sensors o Speed o Position o Temperature o Volume o Pressure o Oxygen • Operation • Faults • Wiring and inputs from other systems
3. Describe engine management outputs	• Principles o Air management • Types of actuators o Solenoids o Motors • Operation • Wiring and control o Computer controls

LEARNING TASKS	CONTENT

4. Diagnose engine management inputs and outputs	• Inspection and testing
	  o Sensory
	  o Electrical
	  o Mechanical
	  o Vacuum
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

5. Repair engine management inputs and outputs	• Component replacement
	• Maintenance
	  o Throttle body cleaning
	• Adaptions
	  o Resetting
	  o Relearning
	  o Fuel trim

6. Access and interpret on-board diagnostic (OBD) information	• Factory interface
	  o Data
	  ▪ Ignition
	  ▪ Fuel
	  ▪ Misfire
	  o Software versions
	• OBD global interface
	  o Codes
	  o Freeze frame
	  o Readiness monitors
	• Evaluation of data
	  o Code definition and description
	  o Failure parameters

Achievement Criteria

Performance — The learner will access and interpret data to diagnose a system fault.

Conditions — The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E5 Diagnose and repair gasoline intake and exhaust systems

Objectives

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

- Describe air induction, forced induction, and exhaust systems.
- Diagnose forced induction, and exhaust systems.
- Repair forced induction, and exhaust systems.

LEARNING TASKS	CONTENT

1. Describe air induction and exhaust systems	• Air induction components
	  o Air filtration
	  o Throttle body
	  o Intake manifold
	  ▪ Swirl valve
	  ▪ Variable runners
	• Exhaust systems
	  o Manifolds and headers
	  o Catalytic converters
	  o Mufflers and resonators
	  o Associated pipes and hardware
	• Faults

2. Describe forced air induction	• Types
	  o Superchargers
	  o Turbochargers
	• Principles of operation
	  o Boost
	  o Measurements
	  o Calculations
	  o Effects
	• Intercoolers
	• Boost control

3. Diagnose forced air induction	• Inspection and testing
	  o Sensory
	  o Electrical
	  o Mechanical
	  o Vacuum
	• Tests
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT
4. Repair forced air induction	• Component replacement • Faults

5. Diagnose exhaust systems	• Inspection and testing
	  o Sensory
	  o Electrical
	  o Mechanical
	  o Pressure
	• Tests
	  o Functional
	  o Codes and data

6. Repair exhaust systems	• Component replacement • Faults

Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E6 Diagnose and repair gasoline emissions control systems

Objectives

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

- Describe vehicle emission control systems.
- Diagnose gasoline emission control systems.
- Repair gasoline emission control systems.
- Diagnose gasoline evaporative emission control systems.
- Repair gasoline evaporative emission control systems.

LEARNING TASKS	CONTENT

1. Describe vehicle emissions	• Types
	  o Hydrocarbons
	  o Carbon Monoxide
	  o Oxides of nitrogen (NOX)
	• Impacts of emissions
	• Regulations

2. Describe gasoline emission systems	• Pre-combustion systems
	  o Positive crankcase ventilation (PCV)
	  o Exhaust gas recirculation (EGR)
	• Post-combustion systems
	  o Secondary air injection
	  o Catalytic converters
	• Operation
	• Faults
	• Wiring and control
	• Sensors and actuators

3. Diagnose gasoline emission systems	• Inspection and testing
	  o Sensory
	  o Pressure
	  o Mechanical
	  o Electrical
	  o Vacuum
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT
4. Repair gasoline emission systems	• Safety • Component replacement • Faults

5. Describe evaporative emission systems	• Types
	  o Pressure
	  o Vacuum
	• Components
	  o Fuel tank
	  o Canister
	  o Solenoids/ valves
	  o Sensors
	• Operation
	  o System self test
	  o Readiness monitor
	• Faults
	• Wiring and control

6. Diagnose evaporative emission systems	• Inspection and testing
	  o Sensory
	  o Pressure
	  o Mechanical
	  o Electrical
	  o Vacuum
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

7. Repair evaporative emission systems	• Safety • Component replacement • Faults

Achievement Criteria 1

Performance — The learner will perform a catalyst efficiency test.

Conditions — The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Achievement Criteria 2

Performance	The learner will perform evaporative emissions system leak test.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): G DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS

Competency: G1 Describe networking systems

Objectives

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

- Describe network computer control systems.
- Describe CAN bus network.

LEARNING TASKS

1. Describe network communication systems

2. Describe CAN bus network

CONTENT

- Network fundamentals
- Operation
- Wiring
- Connections
- Application
    - Powertrain

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

Competency: I4 Diagnose and repair electrical options and accessories

Objectives

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

- Describe electrical options and accessories.
- Diagnose electrical options and accessories.
- Repair electrical options and accessories.

LEARNING TASKS	CONTENT

1. Describe electrical options and accessories	• Factory options
	  o Sunroof
	  o Mirrors
	  o Seats
	  o Windows
	  o Keyless entry
	• Theft deterrents
	  o Alarm
	  o Immobilizor
	• Operation
	• Faults
	• Wiring and controls

2. Diagnose electrical options and accessories	• Inspection
	  o Sensory
	  o Electrical
	  o Mechanical
	• Tests
	  o Functional
	  o Codes and data

3. Repair electrical options and accessories	• Removal and replacement • Relearning • Faults

Achievement Criteria 1

Performance	The learner will perform electrical tests on a power window system.
Conditions	The learner will be given • Vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will perform electrical tests on a power door lock system.
Conditions	The learner will be given • Vehicle • Test equipment • Access to technical information
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: K5 Diagnose and repair advanced driver assistance systems (ADAS)

Objectives

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

- Describe advanced driver assistance systems (ADAS).
- Diagnose advanced driver assistance systems (ADAS).
- Repair advanced driver assistance systems (ADAS).

LEARNING TASKS	CONTENT

1. Describe advanced driver assistance systems (ADAS)	• Systems
	  o Adaptive Cruise Control
	  o Lane departure warning
	  o Lane assist
	  o Automatic emergency braking
	  o Blindspot detection
	  o Cross traffic alert
	• Sensors
	  o Windshield camera
	  o Front radar
	  o Front lidar
	  o Blindspot radar
	  o Blindspot cameras
	• Controls and modules
	• Equipment
	  o Scan tool
	  o Calibration frame
	  o Targets
	• Training requirements and regulations
	• Road testing
	• Faults

2. Diagnose advanced driver assistance systems (ADAS)	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Signal
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT

3. Repair advanced driver assistance systems (ADAS)	• Removal and replacment
	• Repair
	  o Software
	• Calibration
	  o Adjustments
	  o Static
	  o Dynamic
	  o Repair verification
	• Faults

Achievement Criteria

Performance	The learner will perform an ADAS calibration.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Level 4

Automotive Service Technician

Line (GAC): C USE COMMUNICATION AND MENTORING TECHNIQUES

Competency: C2 Use mentoring techniques

Objectives

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

- Use mentoring techniques.

LEARNING TASKS

1. Use mentoring techniques

CONTENT

- Journeyperson responsibilities
  - Apprentice guidance
  - Peer support
  - Industry networking
- Leadership
  - Methods
    - Active listening
    - Idea sharing
    - Modelling behaviours
    - Positive attitude towards change
- Coaching
  - Work-based training
    - Demonstrating skills
    - Assessing skills
  - Interpersonal skills
- Communication
  - Constructive feedback
- Professionalism
  - Respect
  - Punctuality

Line (GAC): F DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

Competency: F1 Diagnose and repair diesel fuel delivery and injection systems

Objectives

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

- Describe diesel fuel and fuel testing.
- Describe diesel high pressure electronic fuel injection systems.
- Diagnose diesel fuel systems.
- Repair diesel fuel systems.

LEARNING TASKS	CONTENT

1. Describe diesel fuels	• Safety
	• Characteristics
	  o Ratings
	  o Properties
	  o Additives
	• Contamination and testing

2. Describe low pressure diesel fuel delivery	• Components
	  o Fuel tank
	  o Fuel pump assembly
	  o Associated lines and fittings
	  o Filteration
	  ▪ Water
	  ▪ Sensor
	• Operation
	• Wiring and control
	• Faults

3. Diagnose low pressure diesel fuel systems	• Inspection and testing
	  o Sensory
	  o Hydrometer
	  o Pressure
	  o Volume
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data

4. Repair low pressure diesel fuel systems	• Safety • Component replacement • Maintenance • Faults

LEARNING TASKS	CONTENT

5. Describe high pressure diesel fuel injection systems	• Safety
	• High pressure components
	  o Pump
	  o Regulators
	  o Injectors
	  o Lines and fittings
	• Operation
	  o Timing
	  o Strategies
	• Faults
	• Wiring and controls
	• Sensors

6. Diagnose high pressure diesel fuel injection systems	• Inspection and testing
	  o Sensory
	  o Hydrometer
	  o Pressure
	  o Volume
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data

7. Repair high pressure diesel fuel injection systems	• Safety o High pressure • Component replacement • Maintenance • Faults

Achievement Criteria 1

Performance	The learner will test diesel fuel.
Conditions	The learner will be given • Fuel • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will test the operation of a high pressure fuel supply system.
Conditions	The learner will be given • Vehicle • Scan tool • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): F DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

Competency: F2 Diagnose and repair diesel intake and exhaust systems

Objectives

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

- Describe air induction, forced induction, and exhaust systems.
- Diagnose forced induction, and exhaust systems.
- Repair forced induction, and exhaust systems.

LEARNING TASKS	CONTENT

1. Describe air induction and exhaust systems	• Air induction components
	  o Air filtration
	  o Intake manifold
	  ▪ Swirl valve
	  ▪ Intake heaters
	  ▪ Glow plugs
	• Exhaust systems
	  o Manifolds and headers
	  o Mufflers and resonators
	  o Associated pipes and hardware
	• Faults

2. Describe forced air induction	• Types
	  o Turbochargers
	• Principles of operation
	  o Boost
	  o Measurements
	  o Calculations
	  o Effects
	• Intercoolers
	• Boost control

3. Diagnose forced air induction	• Inspection and testing
	  o Sensory
	  o Electrical
	  o Mechanical
	  o Vacuum
	• Tests
	  o Functional
	  o Codes and data

4. Repair forced air induction	• Component replacement • Faults
5. Diagnose exhaust systems	• Inspection and testing o Sensory

LEARNING TASKS	CONTENT
6. Repair exhaust systems	○ Electrical ○ Mechanical ○ Pressure • Tests ○ Functional • Codes and data • Component replacement • Faults

Line (GAC): F DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

Competency: F3 Diagnose and repair diesel emission control systems

Objectives

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

- Describe diesel emission systems.
- Diagnose diesel emisson systems.
- Repair diesel emisson systems.

LEARNING TASKS	CONTENT

1. Describe diesel emissions	• Types
	  o Particulates
	  o Oxides of nitrogen (NOX)
	• Impacts of emissions
	• Regulations

2. Describe diesel emission systems	• Pre-combustion systems
	  o Positive crankcase ventilation (PCV)
	  o Exhaust gas recirculation (EGR)
	• Post-combustion systems
	  o Catalytic convertors
	  o Diesel particulate filter (DPF)
	  o Selective catalyst reduction (SCR)
	• Operation
	• Faults
	• Wiring and control
	• Sensors and actuators

3. Diagnose diesel emission systems	• Inspection and testing
	  o Sensory
	  o Electrical
	• Tests
	  o Functional test
	  o Codes and data
	• Diesel exhaust fluid (DEF)
	  o Testing

4. Repair diesel emission systems	• Safety
	• Component replacement
	• Maintenance
	  o Exhaust gas recirculation (EGR) de-carbonization
	  o Diesel particulate filter (DPF)
	  o Selective catalyst reduction (SCR)
	• Faults

Line (GAC): G DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS

Competency: G2 Diagnose and repair networking systems

Objectives

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

- Describe network communication and multiplexing systems.
- Diagnose networking systems.
- Repair networking systems.
- Diagnose multiplexing systems.
- Repair multiplexing systems.
- Service module software.

LEARNING TASKS	CONTENT

1. Describe network communication systems	• Network configurations
	  o Ring
	  o Parallel
	  o Bus
	• Components
	• Wiring and connectors
	  o Single wire
	  o Twisted pair
	  o Fiber optic
	• Network types
	  o Controller Area Network (CAN)
	  o Local Interconnect Network (LIN)

2. Diagnose networking systems	• Inspection and testing
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

3. Repair networking systems	• Component replacement • Repair • Faults

4. Describe multiplexing	• Multiplexing fundamentals
	  o Switch inputs
	  o Control Modules
	  ▪ Body Control Module (BCM)
	  o Outputs
	• Faults

LEARNING TASKS	CONTENT

5. Diagnose multiplexing systems	• Inspection and testing
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

6. Repair multiplexing systems	• Component replacement • Repair • Faults

7. Service module software	• Identify module software version
	  o Technical Service Bulletin (TSB)
	• Service equipment
	• Procedure
	  o Manufactures guidelines
	  ▪ Battery voltage
	• Update
	• Configuration

Achievement Criteria 1

Performance — The learner will perform a functional test on a multiplexing system.

Conditions — The learner will be given

- Vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Achievement Criteria 2

Performance — The learner will test for a CAN bus signal.

Conditions — The learner will be given

- Vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H3 Diagnose and repair automatic transmissions and transaxles

Objectives

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

- Describe automatic transmissions and transaxles.
- Diagnose automatic transmissions and transaxles.
- Repair automatic transmissions and transaxles.

LEARNING TASKS	CONTENT
1. Describe automatic transmissions and transaxles components	• Torque convertors • Planetary gear train • Clutches and bands • Control valve body • Chains and sprockets • Coolers • Pumps • Fluid types • Sensors and actuators

2. Describe automatic transmissions and transaxles	• Types
	  o Dual clutch transmission (DCT)
	  o Constant velocity transmission (CVT)
	  o Conventional planetary
	• Operation
	• Fundamentals
	  o Gear ratios
	  o Power flow
	  o Hydraulics
	  o Electronics
	• Faults
	  o Mechanical
	  o Electrical (Control-side)

3. Diagnose automatic transmissions and transaxles	• Tests
	  o Sensory
	  o Signals
	  o Functional
	  o Codes and data
	• Test equipment

4. Repair automatic transmissions and transaxles	• Procedures • Testing and inspection • Wiring and controls

- Hydraulics and electronics
- Lubrication
- Adjustments
    - Shift adaptations
- Service procedures
    - Relearn
    - Software update
- Maintenance
    - Filtration
- Fluid exchange

Achievement Criteria

Performance	The learner will diagnose automatic transmission/transaxle.
Conditions	The learner will be given • A vehicle or transmission • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Competency: H5 Diagnose and repair all-wheel drive (AWD) systems

Objectives

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

- Describe transfer cases.
- Describe AWD and 4WD systems.
- Diagnose all-wheel drive (AWD) and four-wheel drive (4WD) systems.
- Repair all-wheel drive (AWD) and four-wheel (4WD) drive systems.

LEARNING TASKS	CONTENT

1. Describe transfer cases	• Types
	  o Part-time
	  o Full-time
	  o On-demand
	  o Chain-drive
	  o Gear-drive
	• Components
	• Lubricants
	• Operation

2. Describe transfer case operation	• Types
	  o Part-time
	  o Full-time
	• Engagement types
	  o Mechanical
	  o Electrical
	• Modes of operation
	  o Two-high (2H)
	  o Four-high (4H)
	  o Four-low (4L)

3. Describe AWD systems	• Principles of operation
	  o Power flow
	  o Torque vectoring
	• Components
	  o Power transfer unit (PTU)
	  o Couplings
	  o Torque splitting device
	• Sensors and actuators
	• Related systems
	  o Stability control
	  o Traction control
	• Lubrication and fluids

LEARNING TASKS	CONTENT

4. Describe 4WD systems	• Wiring and controls
	• Faults
	• Modes of operation
	  o Selective
	  o Automatic
	• Components
	  o Transfer cases
	  o Axle disconnects
	  o Hubs
	  ▪ Manual
	  ▪ Auto
	• Sensors and actuators
	• Related systems
	  o Stability control
	  o Traction control
	• Lubrication and fluids
	• Wiring and controls
	• Faults

5. Diagnose AWD and 4WD systems	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	  o Vacuum
	• Tests
	  o Signals
	  o Data
	  o Functional test
	• Test equipment

6. Repair AWD and 4WD systems	• Disassembly
	• Reassembly
	• Service procedures
	  o Relearning
	• Component replacement
	• Maintenance
	  o Fluid
	• Faults

Achievement Criteria

Performance	The learner will assess AWD operation.
Conditions	The learner will be given • A transfer case • 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: I5 Diagnose and repair instrumentation, entertainment systems, and displays

Objectives

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

- Describe instrumentation, entertainment systems, and displays.
- Diagnose instrumentation, entertainment systems, and displays.
- Repair instrumentation, entertainment systems, and displays.

LEARNING TASKS	CONTENT

1. Describe instrumentation	• Types
	  o Analogue
	  o Digital
	• Gauges
	  o Inputs
	  ▪ Sending units
	• Warning lights
	• Networking

2. Describe entertainment systems	• Audio
	  o Speakers
	  o Networking
	• Video
	• Wiring and components
	• Wireless
	  o Bluetooth
	  o WiFi
	  o Cellular
	• Faults

3. Describe displays and advanced driver assistance systems (ADAS)	• Information center
	  o Navigation
	  o ADAS
	  ▪ Back up camera
	  ▪ Around view (360° view)
	  ▪ Parking aid sensors
	• Warning lights

4. Diagnose instrumentation, entertainment systems, and displays	• Inspection
	  o Sensory
	• Tests
	  o Signals
	  o Functional
	  o Codes and data

5. Repair instrumentation, entertainment systems, and displays	• Removal and replacement • Repair

LEARNING TASKS	CONTENT
	○ Software ○ Relearning • Personalization • Faults

Line (GAC): J DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS

Competency: J1 Diagnose and repair air flow control and heating systems

Objectives

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

- Describe air flow and heating systems.
- Diagnose air flow and heating systems.
- Repair air flow and heating systems.

LEARNING TASKS	CONTENT

1. Describe air flow systems	• Components
	  o Actuators
	  o Sensors
	  o Doors
	  o Linkage
	• Wiring and control
	  o Computer contolled
	• Operation
	  o Modes
	  ▪ Blend
	  ▪ Defrost
	  o Zones
	• Faults

2. Describe heating systems	• Components
	  o Cooling system
	  o Heater cores
	  o Secondary heater
	  ▪ Electric
	• Wiring and control
	  o Computer contolled
	• Operation
	  o Modes
	  ▪ Blend
	  ▪ Defrost
	  o Zones
	• Faults

3. Diagnose air flow and heating systems	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT

4. Repair air flow and heating systems	• Removal and replacement
	• Repair
	  o Relearning
	• Maintenance
	  o Filters

Line (GAC): J DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS

Competency: J2 Diagnose and repair refrigerant systems

Objectives

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

- Describe refrigerant systems.
- Diagnose refrigerant systems.
- Repair refrigerant systems.

LEARNING TASKS	CONTENT

1. Describe refrigerant systems	• Safety
	• Principles of operation
	  o Fundamentals
	  o Strategies
	• Types
	  o Refrigerants
	  o Lubricants
	  o Systems
	• Components
	  o Types of compressors
	  ▪ Clutch-type
	  ▪ Clutchless
	  o Condensor
	  o Evaporator core
	  o Restriction
	  ▪ Thermostatic Expansion Valve (TXV)
	  ▪ Orfice-tube
	• Wiring and control
	  o Computer controlled
	  o Sensors and actuators
	• Faults

2. Diagnose refrigerant systems	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	  o Temperature
	  o Pressure
	  o Leak detection
	• Tests
	  o Signal
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT

3. Repair refrigerant systems	• Safety
	• Removal and replacement
	• Procedures
	  o Recover
	  o Repair
	  o Recharge
	• Faults

Achievement Criteria 1

Performance — The learner will assess refrigerant operating pressures.

Conditions — The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

Achievement Criteria 2

Performance — The learner will perform a refrigerant system performance test.

Conditions — The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria — The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results

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

Competency: L1 Diagnose and repair restraint systems

Objectives

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

- Describe restraint systems.
- Diagnose restraint systems.
- Repair restraint systems.

LEARNING TASKS	CONTENT

1. Describe restraint systems	• Principles of operation
	  o Deployment strategies
	• Types
	• Components
	  o Clockspring
	  o Sensors
	  ▪ Impact
	  ▪ Occupancy detection
	  o Modules
	• Wiring and controls

2. Diagnose restraint systems	• Safety
	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	• Tests
	  o Signals
	  o Codes and data

3. Repair restraint systems	• Component replacement
	  o Handling
	  o Disposal
	• Calibration
	  o Relearning

Achievement Criteria

Performance	The learner will diagnose a restraint system.
Conditions	The learner will be given • A vehicle • Test equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool usage • Procedure • Accuracy of results

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

Competency: M2 Diagnose and repair hybrid and electric vehicle (EV) systems

Objectives

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

- Diagnose hybrid and electric vehicles (EV).
- Repair hybrid and electric vehicles (EV).
- Diagnose high voltage batteries.
- Repair high voltage batteries.

LEARNING TASKS	CONTENT

1. Describe hybrid and electric vehicles (EV)	• Fundamentals of operation
	  o Hybrid Electric Vehicle (HEV)
	  ▪ Series
	  ▪ Parallel
	  ▪ Plug-in
	  o Electric Vehicle (EV)
	• Components
	  o High voltage battery
	  o Motor generators
	  o Inverters and converters
	  o Onboard chargers
	  o Electric vehicle supply equipment (EVSE)
	• Modes of operation
	• Wiring and control
	• Driveline systems
	  o Lubricants
	  o Coolants

2. Diagnose hybrid and electric vehicles (EV)	• Safety
	• Test equipment
	• Inspection
	  o Sensory
	  o Electrical
	• Tests
	  o Functional
	  o Codes and data
	• Charging tests
	  o Level 1
	  o Level 2
	  o DC fast charge
	• Isolation fault testing

LEARNING TASKS	CONTENT

3. Repair hybrid and electric vehicles (EV)	• Safety
	• Component replacement
	• Maintenance
	  o Filtration
	  o Lubricants
	  o Coolants
	• Repair
	• Repair verification
	  o Battery charging

4. Describe high voltage batteries	• Safety
	• Types
	  o Lithium ion
	  o Nickel metal hydride (NiMH)
	• Components
	  o Contactors
	  o Control modules
	  o Bus bars
	  o High voltage interlocks
	  o Sensors
	  o Battery housing

5. Diagnose high voltage batteries	• Safety
	• Inspection
	  o Sensory
	• Tests
	  o Codes and data
	  o State of health
	  o State of charge
	  o Predictive vehicle range
	  o Voltage balance
	  o Pressure

6. Repair high voltage batteries	• Safety
	• Removal and installation
	  o Disassembly
	  o Component replacement
	  o Reassembly
	• Relearning
	• Bleeding
	• Repair verification
	  o Battery charging

Achievement Criteria 1

Performance	The learner will perform a high voltage battery disconnect.
Conditions	The learner will be given • A hybrid vehicle or an electric vehicle (EV) • Tools and equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool and equipment usage • Procedure • Accuracy of results

Achievement Criteria 2

Performance	The learner will retrieve high voltage battery data.
Conditions	The learner will be given • A hybrid vehicle or an electric vehicle (EV) • Tools and equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool and equipment usage • Procedure • Accuracy of results

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

Competency: M3 Diagnose and repair hybrid and electric vehicle (EV) temperature management systems

Objectives

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

- Describe hybrid and electric vehicles (EV) HVAC systems.
- Diagnose hybrid and electric vehicles (EV) HVAC systems.
- Repair hybrid and electric vehicles (EV) HVAC systems.

LEARNING TASKS	CONTENT

1. Describe hybrid and electric vehicles (EV) HVAC systems	• Systems
	  o Positive Temperature Coefficient (PTC) Heater
	  o Heat pump
	  o Battery and electronics cooling
	  ▪ Air
	  ▪ Liquid
	• Components
	  o High voltage compressor
	  o Valves
	  o Modules
	  o Electric cooling pumps
	  o Heat exchangers
	• Lubricants
	• Coolants
	• Wiring and control

2. Diagnose hybrid and electric vehicles (EV) HVAC systems	• Safety
	• Inspection
	  o Sensory
	  o Mechanical
	  o Electrical
	  o Temperature
	  o Pressure
	  o Leak detection
	  ▪ Refrigerant
	  ▪ Coolant
	• Tests
	  o Signal
	  o Pressure
	  o Functional
	  o Codes and data

LEARNING TASKS	CONTENT

3. Repair hybrid and electric vehicles (EV) HVAC systems	• Safety
	• Component replacement
	• Maintenance
	  o Filtration
	  o Lubricants
	  o Coolants
	• Relearning
	• Repair
	• Repair verification

Achievement Criteria 1

Performance	The learner will verify battery temperature readings.
Conditions	The learner will be given • A hybrid vehicle or electric vehicle (EV) • Tools and equipment • Access to technical information
Criteria	The learner will be evaluated on • Safety • Tool and equipment usage • Procedure • Accuracy of results

Section 4

ASSESSMENT GUIDELINES

Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	AUTOMOTIVE SERVICE TECHNICIAN LEVEL 1		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
A	PERFORM SAFETY-RELATED FUNCTIONS	7%	7%
B	USE TOOLS, EQUIPMENT, AND DOCUMENTATION	10%	10%
C	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	0%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	3%	5%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	25%	33%
K	DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS, AND WHEEL BEARINGS	48%	45%
L	DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM	2%	0%
M	DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	4%	0%
	Total	100%	100%
In-school theory / practical subject competency weighting		70%	30%
Final in-school percentage score		**IN-SCHOOL%**	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standardized Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score	**FINAL %**

Assessment Guidelines – Level 2

Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	AUTOMOTIVE SERVICE TECHNICIAN LEVEL 2		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
D	DIAGNOSE AND REPAIR ENGINE SYSTEMS	30%	30%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	25%	25%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	22%	22%
K	DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS, AND WHEEL BEARINGS	23%	23%
	Total	100%	100%
In-school theory & practical subject competency weighting		70%	30%
Final in-school percentage score		**IN-SCHOOL%**	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standardized Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score	**FINAL %**

Assessment Guidelines – Level 3

Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	AUTOMOTIVE SERVICE TECHNICIAN LEVEL 3		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
E	DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS	75%	75%
G	DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS	3%	0%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	12%	15%
K	DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS, AND WHEEL BEARINGS	10%	10%
	Total	100%	100%
In-school theory / practical subject competency weighting		70%	30%
Final in-school percentage score		**IN-SCHOOL%**	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standardized Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score	**FINAL %**

Assessment Guidelines – Level 4

Level 4 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	AUTOMOTIVE SERVICE TECHNICIAN LEVEL 4		
LINE	**SUBJECT COMPETENCIES**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
C	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	0%
F	DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS	15%	20%
G	DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS	7%	10%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	20%	25%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	10%	0%
J	DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS	22%	25%
L	DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES, AND TRIM	8%	5%
M	DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	17%	15%
	Total	100%	100%
In-school theory / practical subject competency weighting		70%	30%
Final in-school percentage score		**IN-SCHOOL**%	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standardized Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score Apprentices must achieve a minimum 70% for the final level percentage score to be eligible to write the Automotive Service Technician Interprovincial Red Seal exam.	**FINAL** %

SkilledTradesBC will enter the apprentices Automotive Service Technician Red Seal Interprovincial examination mark in SkilledTradesBC Portal. A minimum mark of 70% on the examination is required for a pass.

Section 5

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: Level 1

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

Tools and Equipment: Level 2

Required Shop Tools and Equipment

- Alternator pulley remover
- Antifreeze tester
- Black light
- Bore scope
- Compression tester
- Coolant drain barrels and disposal system
- Coolant vacuum filler
- Cooling system pressure tester
- Cylinder leak down tester
- Dial bore gauge
- Engine lift
- Engine oil pressure test kit
- Engine supports
- Headlight aiming equipment
- Infrared thermometer
- Lab scope – 4-8 per class of 16 (2-channel, digital, curser function with time capture capability)
- Lab scope accessories (shielded cables and back probes)
- Micrometers
- Pyrometer
- Transmission fixture

Tools and Equipment: Level 3

Required Shop Tools and Equipment

- Fuel line disconnect set
- Fuel testing equipment
- Infrared thermometer
- Injector rail puller
- Injector seal kits
- Lab scope – 4-8 per class of 16 (2-channel, digital, curser function with time capture capability)
- Lab scope accessories (shielded cables and back probes)
- Low amp probe
- Module reprogramming equipment
- Smoke machine
- Vacuum/pressure gauge
- ADAS software and target

Tools and Equipment: Level 4

Required Shop Tools and Equipment

- Air bag load tool
- Air conditioning recovery equipment
- Airbag simulators
- Automatic transmission oil pressure test kit
- Chassis ears
- Diesel fuel hydrometer
- Fuel pressure gauges
- Infrared thermometer
- Lab scope – 4-8 per class of 16 (2-channel, digital, curser function with time capture capability)
- Lab scope accessories (shielded cables and back probes)
- Leak detection equipment (refrigerants)
- Low amp probe
- Megohmmeter
- Milliohmmeter
- Multimeter Category 3
- Refractometer
- Stanchions

Reference Materials

Recommended Reference Materials

Level One

- 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).

Level Two

- 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* (second period).

Level Three

- CDX, *Fundamentals of Automotive Technology.*
- Erjavec, J., *Automotive technology: A systems approach*.
- Halderman, J. D., *Advanced Automotive Electrical and Electronics.*
- Halderman, J. D., *Advanced Engine Performance Diagnosis.*
- Halderman, J. D., *Automotive Fuel and Emissions Control Systems.*
- Trade Secrets Alberta, *Individual Learning Modules* (third period).

Level Four

- CDX, *Fundamentals of Automotive Technology.*
- Erjavec, J., *Automotive technology: A systems approach*.
- Halderman, J. D. and T. Birch., *Automatic Transmissions and Transaxles*.
- Halderman, J. D., *Advanced Automotive Electrical and Electronics.*
- Trade Secrets Alberta, *Individual Learning Modules* (fourth 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.*

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Automotive Service Technician with an Interprovincial Red Seal endorsement

Work Experience

The instructor must possess:

- A minimum of five years' experience working in industry as a journeyperson.
- Diverse industry experience coveirng all the competencies in this program.

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- An instructor Diploma or equivalent
- A Bachelor's Degree in Education
- A Master's Degree in Education

Appendices

Appendix A
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 B
Summary of Achievement Criteria

Achievement Criteria are included for competencies that require a practical assessment. The intent of including Achievement Criteria in the 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 – LEVEL 1 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 – LEVEL 2 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	**ACHIEVEMENT CRITERIA TASK**
D3 Diagnose and repair engine assembly	The learner will perform engine assessment.
H6 Diagnose and repair final drive assemblies	The learner will perform backlash measurement.
I2 Diagnose and repair 12-volt batteries, starting, and charging systems	The learner will test a starting system.
K2 Diagnose and repair steering and control systems	The learner will relearn a steering angle sensor.
K4 Diagnose and repair braking and control systems	The learner will test a wheel-speed sensor.

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 3 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	**ACHIEVEMENT CRITERIA TASK**
E1 Diagnose and repair advanced wiring and electronics	1. The learner will use lab scope to test a component. 2. The learner will use an advanced wiring diagram to diagnose a fault.
E2 Diagnose and repair gasoline fuel delivery and injection systems	1. The learner will perform a fuel pressure test. 2. The learner will test a fuel injector.
E3 Diagnose and repair gasoline ignition systems	1. The learner will test an ignition coil. 2. The learner will test a crank shaft position sensor.
E4 Diagnose and repair engine management systems	The learner will access and interpret data to diagnose a system fault.
E6 Diagnose and repair gasoline emissions control systems	1. The learner will perform a catalyst efficiency test. 2. The learner will perform evaporative emissions system leak test.
I4 Diagnose and repair electrical options and accessories	1. The learner will perform electrical tests on a power window system. 2. The learner will perform electrical tests on a power door lock system.
K5 Diagnose and repair advanced driver assistance systems (ADAS)	The learner will perform an ADAS calibration.

AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 4 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	**ACHIEVEMENT CRITERIA TASK**
F1 Diagnose and repair diesel fuel delivery and injection systems	1. The learner will test diesel fuel. 2. The learner will test the operation of a high pressure fuel supply system.
G2 Diagnose and repair networking systems	1. The learner will perform a functional test on a multiplexing system. 2. The learner will test for a CAN bus signal.
H3 Diagnose and repair automatic transmissions and transaxles	The learner will diagnose automatic transmission/transaxle.
H5 Diagnose and repair all-wheel drive (AWD) systems	The learner will assess AWD operation.
J2 Diagnose and repair refrigerant systems	1. The learner will assess refrigerant operating pressures. 2. The learner will perform a refrigerant system performance test.
L1 Diagnose and repair restraint systems	The learner will diagnose a restraint system.
M2 Diagnose and repair hybrid and electric vehicle (EV) systems	1. The learner will perform a high voltage battery disconnect. 2. The learner will retrieve high voltage battery data.
M3 Diagnose and repair hybrid and electric vehicle (EV) temperature management systems	The learner will verify battery temperature readings.