



AUTOMOTIVE SERVICE TECHNICIAN 2017

Level 1 Based on the CCDA Harmonization Recommendations and
the Interprovincial Program Guide
(pg. 11 for Program Structure)



The Joint Planning Committee (JPC) recognizes this Interprovincial Program Guide as the national curriculum for the occupation of Automotive Service Technician.

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In 2012, a review, update and jurisdictional validation of this IPG were completed to ensure adequate coverage of the occupation as outlined in the 2011 National Occupational Analysis (NOA).

As this program guide will be amended periodically, comments or suggestions for improvement should be directed to:

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User Guide

According to the Canadian Apprenticeship Forum, the IPG is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the NOA, and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the NOAs and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans for training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended levelling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The IPG is divided into units. The unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Each unit consists of *Learning Outcomes* and *Objectives and Content*.

The *Learning Outcomes* are the specific performances that must be evaluated. Wording of the learning outcomes, "Demonstrate knowledge of...", acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which learning outcomes are evaluated; theoretically, practically or a combination of both.

User Guide (*continued*)

The *Objectives and Content* for the unit details the information to be covered in order to achieve the performances specified in the *Learning Outcomes*. These objectives can be either theoretical or practical in nature, based on the requirements identified through the industry consultation process. The learning activities used to cover the objectives are at the discretion of the jurisdiction; however, practically worded objective statements have been used where industry indicated a need for the apprentices to receive exposure to performing the task or skill outlined while attending technical training. For example, this exposure could be done through instructor demonstration or individual or group performance of the skill or task. This practical training will help to reinforce the theoretical component of the technical training.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. The content listed within the IPG document is **not** intended to represent an inclusive list; rather, it is included to illustrate the intended direction for the objective. Content may be added or extended in jurisdictional training plans as required.

Jurisdictions are free to deliver the IPG units one at a time or concurrently, provided that all *Learning Outcomes* are met. The IPG does not indicate the amount of time to be spent on a particular unit as the length of time required to deliver the *Learning Outcomes* successfully will depend upon the learning activities and teaching methods used.

IPG Glossary of Terms

These definitions are intended as a guide to how language is used in the IPGs.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which you would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs, and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

IPG Glossary of Terms *(continued)*

TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	<p>v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality.</p> <p>n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.</p>
TROUBLESHOOT	To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

Essential Skills are the skills needed for work, learning and life. They provide the foundation for learning all the other skills that enable people to evolve within their jobs and adapt to workplace change.

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit HRSDC's Essential Skills website at:

<http://www.hrsdc.gc.ca/eng/workplaceskills/LES/profiles/profiles.shtml>

Profile Chart

OCCUPATIONAL SKILLS			
AST-100 Safety	AST-105 Tools and Equipment	AST-110 Hoisting and Lifting	AST-115 Communication
AST-120 Trade Related Documents	AST-130 Oxy-Acetylene Welding and Cutting (OAW)	AST-135 Gas Metal Arc Welding (MIG)	AST-165 Vehicle Maintenance Inspection
ENGINE AND ENGINE SUPPORT SYSTEMS			
AST-145 Accessory Drive Systems	AST-200 Engine Principles	AST-205 Cooling Systems	AST-210 Engine Lubrication Systems
AST-230 Fuel Delivery Systems	AST-235 Ignition Systems	AST-300 Engine Repair	AST-305 Gasoline Fuel Systems
AST-330 Emission Control Systems	AST-335 Intake and Exhaust Systems	AST-400 Diesel Fuel Injection Systems	
VEHICLE MANAGEMENT SYSTEMS			
AST-310 Vehicle Management Systems			
DRIVE LINE SYSTEMS			
AST-240 Drive Shafts and Axles	AST-315 Manual Transmissions and Transaxles	AST-320 Clutches and Flywheels	AST-325 Transfer Cases
AST-340 Differentials and Final Drive Assemblies	AST-420 Automatic Transmissions and Transaxles		
ELECTRICAL AND COMFORT CONTROL SYSTEMS			
AST-155 Electrical and Electronic Principles	AST-215 Starting Systems	AST-220 Charging Systems	AST-225 Lighting and Wiper Systems
AST-425 Electrical Options and Accessories	AST-430 Instrumentation and Information Displays	AST-435 Heating, Ventilation and Air Conditioning Systems	

Profile Chart *(continued)*

STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, HUBS AND WHEEL BEARINGS			
AST-125 Tires, Wheels and Hubs	AST-140 Braking Systems I (Non-ABS)	AST-160 Suspension Systems I	AST-245 Steering Systems
AST-410 Braking Systems II (ABS)	AST-415 Suspension Systems II		
BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS			
AST-150 Body Components and Trim	AST-440 Restraint Systems		
HYBRID AND ALTERNATE FUEL SYSTEMS			
AST-170 Hybrid and Alternate Fuel Systems I	AST-445 Hybrid and Alternate Fuel Systems II		

Program Structure – Nova Scotia Apprenticeship Program

The courses listed below are required technical training in the Automotive Service Technician Apprenticeship Program.

Nova Scotia Course	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered			
			IPG Units		Sugg. Hrs.	Page #
Level 1 (6 Weeks)						
	Integrated Milestone	NONE	MENT-1801	Workplace Mentoring 1 (NS Specifig19c)	4	19
ASTA-1831	Fundamental Skills	NONE	AST-100	Safety	13	20
			AST-105	Tools and Equipment	5	21
			AST-110	Hoisting and Lifting	5	23
			AST-115	Communication		24
			AST-120	Trade Related Documents	3	25
ASTA-1832	Chassis Systems 1	ASTA-1831	AST-125	Tires Wheels and Hubs	10	26
			AST-160	Suspension Systems I	20	28
			AST-240	Drive Shafts and Axles		30
MPOA-1800	Basic Welding	ASTA-1831	AST-130	Oxy-Acetylene Welding (OAW) and Cutting	17	32
			AST-135	Gas Metal Arc Welding	13	33
ASTA-1833	Non-ABS Brake Systems	ASTA-1831	AST-140	Braking System I (Non-ABS)	40	34
ASTA-1834	Electrical and Electronic Systems 1	ASTA-1831	AST-155	Electrical and Electronic Principles	40	36
ASTA-1835	Maintenance Inspection and Body Adjustment	ASTA-1831	AST-145	Accessory Drive Systems	10	39
			AST-150	Body Components and Trim	10	41
			AST-165	Vehicle Maintenance Inspection	10	43
Level 2 (6 Weeks)						
ASTA-1851	Engine Principles & Fuel Delivery Sys	ASTA-1831, 1834	AST-200	Engine Principles	24	46
			AST-230	Fuel Delivery Systems	6	48
ASTA-1817	Engine Cooling and Lubrication	ASTA-1831, 1834	AST-205	Cooling Systems	15	50
			AST-210	Engine Lubrication Systems	15	52
ASTA-1804	Starting and Charging Systems	ASTA-1831, 1834	AST-215	Starting Systems	15	54
			AST-220	Charging Systems	15	55
ASTA-1836	Lighting and Wiper Systems	ASTA-1831, 1834	AST-225	Lighting and Wiper Systems	30	56
ASTA-1805	Ignition Systems	ASTA-1831, 1834	AST-235	Ignition Systems	30	58
ASTA-1837	Chassis Systems 2	ASTA-1831, 1832				
			AST-245	Steering Systems	20	60

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered			
			IPG Units		Sugg. Hrs.	Page #
Level 3 (7 Weeks)						
	Integrated Milestone	MENT-1801	MENT-1802	Workplace Mentoring II (NS Specific)	4	63
ASTA-1843	Final Drive Systems	ASTA-1831, 1832, 1837	AST-325	Transfer Cases	10	64
			AST-340	Differentials and Final Drive Assemblies	20	66
ASTA-1847	Vehicle Alignment	ASTA-1831, 1832, 1837	AST-415	Suspension Systems II	30	68
ASTA-1839	Gasoline Fuel Systems	ASTA-1831, 1834, 1851	AST-305	Gasoline Fuel Systems	30	70
ASTA-1840	Vehicle Management Systems	ASTA-1805, 1831, 1834, 1839, 1851	AST-310	Vehicle Management Systems	30	72
ASTA-1841	Intake and Emission Systems / Vehicle Inspection	ASTA-1805, 1831, 1832, 1834, 1837, 1839, 1840, 1851	AST-330	Emission Control Systems	17	74
			AST-335	Intake and Exhaust	9	76
			ASTA-1823	Vehicle Inspection (NS Specific)	4	78
ASTA-1845	Alternate Fuels and Energy Sources	ASTA-1805, 1831, 1834, 1839, 1840, 1851	AST-170	Hybrid and Alternate Fuel Systems I ¹	15	79
			AST-445	Hybrid and Alternate Fuel Systems II	15	80
ASTA-1846	ABS Brake and Restraint Systems	ASTA-1805, 1831, 1833, 1834, 1839, 1840	AST-410	Braking Systems II (ABS)	20	81
			AST-440	Restraint Systems	10	83
Nova Scotia AST (Service Station Mechanic) Apprenticeship Program: The 19 Courses Listed Above are Required.						
Level 4 (7 Weeks)						
ASTA-1838	Engine Repair	ASTA-1831, 1817, 1851	AST-300	Engine Repair	30	86
ASTA-1842	Manual Transmissions & Transaxles/ Clutches & Flywheels	ASTA-1831, 1832, 1837	AST-315	Manual Transmissions and Transaxles	22	87
			AST-320	Clutches and Flywheels	8	89
ASTA-1844	Diesel Fuel Injection Systems	ASTA-1805, 1831, 1834, 1839, 1840, 1851	AST-400	Diesel Fuel Injection Systems	30	91
ASTA-1848	Electrical and Electronic Systems 2	ASTA-1831, 1834	AST-425	Electrical Options and Accessories	20	93
			AST-430	Instrumentation and Information Displays	10	95
ASTA-1849	Automatic Transmissions and Transaxles	ASTA-1805, 1831, 1832, 1834, 1837, 1839, 1840, 1851	AST-420	Automatic Transmission and Transaxle	30	97

¹ Was “AST-405 Alternate Fuels and Energy Sources” in previous version of Curriculum Standard

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered			
			IPG Units		Sugg. Hrs.	Page #
ASTA-1850	Heating, Ventilation and Air Conditioning Systems	ASTA-1805, 1831, 1834, 1939, 1840, 1851	AST-435	Heating, Ventilation and Air Conditioning Systems	30	99
ASTA-1830	Program Review	Entire program	ASTA-1830	Program Review (NS Specific)	30	101
Nova Scotia Automotive Service Technician Apprenticeship Program: All Courses are Required.						

2011 NOA Sub-Task to IPG Unit Comparison

NOA Sub-task		IPG Unit	
Task 1 – Uses and maintains tools and equipment.			
1.01	Maintains tools and equipment.	AST-105	Tools and Equipment
1.02	Uses hoisting and lifting equipment.	AST-110	Hoisting and Lifting
		AST-100	Safety
1.03	Uses personal protective equipment (PPE) and safety equipment.	AST-100	Safety
Task 2 – Performs common trade activities.			
2.01	Uses technical information.	AST-120	Trade Related Documents
2.02	Estimates preliminary job cost.	AST-120	Trade Related Documents
2.03	Maintains safe work environment.	AST-100	Safety
Task 3 – Diagnoses engine systems.			
3.01	Diagnoses cooling systems.	AST-205	Cooling Systems
3.02	Diagnoses lubricating systems.	AST-210	Engine Lubricating Systems
3.03	Diagnoses base engine.	AST-200	Engine Principles
Task 4 – Repairs engine systems.			
4.01	Repairs cooling systems.	AST-205	Cooling Systems
4.02	Repairs lubricating systems.	AST-210	Engine Lubricating Systems
4.03	Repairs base engine.	AST-300	Engine Repair
Task 5 – Diagnoses engine support systems.			
5.01	Diagnoses fuel delivery systems.	AST-230	Fuel Delivery Systems
		AST-305	Gasoline Fuel Systems
		AST-400	Diesel Fuel Injection Systems
5.02	Diagnoses ignition systems.	AST-235	Ignition Systems
5.03	Diagnoses intake/exhaust systems.	AST-335	Intake and Exhaust Systems
5.04	Diagnoses emission systems.	AST-330	Emission Control Systems
5.05	Diagnoses accessory drive systems and mounts.	AST-145	Accessory Drive Systems
		AST-315	Manual Transmissions and Transaxles
		AST-420	Automatic Transmissions and Transaxles
5.06	Diagnoses diesel engine support systems.	AST-230	Fuel Delivery Systems
		AST-400	Diesel Fuel Injection Systems
		AST-235	Ignition Systems
		AST-335	Intake and Exhaust Systems
Task 6 – Repairs engine support systems.			
6.01	Repairs gasoline delivery systems.	AST-230	Fuel Delivery Systems
		AST-305	Gasoline Fuel Systems
		AST-400	Diesel Fuel Injection Systems
6.02	Repairs ignition systems.	AST-235	Ignition Systems
6.03	Repairs intake/exhaust systems.	AST-335	Intake and Exhaust Systems
6.04	Repairs emission systems.	AST-330	Emission Control Systems
6.05		AST-145	Accessory Drive Systems

NOA Sub-task		IPG Unit	
	Repairs accessory drive systems and mounts.	AST-315	Manual Transmissions and Transaxles
		AST-420	Automatic Transmissions and Transaxles
6.06	Repairs diesel engine support systems.	AST-230	Fuel Delivery Systems
		AST-400	Diesel Fuel Injection Systems
		AST-235	Ignition Systems
		AST-335	Intake and Exhaust Systems
		AST-330	Emission Control Systems
Task 7 – Diagnoses vehicle management systems.			
7.01	Reads diagnostic trouble codes (DTCs).	AST-310	Vehicle Management Systems
7.02	Monitors parameters.	AST-310	Vehicle Management Systems
7.03	Interprets test results.	AST-310	Vehicle Management Systems
7.04	Tests system circuitry and components.	AST-310	Vehicle Management Systems
Task 8 – Repairs vehicle management systems.			
8.01	Updates component software.	AST-310	Vehicle Management Systems
8.02	Replaces components.	AST-310	Vehicle Management Systems
8.03	Verifies vehicle management system repair.	AST-310	Vehicle Management Systems
		AST-155	Electrical and Electronic Principles
Task 9 – Diagnoses drive line systems.			
9.01	Diagnoses drive shafts and axles.	AST-240	Drive Shafts and Axles
9.02	Diagnoses manual transmissions/trans-axles.	AST-315	Manual Transmissions and Transaxles
9.03	Diagnoses automatic transmissions/transaxles.	AST-420	Automatic Transmissions and Transaxles
9.04	Diagnoses clutches.	AST-320	Clutches and Flywheels
9.05	Diagnoses transfer cases.	AST-325	Transfer Cases
9.06	Diagnoses final drive assemblies.	AST-340	Differentials and Final Drive Assemblies
Task 10 – Repairs drive line systems.			
10.01	Repairs drive shafts and axles.	AST-240	Drive Shafts and Axles
10.02	Repairs manual transmissions/transaxles.	AST-315	Manual Transmissions and Transaxles
10.03	Repairs automatic transmissions/transaxles.	AST-420	Automatic Transmissions and Transaxles
10.04	Repairs clutches.	AST-320	Clutches and Flywheels
10.05	Repairs transfer cases.	AST-325	Transfer Cases
10.06	Repairs final drive assemblies.	AST-340	Differentials and Final Drive Assemblies
Task 11 – Diagnoses electrical systems and components.			
11.01	Diagnoses starting/charging systems and batteries.	AST-215	Starting Systems
		AST-220	Charging Systems
11.02	Diagnoses basic wiring and electrical systems.	AST-155	Electrical and Electronic Principles
		AST-425	Electrical Options and Accessories
11.03	Diagnoses lighting and wiper systems.	AST-225	Lighting and Wiper Systems
11.04	Diagnoses entertainment systems.	AST-425	Electrical Options and Accessories
11.05	Diagnoses electrical options.	AST-425	Electrical Options and Accessories
11.06		AST-155	Electrical and Electronic Principles

NOA Sub-task		IPG Unit	
	Diagnoses instrumentation and information displays.	AST-430	Instrumentation and Information Displays
11.07	Diagnoses electrical accessories.	AST-155	Electrical and Electronic Principles
		AST-425	Electrical Options and Accessories
Task 12 – Repairs electrical systems and components.			
12.01	Repairs starting/charging systems and batteries.	AST-215	Starting Systems
		AST-220	Charging Systems
12.02	Repairs basic wiring and electrical systems.	AST-155	Electrical and Electronic Principles
		AST-425	Electrical Options and Accessories
12.03	Repairs lighting and wiper systems.	AST-225	Lighting and Wiper Systems
12.04	Repairs entertainment systems.	AST-425	Electrical Options and Accessories
12.05	Repairs electrical options.	AST-425	Electrical Options and Accessories
12.06	Repairs electrical accessories.	AST-155	Electrical and Electronic Principles
		AST-425	Electrical Options and Accessories
12.07	Installs electrical accessories.	AST-155	Electrical and Electronic Principles
		AST-425	Electrical Options and Accessories
12.08	Repairs instrumentation and information displays.	AST-155	Electrical and Electronic Principles
		AST-430	Instrumentation and Information Displays
Task 13 – Diagnoses heating, ventilation and cooling (HVAC) and comfort control systems.			
13.01	Diagnoses air flow control systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
13.02	Diagnoses refrigerant systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
13.03	Diagnoses heating systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
Task 14 – Repairs heating, ventilation and cooling (HVAC) and comfort control systems.			
14.01	Repairs air flow control systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
14.02	Repairs refrigerant systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
14.03	Repairs heating systems.	AST-435	Heating, Ventilation and Air Conditioning Systems
Task 15 – Diagnoses steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings.			
15.01	Diagnoses steering, suspension and control systems.	AST-245	Steering Systems
15.02	Diagnoses braking and control systems.	AST-140	Braking Systems I (Non ABS)
		AST-410	Braking Systems II (ABS)
15.03	Diagnoses tires, wheels, hubs, and wheel bearings.	AST-125	Tires, Wheels and Hubs
Task 16 – Repairs steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings.			

NOA Sub-task		IPG Unit	
16.01	Repairs steering, suspension and control systems.	AST-245	Steering Systems
16.02	Repairs braking and control systems.	AST-140	Braking Systems I (Non-ABS)
		AST-410	Braking Systems II (ABS)
16.03	Repairs tires, wheels, hubs and wheel bearings.	AST-125	Tires, Wheels and Hubs
Task 17 – Diagnoses body components, trim and restraint systems.			
17.01	Diagnoses restraint systems.	AST-440	Restraint Systems
17.02	Diagnoses wind noise, rattles and water leaks.	AST-150	Body Components and Trim
17.03	Diagnoses interior and exterior components and trim.	AST-150	Body Components and Trim
17.04	Diagnoses latches, locks and movable glass.	AST-150	Body Components and Trim
Task 18 – Repairs body components, trim, restraint systems and installed accessories.			
18.01	Repairs restraint systems.	AST-440	Restraint Systems
18.02	Repairs problems with wind noise, rattles and water leaks.	AST-150	Body Components and Trim
18.03	Repairs interior and exterior components and trim.	AST-150	Body Components and Trim
18.04	Repairs latches, locks and movable glass.	AST-150	Body Components and Trim
18.05	Install interior and exterior accessories.	AST-150	Body Components and Trim
Task 19 – Diagnoses hybrid and alternate fuel systems.			
19.01	Implements hybrid safety protocols.	AST-170	Hybrid and Alternate Fuel Systems I
19.02	Diagnoses hybrid systems.	AST-445	Hybrid and Alternate Fuel Systems II
19.03	Diagnoses alternate fuel systems.	AST-445	Hybrid and Alternate Fuel Systems II
Task 20 – Repairs hybrid and alternate fuel systems.			
20.01	Repairs hybrid systems.	AST-445	Hybrid and Alternate Fuel Systems II
20.02	Repairs alternate fuel systems.	AST-445	Hybrid and Alternate Fuel Systems II

LEVEL 1

MENT-1801

Workplace Mentoring I

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for learning workplace skills.
- Demonstrate strategies to assist in learning skills in the workplace.

Objectives and Content:

1. Describe the importance of your own experiences.
2. Identify the partners involved in apprenticeship.
3. Describe the shared responsibilities for workplace learning.
4. Determine your own learning preferences and explain how these relate to learning new skills.
5. Describe the importance of different types of skills in the workplace.
6. Describe the importance of essential skills in the trade.
7. Identify different ways of learning.
8. Identify your learning preferences.
9. Identify different learning needs and strategies to meet learning needs.
10. Identify techniques for effective communication.
11. Identify strategies to assist in learning a skill.

AST-100 Safety

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

Objectives and Content:

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.
2. Describe the procedures used to care for and maintain PPE.
3. Identify workplace hazards and describe safe work practices and equipment.
 - i) personal
 - ii) shop/facility
 - fire
 - explosion
 - gases
 - iii) environmental awareness
 - iv) vehicle
 - restraint systems
 - high voltage systems
 - high pressure fuel systems
 - hybrid and electrical vehicles
4. Identify and explain workplace safety and health regulations.
 - i) federal
 - Material Safety Data Sheets (MSDS)
 - Workplace Hazardous Material Information System (WHMIS)
 - ii) provincial/territorial
 - Occupational Health and Safety (OHS)
 - right of refusal
 - reportable incidents
 - inspections and safety certifications
 - iii) municipal

AST-105 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of hand and power tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measuring and testing devices, their applications, maintenance and procedures for use.
- Demonstrate knowledge of shop equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of welding, cutting and heating equipment and their applications.
- Demonstrate knowledge of fasteners, tubing, hoses and fittings, their applications and procedures for use.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to the use of tools and equipment.
2. Identify types of hand tools and describe their applications and procedures for use.
3. Describe the procedures used to store and maintain hand tools.
4. Identify types of power tools and describe their applications and procedures for use.
 - i) electric
 - ii) pneumatic
 - iii) hydraulic
5. Describe the procedures used to inspect, maintain and store power tools.
6. Identify types of measuring tools and describe their applications and procedures for use.
 - i) micrometers
 - ii) vernier calipers
 - iii) pressure gauges

7. Identify types of scan tools and digital voltage ohmmeters (DVOM) and describe their applications.
8. Describe the procedures used to inspect, maintain and store measuring tools.
9. Identify types of shop equipment and describe their applications and procedures for use.
10. Describe the procedures used to inspect, maintain and store shop equipment.
11. Identify types of welding, cutting and heating equipment and describe their applications.
 - i) oxy-acetylene heating and cutting
 - ii) gas metal arc welding (GMAW)
 - metal inert gas welding (MIG)
 - tungsten inert gas welding (TIG)
 - iii) shielded metal arc welding (SMAW)
12. Identify types of fasteners and describe their applications and procedures for use.
13. Identify types of tubing and hoses and describe their applications and procedures for use.
14. Identify types of fittings and describe their applications and procedures for use.

AST-110 Hoisting and Lifting

Learning Outcomes:

- Demonstrate knowledge of hoisting and lifting equipment, their applications and procedures for use.

Objectives and Content:

1. Define terminology associated with hoisting and lifting.
2. Identify hazards and describe safe work practices pertaining to hoisting and lifting.
 - i) Occupational Health and Safety (OHS) regulations
 - ii) safe work practices
3. Interpret information pertaining to hoisting and lifting found on drawings and specifications.
4. Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use.
5. Describe the procedures used when hoisting and lifting.
6. Describe the procedures used to inspect, maintain and store hoisting and lifting equipment.

AST-115 Communication

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.

Objectives and Content:

1. Identify audiences and describe techniques for effective verbal and non-verbal communication.
 - i) apprentices
 - ii) other tradespersons
 - iii) colleagues
 - iv) supervisors
 - v) clients
2. Describe the importance of effective communication.
 - i) customers
 - ii) co-workers
 - iii) related professionals
 - iv) journey person/apprentice
3. Describe effective information gathering and communication techniques.
 - i) questioning
 - ii) translating technical information
 - iii) using communication equipment
4. Identify types of communication devices and describe their purpose and operation.
 - i) portable and stationary radios
 - ii) cellular phones and mobility devices
 - iii) computers
 - iv) digital camera
5. Identify government and company policies and procedures, guidelines and standards.
6. Describe the importance of communicating job requirements.

AST-120

Trade Related Documents

Learning Outcomes:

- Demonstrate knowledge of trade related documents and their use.
- Demonstrate knowledge of the procedures used to prepare and complete documentation.

Objectives and Content:

1. Identify sources of related information.
2. Identify formats of related information.
 - i) print
 - ii) electronic
3. Locate and interpret identification codes found on the vehicle and vehicle components.
 - i) vehicle identification number (VIN)
4. Identify types of trade related documents and describe their applications.
 - i) work orders
 - ii) schematics and service information
 - iii) technical service bulletins (TSB)
 - iv) preventative maintenance schedules
 - v) estimates
 - vi) industry standard labour guides
 - vii) manufacturers' specifications
 - viii) codes and standards
 - ix) company policies
5. Describe the procedures used to prepare and complete trade related documents.
 - i) work orders
 - ii) estimates
 - iii) pre-delivery inspection
 - iv) preventative maintenance

AST-125 Tires, Wheels and Hubs

Learning Outcomes:

- Demonstrate knowledge of tires, wheels and hubs, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair tires, wheels and hubs.

Objectives and Content:

1. Define terminology associated with tires, wheels and hubs.
2. Identify safety considerations, hazards and describe safe work practices pertaining to tires and wheels.
 - i) tire inflation
 - ii) tire sizing
3. Identify types of tools and equipment relating to tires, wheels and hubs and describe their applications and procedures for use.
4. Identify types of tires and describe their construction.
5. Interpret tire codes and sidewall markings.
6. Describe the importance of tire rotation and maintenance.
7. Identify types of wheels and describe their components and operation.
8. Identify types of hubs and bearing assemblies and describe their components and operation.
9. Identify types of tire pressure monitoring systems and describe their applications.
10. Identify types of lubricants and describe their applications and procedures for use.
11. Describe the relationship between the suspension system and wheel assemblies.

12. Identify types of specialized tools and equipment and describe their applications and procedures for use.
13. Describe the procedures used to diagnose tires, wheels and hubs.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
14. Describe the procedures used to remove and reinstall tires and wheel assemblies.
 - i) index and balance
15. Describe the procedures used to remove and reinstall hubs and bearings.
16. Describe the procedures used to repair and/or replace tires and wheel assemblies.
 - i) perform repair
 - ii) verify repair
17. Describe the procedures used to adjust, repair and/or replace hubs and bearings.
 - i) perform repair
 - ii) verify repair

AST-160 Suspension Systems I

Learning Outcomes:

- Demonstrate knowledge of suspension systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair suspension systems.

Objectives and Content:

1. Define terminology associated with suspension systems.
2. Identify hazards and describe safe work practices pertaining to suspension systems.
 - i) springs
3. Interpret codes, standards and regulations pertaining to suspension systems.
 - i) manufacturers' specifications
4. Identify tools and equipment relating to suspension systems and describe their applications and procedures for use.
5. Identify types of suspension systems and describe their components and operation.
 - i) independent
 - ii) solid axle
6. Identify types of frames and body construction.
7. Identify types of springs and describe their purpose and operation.
 - i) coil
 - ii) leaf
 - iii) torsion bar
 - iv) air
8. Identify types of dampers and describe their components and operation.
 - i) struts
 - ii) shocks

9. Identify types of specialized tools and equipment and describe their applications and procedures for use.
10. Describe the procedures used to diagnose suspension systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) access service information
 - iv) conduct tests and measurements
 - v) isolate problem and root cause
11. Describe the procedures used to remove and reinstall suspension system components.
12. Describe the procedures used to adjust, repair and/or replace suspension system components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of drive shafts and axles, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair drive shafts and axles.

Objectives and Content:

1. Define terminology associated with drive shafts and axles.
2. Identify hazards and describe safe work practices pertaining to drive shafts and axles.
3. Identify specialized tools and equipment and describe their applications and procedures for use.
 - i) dial indicators
 - ii) inclinometer
4. Identify types of drive shafts and describe their composition.
5. Identify types of drive shaft components and describe their purpose and operation.
 - i) slip yokes and flanges
 - ii) flex joints
 - iii) single cardan joints
 - iv) double cardan joints
 - v) support bearing
 - vi) viscous coupling
6. Identify types of axles and describe their components and operation.
 - i) half shafts
 - ii) floating
 - iii) semi-floating
7. Describe axle disconnects, locking hubs and their purpose.

8. Describe the importance of multiple piece drive shaft phasing and indexing.
9. Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to diagnose drive shafts and axles systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - measure drive line angles
 - vi) isolate problem and root cause
11. Describe the procedures used to remove and reinstall drive shafts and axles.
12. Describe the procedures used to adjust, repair and/or replace drive shafts and axles and their related components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of oxy-acetylene welding and cutting equipment, their applications, maintenance and procedure for use.
- Demonstrate knowledge of weld defects, their causes and the procedures to prevent and correct them.

Objectives and Content:

1. Define and explain terminology associated with oxy-acetylene welding, cutting and heating.
2. Identify hazards and describe safe work practices pertaining to oxy-acetylene welding and cutting.
 - i) personal
 - ii) shop/facility
 - iii) equipment
3. Identify oxy-acetylene welding and cutting equipment and accessories and describe their applications.
4. Identify types of oxy-acetylene processes and describe their applications.
 - i) brazing/welding
 - ii) cutting
 - iii) heating
5. Describe the procedures used to set-up, adjust and shut-down oxy-acetylene welding and cutting equipment.
6. Describe the procedures used to inspect, store and maintain oxy-acetylene welding and cutting equipment.
7. Describe the procedures used to operate oxy-acetylene equipment.
8. Identify types of weld defects and describe their causes.
9. Describe the procedures used to prevent and correct weld defects.

AST-135

Gas Metal Arc Welding (GMAW [MIG])

Learning Outcomes:

- Demonstrate knowledge of gas metal arc welding equipment, their applications, maintenance and procedure for use.
- Demonstrate knowledge of weld defects, their causes and the procedures to prevent and correct them.

Objectives and Content:

1. Define and explain terminology associated with GMAW welding.
2. Identify safety precautions relating to GMAW use.
 - i) personal
 - ii) shop/facility
 - iii) equipment
3. Identify types of GMAW processes and describe their applications.
4. Identify GMAW welding equipment and accessories and describe their applications.
5. Describe the procedures used to set-up, adjust and shut-down GMAW equipment.
6. Describe the procedures used to operate GMAW equipment.
7. Describe the procedures used to inspect, maintain and store GMAW equipment.
8. Describe the procedures used to weld using GMAW equipment.
9. Identify types of weld defects and describe their causes.
10. Describe the procedures used to prevent and correct weld defects.

Learning Outcomes:

- Demonstrate knowledge of braking systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair braking systems.

Objectives and Content:

1. Define terminology associated with braking systems.
2. Identify safety considerations pertaining to braking systems.
 - i) hydraulic pressure
 - ii) anti-lock brake system (ABS)
3. Explain hydraulic principles related to braking systems.
 - i) Pascal's law
4. Identify types of tools and equipment relating to braking systems and describe their applications and procedures for use.
5. Identify types of braking systems and describe their components and operation.
 - i) disc
 - ii) drum
 - iii) parking
6. Identify types of power assists and describe their components and operation.
 - i) vacuum
 - ii) hydraulic
 - iii) electric
7. Identify types of fluids and describe their applications and procedures for use.
8. Identify types of fittings, flaring, tubing and hoses and describe their applications and procedures for use.

9. Describe the procedures used to diagnose braking systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
10. Describe the procedures used to flush and bleed hydraulic brakes.
11. Describe the procedures used to measure and machine components.
12. Describe the procedures used to adjust, repair and/or replace braking system components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of basic electrical and electronic principles.
- Demonstrate knowledge of batteries, their characteristics and procedures to replace.
- Demonstrate knowledge of circuits, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair circuits and components.

Objectives and Content:

1. Define terminology associated with electrical and electronic principles.
2. Identify hazards and describe safe work practices pertaining to electrical and electronic components.
 - i) personal
 - ii) vehicle
3. Interpret information pertaining to electrical and electronic components found on drawings and specifications.
 - i) diagnostic flowcharts
 - ii) schematics
4. Explain basic electrical theory.
 - i) conventional theory
 - ii) electron theory
5. Explain basic computer operation.
 - i) inputs
 - ii) outputs

6. Explain Ohm's law and its applications to electrical circuits.
 - i) series circuit
 - ii) parallel circuit
 - iii) series-parallel circuits
7. Identify types of specialized tools and equipment used to test batteries and describe their applications and procedures for use.
8. Identify types of batteries and describe their characteristics.
9. Describe the procedures used to test and/or charge batteries.
10. Identify types of wire and describe their characteristics, composition and applications.
11. Identify types of electrical components and describe their purpose and operation.
 - i) circuit protection
 - ii) control devices
 - iii) load devices
12. Identify types of electronic components and describe their purpose and operation.
 - i) diodes
 - ii) transistors
 - iii) resistors
 - iv) integrated circuits
13. Identify types of specialized tools and equipment used to test circuits and components and describe their applications and procedures for use.
 - i) scan tools
14. Describe the procedures used to diagnose circuits and components.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

15. Identify methods of wire repair and describe their associated procedures.
 - i) splicing
 - ii) terminal replacement
 - iii) soldering
 - iv) crimping

16. Describe the procedures used to repair and/or replace circuits and components.
 - i) perform repair
 - ii) verify repair

AST-145 Accessory Drive Systems

Learning Outcomes:

- Demonstrate knowledge of accessory drive systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair accessory drive systems.

Objectives and Content:

1. Define terminology associated with accessory drive systems.
2. Identify hazards and describe safe work practices pertaining to accessory drive systems.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify the types of accessory drive systems and describe their components and operation.
 - i) belt tension/tensioners
 - ii) belts
 - iii) drives
 - electric
 - hydraulic
 - gear
5. Describe the procedures used to diagnose accessory drive systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
6. Describe the procedures used to remove and reinstall accessory drive system components.

7. Describe the procedures used to adjust, repair and/or replace accessory drive system components.
 - i) perform repair
 - ii) verify repair

AST-150

Body Components and Trim

Learning Outcomes:

- Demonstrate knowledge of body components and trim and their applications.
- Demonstrate knowledge of the procedures used to diagnose and repair body components and trim.

Objectives and Content:

1. Define terminology associated with body components and trim.
2. Identify hazards and describe safe work practices pertaining to body components and trim.
 - i) restraint systems
3. Identify tools and equipment relating to body components and trim and describe their applications and procedures for use.
4. Identify body components and accessories and describe their purpose and operation.
 - i) interior
 - doors
 - seats
 - dashes
 - ii) exterior
 - bumpers
 - mirrors
 - add-on accessories
 - mounts
5. Identify types of electrical/electronic systems and describe their components and operation.
 - i) locks
 - ii) latches
6. Explain the principles of basic aerodynamics related to body design.

7. Identify types and sources of noise, vibration and harshness (NVH).
 - i) chuckles
 - ii) rattles
 - iii) knocks and whines
 - iv) offensive noises

8. Identify materials used to dampen or interrupt vibration.
 - i) tapes
 - ii) adhesives
 - iii) insulators

9. Identify types and sources of wind and water leaks.

10. Identify types of seals, adhesives, cleaners and sealing materials and describe their applications and procedures for use.

11. Describe the procedures used to diagnose body components and trim.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

12. Describe the procedures used to adjust, repair and/or replace body components and trim.
 - i) perform repair
 - ii) verify repair

AST-165

Vehicle Maintenance Inspection

Learning Outcomes:

- Demonstrate knowledge of vehicle maintenance inspections and their purpose.
- Demonstrate knowledge of the procedures used to perform vehicle maintenance inspections.
- Demonstrate knowledge of pre-delivery inspections and their purpose.
- Demonstrate knowledge of the procedures used to perform pre-delivery inspections.

Objectives and Content:

1. Define terminology associated with vehicle maintenance inspections.
2. Identify hazards and describe safe work practices pertaining to vehicle maintenance inspections.

VEHICLE MAINTENANCE INSPECTION

3. Describe the importance of regular vehicle maintenance inspections.
4. Identify tools and equipment used to perform vehicle maintenance inspections.
5. Identify vehicle components and accessories requiring operational checks.
 - i) brakes
 - ii) tires
 - iii) lights and wipers
 - iv) steering linkage
 - v) belts and filters
 - vi) exhaust
6. Identify lubricants and fluids requiring service checks.
7. Describe the procedures used to perform vehicle maintenance inspections.

PRE-DELIVERY INSPECTION

8. Identify the purpose of pre-delivery inspections.

9. Describe the procedures used to perform pre-delivery inspections.
 - i) inspection instructions
 - ii) specifications and tolerances documentation

LEVEL 2

AST-200 Engine Principles

Learning Outcomes:

- Demonstrate knowledge of engine theory.
- Demonstrate knowledge of engines, their components and operation.

Objectives and Content:

1. Define and explain terminology associated with engines.
2. Explain internal combustion principles.
3. Identify types of engine classifications.
 - i) fuel
 - diesel
 - gasoline
 - alternate fuels
 - ii) stroke
 - iii) cooling systems
 - air
 - liquid
4. Identify types of engine configurations and describe their construction.
 - i) inline
 - ii) rotary
 - iii) opposed
 - iv) V
5. Identify types of valve train configurations and describe their construction.
 - i) push rod
 - ii) overhead cam
 - iii) multi-valve
 - iv) solenoid operated valve
6. Identify engine components and describe their design, purpose and operation.
 - i) block assembly
 - ii) cylinder head assembly
 - iii) timing

- gears
- belts
- chains
- variable

iv) mounts

7. Identify types of fasteners, gaskets, seals and sealants and describe their applications and procedures for use.
8. Calculate engine displacement, compression ratios, horsepower, area and volume.

AST-230 Fuel Delivery Systems

Learning Outcomes:

- Demonstrate knowledge of fuel delivery systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair fuel delivery systems.

Objectives and Content:

1. Define terminology associated with fuel delivery systems.
2. Identify hazards and describe safe work practices pertaining to fuel delivery systems.
 - i) handling and storage of fuels
 - ii) depressurize fuel systems and fuel recovery
2. Identify regulatory requirements pertaining to fuel.
 - i) storage and disposal of fuels
3. Identify types of fuels and describe their characteristics and properties.
 - i) gasoline
 - ii) diesel
 - iii) alternate
4. Identify types of fuel delivery systems and describe their components and operation.
 - i) mechanical
 - ii) electrical
5. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
6. Describe the procedures used to diagnose fuel delivery systems and their components.
 - i) types
 - gasoline
 - diesel

- ii) procedures
 - verify complaint
 - visually inspect
 - retrieve diagnostic codes
 - access service information
 - conduct tests and measurements
 - pressure
 - volume/flow
 - vacuum
 - electrical
 - contamination
 - quality
 - isolate problem and root cause

- 7. Describe the procedures used to remove and reinstall fuel delivery system components.

- 8. Describe the procedures used to adjust, repair and/or replace fuel delivery system components.
 - i) types
 - gasoline
 - diesel
 - ii) procedures
 - perform repair
 - verify repair

AST-205 Cooling Systems

Learning Outcomes:

- Demonstrate knowledge of cooling systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair cooling systems.

Objectives and Content:

1. Define terminology associated with cooling systems.
2. Identify hazards and describe safe work practices pertaining to cooling systems.
 - i) environmental
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of cooling systems and describe their purpose, characteristics and applications.
 - i) liquid
 - ii) air cooled
5. Identify cooling system components and describe their purpose and operation.
6. Identify warning systems and indicators and describe their purpose and operation.
 - i) lights
 - ii) gauges
 - iii) audible
7. Identify types of fan systems and describe their components and operation.
 - i) mechanical
 - ii) electric
 - iii) hydraulic

8. Identify related systems and describe their relationship to cooling systems.
 - i) heating, ventilation and air conditioning (HVAC)
 - ii) coolers and auxiliary coolers
 - iii) coolant heaters
9. Identify types of coolants and chemical additives and describe their characteristics and applications.
10. Describe the procedures used to flush, handle, store and recycle or dispose of coolants according to environmental regulations.
11. Identify types of hoses, tubing, belts, gaskets, seals and sealants and describe their applications.
12. Describe the procedures used to diagnose cooling systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
13. Describe the procedures used to remove and reinstall cooling system components.
14. Describe the procedures used to adjust, repair and/or replace cooling system components.
 - i) perform repair
 - ii) verify repair

AST-210 Engine Lubrication Systems

Learning Outcomes:

- Demonstrate knowledge of engine lubrication systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair engine lubrication systems.

Objectives and Content:

1. Define terminology associated with engine lubrication systems.
2. Identify hazards and describe safe work practices pertaining to engine lubrication systems.
3. Identify types of engine lubricants and describe their characteristics and applications.
 - i) grades and classifications
 - ii) synthetics
 - iii) additives
4. Identify types of oil pumps and drives and describe their purpose and operation.
 - i) rotor pump
 - ii) vane type
 - iii) gear type
5. Identify types of oil coolers and describe their purpose and operation.
 - i) oil-to-air
 - ii) oil-to-coolant
6. Identify types of hoses, tubing, gaskets, seals and sealants and describe their applications.
7. Describe oil flow, filtration and pressure regulation.

8. Identify types of warning systems and indicators and describe their purpose and operation.
 - i) lights
 - ii) gauges
 - iii) audible

9. Describe the procedures used to perform oil and filter changes.
 - i) super/turbocharger precautions

10. Describe the procedures used to diagnose engine lubrication systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

11. Describe the procedures used to remove and reinstall engine lubrication system components.

12. Describe the procedures used to adjust, repair and/or replace engine lubrication systems and their related components.
 - i) perform repair
 - ii) verify repair

AST-215 Starting Systems

Learning Outcomes:

- Demonstrate knowledge of starting systems, their components and operation.
- Demonstrate knowledge of the procedures to diagnose and repair starting systems.

Objectives and Content:

1. Define terminology associated with starting systems.
2. Identify hazards and describe safe work practices pertaining to starting systems.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of starting systems and describe their components and operation.
5. Identify types of control systems and describe their components and operation.
 - i) anti-theft
 - ii) safety
6. Describe the procedures used to diagnose starting systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
7. Describe the procedures used to remove and reinstall starting system components.
8. Describe the procedures used to adjust, repair and/or replace starting system components.
 - i) perform repair
 - ii) verify repair

AST-220 Charging Systems

Learning Outcomes:

- Demonstrate knowledge of charging systems, their components and operation.
- Demonstrate knowledge of the procedures to diagnose and repair charging systems.

Objectives and Content:

1. Define terminology associated with charging systems.
2. Identify hazards and describe safe work practices pertaining to charging systems.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of charging systems and describe their components and operation.
5. Describe the procedures used to diagnose charging systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
6. Describe the procedures used to remove and reinstall charging system components.
7. Describe the procedures used to adjust, repair and/or replace charging system components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of lighting and wiper systems, their components and operation.
- Demonstrate knowledge of the procedures to diagnose and repair lighting and wiper systems.

Objectives and Content:

1. Define terminology associated with lighting and wiper systems.
2. Identify hazards and describe safe work practices pertaining to lighting and wiper systems.
 - i) high intensity discharge (HID)
3. Identify regulatory requirements pertaining to lighting and wiper systems.
4. Identify types of specialized tools and equipment and describe their applications and procedures for use.
5. Identify types of lighting systems and describe their components and operation.
 - i) electrically controlled
 - ii) electronically controlled
6. Identify types of wiper systems and describe their components and operation.
 - i) electrically controlled
 - ii) electronically controlled
7. Describe the procedures used to diagnose lighting and wiper systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

8. Describe the procedures used to remove and reinstall lighting and wiper system components.
9. Describe the procedures used to adjust, repair and/or replace lighting and wiper system components.
 - i) perform repair
 - ii) verify repair

AST-235 Ignition Systems

Learning Outcomes:

- Demonstrate knowledge of ignition systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair ignition systems.

Objectives and Content:

1. Define terminology associated with ignition systems.
2. Identify safety considerations pertaining to ignition systems.
 - i) high voltage
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of ignition systems and describe their components and operation.
 - i) distributor
 - ii) distributorless
5. Identify the types of ignition circuits and describe their purpose and operation.
 - i) primary
 - ii) secondary
6. Describe the procedures used to diagnose ignition systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
7. Describe the procedures used to remove and reinstall ignition system components.

8. Describe the procedures used to adjust, repair and/or replace ignition system components.
 - i) perform repair
 - ii) verify repair

AST-245 Steering Systems

Learning Outcomes:

- Demonstrate knowledge of steering systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair steering systems.

Objectives and Content:

1. Define terminology associated with steering systems.
2. Identify safety considerations pertaining to steering systems.
 - i) passive restraints
 - air bags
 - clock springs
 - ii) collapsible columns
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of steering columns and describe their components and operation.
 - i) tilt
 - ii) telescopic
 - iii) collapsible
5. Identify types of steering systems and describe their components and operation.
 - i) linkage
 - tie rods
 - idler arms
 - pitman arms
 - relay rods
 - ii) four wheel steering
 - rack-and-pinion
6. Identify types of steering gears and describe their components and operation.
 - i) recirculating ball
 - ii) rack-and-pinion

7. Identify types of assist systems and describe their components and operation.
 - i) electric
 - ii) hydraulic
 - iii) variable
8. Identify types of power steering pumps and describe their components and operation.
9. Identify types of fluids and lubricants, fasteners, tubing, hoses, gaskets and seals and describe their applications.
10. Describe the procedures used to disarm passive restraints.
11. Describe the procedures used to diagnose steering systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
12. Describe the procedures used to remove and reinstall steering system components.
13. Describe the procedures used to adjust, repair and/or replace steering system components.
 - i) perform repair
 - ii) verify repair

LEVEL 3

MENT-1802

Workplace Mentoring II

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for teaching workplace skills.
- Demonstrate strategies to assist in teaching skills in the workplace

Objectives and Content:

1. Describe the impact of your own experiences in teaching skills.
2. Identify the different roles played by a workplace mentor.
3. Describe the six-step approach to teaching skills.
4. Explain the importance of identifying the point of the lesson.
5. Identify how to choose a good time to present a lesson.
6. Explain the importance of linking the lessons.
7. Identify the components of the skill (the context).
8. Describe considerations for demonstrating a skill.
9. Identify types of skill practice.
10. Describe considerations in setting up opportunities for skill practice.
11. Explain the importance of providing feedback.
12. Identify techniques for giving effective feedback.
13. Describe a skill assessment.
14. Identify methods of assessing progress.
15. Explain how to adjust a lesson to different situations.

AST-325 Transfer Cases

Learning Outcomes:

- Demonstrate knowledge of transfer cases, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair transfer cases.

Objectives and Content:

1. Define terminology associated with transfer cases.
2. Identify safety considerations pertaining to the operation of transfer cases.
3. Identify types of transfer cases and describe their components and operation.
4. Describe the relationship between transfer cases and locking hubs.
5. Identify types of specialized tools and equipment and describe their applications and procedures for use.
6. Identify types of control systems and describe their components and operation.
 - i) vacuum
 - ii) manual
 - iii) electronic
7. Explain power flow as it relates to transfer cases.
8. Describe gear ratios, their purpose and calculations.
9. Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to diagnose transfer cases.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes

- iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
11. Describe the procedures used to remove and reinstall transfer cases.
12. Describe the procedures used to adjust, repair and/or replace transfer cases and their related components.
- i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of differentials and final drive assemblies, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair differentials and final drive assemblies.

Objectives and Content:

1. Define terminology associated with differentials and final drive assemblies.
2. Identify hazards and describe safe work practices pertaining to differentials and final drive assemblies.
3. Identify tools and equipment relating to differentials and final drive assemblies and describe their applications and procedures for use.
4. Identify types of differentials and final drive assemblies and describe their components and operation.
 - i) locking
 - ii) non-locking
5. Identify types of differential housings.
 - i) integral
 - ii) non-integral
6. Identify types of differential control systems and describe their components and operation.
 - i) electronically controlled/electric
 - ii) vacuum
 - iii) mechanical
7. Explain power flow as it relates to differentials and final drive assemblies.
8. Describe gear ratios, their purpose and calculations.

9. Identify types of lubricants, additives, fasteners, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to diagnose differentials and final drive assemblies.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
11. Describe the procedures used to remove and reinstall differentials.
12. Describe the procedures used to adjust, repair and/or replace differentials and final drive assemblies their related components.
 - i) perform repair
 - ii) verify repair

AST-415 Suspension Systems II

Learning Outcomes:

- Demonstrate knowledge of wheel alignment and steering geometry.
- Demonstrate knowledge of electronically controlled suspension systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair wheel alignment and electronically controlled suspension systems.

Objectives and Content:

1. Explain steering geometry principles and their applications.
 - i) alignment angles
 - ii) Ackerman principle
2. Identify types of specialized tools and equipment and describe their applications and procedures for use.
3. Identify types of electronically controlled suspension systems and describe their components and operation.
 - i) ride control
 - ii) height control
4. Describe the procedures used to diagnose wheel alignment and electronically controlled suspension systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
5. Describe the procedures used to remove and reinstall electronically controlled suspension systems components.

6. Describe the procedures used to adjust, repair and/or replace electronically controlled suspension systems components.
 - i) perform repair
 - ii) verify repair

7. Describe the procedures to perform wheel alignment.

AST-305 Gasoline Fuel Systems

Learning Outcomes:

- Demonstrate knowledge of gasoline fuel systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair gasoline fuel systems.

Objectives and Content:

1. Define terminology associated with gasoline fuel systems.
2. Identify safety considerations pertaining to gasoline fuel systems.
 - i) high pressure
 - ii) flammability
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify the types of gasoline fuel systems and describe their components and operation.
 - i) electronic injection
 - ii) mechanical injection
 - iii) carburetion
5. Identify types of tubing, hoses, gaskets, seals and sealants and describe their applications.
6. Describe the procedures used to diagnose gasoline fuel injection systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
7. Describe the procedures used to remove and reinstall gasoline fuel injection system components.

8. Describe the procedures used to adjust, repair and/or replace gasoline fuel injection system components.
 - i) perform repair
 - ii) verify repair

AST-310 Vehicle Management Systems

Learning Outcomes:

- Demonstrate knowledge of vehicle management systems, their components and operation.
- Demonstrate knowledge of reprogramming software.
- Demonstrate knowledge of the procedures used to diagnose and repair vehicle management system components.

Objectives and Content:

1. Define terminology associated with vehicle management systems.
2. Explain basic computer operation and its relationship to vehicle management systems.
3. Identify types of specialized tools and equipment used to diagnose network and electronic circuitry and describe their applications and procedures for use.
 - i) digital volt ohmmeter (DVOM)
 - ii) scopes
 - iii) probes
 - iv) break out boxes
 - v) scan tools
4. Identify on-board diagnostic (OBD) systems and describe their components and operation.
 - i) OBD I
 - diagnostic trouble codes (DTC)
 - pass/fail reporting
 - conditions to set and clear DTC's
 - ii) OBD II
 - drive cycles and monitors
 - DTC
5. Identify the types of network protocols and describe their purpose.
 - i) International Standards Organization (ISO)
 - ii) high speed (HS)
 - iii) controller area network (CAN)
 - iv) universal asynchronous receive transmit (UART)

6. Describe the networking of modules and multi-plexing.
 - i) wiring designs
 - ii) wireless
7. Interpret diagnostic trouble codes (DTC).
8. Identify the parameters of inputs and outputs and describe their relationships.
9. Describe the procedures used to diagnose vehicle management systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
10. Identify methods used to access/transfer and reprogram software and describe their associated procedures.
 - i) CD/DVD
 - ii) Internet
 - iii) scan tool
 - iv) programmable read only memory (PROM)
11. Describe the procedures used to repair and/or replace vehicle management system components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of emission control systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair emission control systems.

Objectives and Content:

1. Define terminology associated with emission control systems.
2. Identify hazards and describe safe work practices pertaining to emission control systems.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify the types of on-board diagnostic systems and describe their applications.
 - i) OBD I
 - ii) OBD II
5. Identify the types of emission gases.
 - i) CO
 - ii) CO²
 - iii) NO_x
 - iv) HC
 - v) O²
6. Identify emission control systems and describe their components and operation.
 - i) exhaust gas recirculation (EGR)
 - ii) evaporative emission control systems (EVAP)
 - iii) air injection
 - secondary
 - iv) exhaust system
 - v) crankcase ventilation (PCV)
 - positive

- vi) induction system
 - vii) variable cam-timing (VCT)
 - viii) particulate filter
7. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
8. Describe the procedures used to diagnose emission control systems.
- i) type
 - gasoline
 - diesel
 - ii) procedure
 - verify complaint
 - visually inspect
 - retrieve diagnostic codes
 - access service information
 - conduct tests and measurements
 - isolate problem and root cause
9. Describe the procedures used to remove and reinstall emission control system components.
10. Describe the procedures used to adjust, repair and/or replace emission control system components.
- i) perform repair
 - ii) verify repair

AST-335 Intake and Exhaust Systems

Learning Outcomes:

- Demonstrate knowledge of intake and exhaust systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair intake and exhaust systems.

Objectives and Content:

1. Define terminology associated with intake and exhaust systems.
2. Identify hazards and describe safe work practices pertaining to intake and exhaust systems.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify the types of intake systems and describe their components and operation.
5. Identify the types of exhaust systems and describe their components and operation.
6. Identify intake air systems and describe their components and operation.
 - i) forced air
 - turbocharged
 - supercharged
 - ii) naturally aspirated (NA)
7. Identify types and sources of induction and exhaust system problems.
 - i) leaks
 - ii) blockages
 - iii) noise
 - iv) vibration
8. Identify the types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.

9. Describe the procedures used to diagnose intake and exhaust systems and their components.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
10. Describe the procedures used to remove and reinstall intake and exhaust system components.
11. Describe the procedures used to adjust, repair and/or replace intake and exhaust system components.
 - i) perform repair
 - ii) verify repair
12. Describe the procedures used to perform oil changes and decarbonization of super/turbo chargers.

ASTA-1823 Vehicle Inspection
(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Demonstrate knowledge of government safety inspections and their purpose.
- Demonstrate knowledge of the procedures used to perform government safety inspections.

Objectives and Content:

1. Identify the purpose of provincial government safety inspections.
2. Identify the responsibilities and liabilities pertaining to government safety inspections.
 - i) vehicle owner
 - ii) journey person
 - iii) shop owner
 - iv) government
3. Describe the procedures used to perform government safety inspections.
 - i) inspection instructions
 - ii) specifications and tolerances
 - iii) documentation
 - inspection forms
 - rejection stickers
 - inspection stickers

Learning Outcomes:

- Demonstrate knowledge of hybrid and alternate fuel systems, their components and operation.

Objectives and Content:

1. Define terminology associated with hybrid and alternate fuel systems.
2. Identify hazards and describe safe work practices pertaining to hybrid and alternate fuel-systems.
 - i) PPE
 - ii) high pressure
 - iii) flammability
 - iv) high voltage
 - v) extreme cold temperatures
 - vi) operation
3. Identify tools and equipment relating to hybrid and alternate fuel vehicles and describe their applications and procedures for use.
4. Identify types of alternate fuels and describe their characteristics and properties.
 - i) flex
 - ii) hydrogen
 - iii) bio-diesel
 - iv) liquid propane gas (LPG)
 - v) compressed natural gas (CNG)
5. Identify types of hybrid and alternate fuel vehicles and their related components.
 - i) hybrid
 - ii) electric
 - iii) fuel cell

AST-445

Hybrid and Alternate Fuel Systems II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to diagnose and repair hybrid and alternate fuel systems.

Objectives and Content:

1. Identify types of testing/diagnostic equipment and describe their applications.
2. Identify types of hybrid and alternate fuel control systems and describe their components and operation.
 - i) ABS
 - ii) TCS
 - iii) stability control systems
 - iv) regenerative braking
3. Identify types of hybrid and alternate fuel steering systems and describe their components and operation.
4. Describe the procedures used to diagnose hybrid and alternate fuel systems and their components.
5. Describe the procedures to adjust, repair and/or replace hybrid and alternate fuel systems and their components.

AST-410 Braking Systems II (ABS)

Learning Outcomes:

- Demonstrate knowledge of anti-lock braking systems (ABS), their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair ABS.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to ABS and their components.
 - i) hydraulic pressure
 - ii) anti-lock brake system (ABS)
2. Identify types of specialized tools and equipment and describe their applications and procedures for use.
3. Identify types of ABS and describe their components and operation.
4. Identify types of trailer brakes and controls and describe their components and operation.
5. Describe ABS and their modes of operation.
6. Identify types of control systems and describe their components and operation.
 - i) traction control system (TCS)
 - ii) anti-lock brake system (ABS)
 - iii) stability control
 - iv) type of trailer brakes and controls
7. Describe the procedures used to diagnose ABS.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

8. Describe the procedures used to flush and bleed ABS.
9. Describe the procedures used to adjust, repair and/or replace ABS components.
 - i) perform repair
 - ii) verify repair

AST-440 Restraint Systems

Learning Outcomes:

- Demonstrate knowledge of restraint systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair restraint systems.

Objectives and Content:

1. Define terminology associated with restraint systems.
2. Identify hazards and describe safe work practices related to restraint systems.
 - i) handling and disposal
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify regulatory requirements pertaining to restraint systems.
5. Identify types of restraint systems and describe their components and operation.
 - i) active
 - ii) passive
6. Identify types of restraint system warning indicators and describe their purpose.
7. Describe the procedures used to diagnose restraint systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iii) access service information
 - iv) conduct tests and measurements
 - v) isolate problem and root cause
8. Describe the procedures used to remove and reinstall restraint system components.

9. Describe the procedures to adjust, repair and/or replace restraint system components.
 - i) perform repair
 - ii) verify repair

LEVEL 4

AST-300 Engine Repair

Learning Outcomes:

- Demonstrate knowledge of the procedures used to diagnose and repair engines.

Objectives and Content:

1. Define terminology associated with engine repair.
2. Identify hazards and describe safe work practices pertaining to engine repair.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types and sources of engine problems.
 - i) low power
 - ii) smoke
 - iii) oil consumption
 - iv) fluid contamination
 - v) rough running
 - vi) internal/external leaks
 - vii) noises
5. Describe the procedures used to diagnose mechanical engine problems.
 - i) verify complaint
 - ii) visually inspect
 - iii) access service information
 - iv) conduct tests and measurements
 - v) isolate problem and root cause
6. Describe the procedures used to remove and reinstall engines.
7. Describe the procedures used to adjust, repair and/or replace engine components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of manual transmissions and transaxles, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair manual transmissions and transaxles.

Objectives and Content:

1. Define terminology associated with manual transmissions and transaxles.
2. Identify hazards and describe safe work practices pertaining to manual transmissions and transaxles.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of manual transmissions and transaxles and describe their components and operation.
5. Explain power flow as it relates to manual transmissions and transaxles.
6. Describe gear ratios, their purpose and calculation.
7. Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.
8. Describe the procedures used to diagnose manual transmissions and transaxles.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
9. Describe the procedures used to remove and reinstall manual transmissions and transaxles.

10. Describe the procedures used to adjust, repair and/or replace manual transmissions and transaxles and their related components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of clutches and flywheels, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair clutches and flywheels.

Objectives and Content:

1. Define terminology associated with clutches and flywheels.
2. Identify hazards and describe safe work practices pertaining to clutches and flywheels.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of clutches and describe their components and operation.
5. Identify types of flywheels and describe their components and operation.
6. Identify mechanical and hydraulic clutch operating systems and describe their components and operation.
7. Identify types of fluids, fasteners, tubing, hoses and seals and describe their applications.
8. Describe the procedures used to diagnose clutches and flywheels.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
9. Describe the procedures used to remove and reinstall clutches and flywheels.

10. Describe the procedures used to adjust, repair and/or replace clutches and flywheels and their related components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of diesel fuel injection systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair diesel fuel injection systems.

Objectives and Content:

1. Define terminology associated with diesel fuel injection systems.
2. Identify hazards and describe safe work practices pertaining to diesel fuel injection systems.
 - i) high pressure
 - ii) high amperage/voltage
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify the types of diesel fuel injection systems and describe their components and operation.
 - i) electronic
 - ii) mechanical
5. Identify types of tubing, hoses, gaskets, seals and sealants and describe their applications.
6. Identify the types of starting aids and describe their purpose and operation.
7. Identify methods to test fuel quality and describe their associated procedures.
8. Describe the procedures used to diagnose diesel fuel injection systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes

- iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
9. Describe the procedures used to remove and reinstall diesel fuel injection system components.
10. Describe the procedures used to adjust, repair and/or replace diesel fuel injection system components.
- i) perform repair
 - ii) verify repair

AST-425

Electrical Options and Accessories

Learning Outcomes:

- Demonstrate knowledge of electrical options and accessories, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair electrical options and accessories.
- Demonstrate knowledge of the procedures used to install electrical options and accessories.

Objectives and Content:

1. Define terminology associated with electrical options and accessories.
2. Identify hazards and describe safe work practices pertaining to electrical options and accessories.
 - i) passive restraints
 - ii) active restraints
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of electrical options and accessories and describe their components and operation.
 - i) power accessories
 - ii) theft deterrents
 - iii) audio/video
 - iv) navigation systems
 - v) remote starter
5. Describe the procedures used to diagnose electrical options and accessories.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

6. Describe the procedures used to install, adjust, repair and/or replace electrical options and accessories and their related components.
 - i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of instrumentation and information displays, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair instrumentation and information displays.

Objectives and Content:

1. Define terminology associated with instrumentation and information displays.
2. Identify hazards and describe safe work practices pertaining to instrumentation and information displays.
 - i) fuel tank
 - ii) restraint systems
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify regulatory requirements pertaining to instrumentation and information displays.
 - i) odometer servicing
5. Identify types of instrumentation systems and describe their components and operation.
 - i) gauges
 - ii) warning indicators
 - iii) odometer
6. Identify types of information displays and describe their purpose and operation.
7. Describe the procedures used to diagnose instrumentation and information displays.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes

- iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
8. Describe the procedures used to remove and reinstall instrumentation and information displays and their related components.
9. Describe the procedures used to adjust, repair and/or replace instrumentation and information displays and their related components.
- i) perform repair
 - ii) verify repair

Learning Outcomes:

- Demonstrate knowledge of automatic transmissions and transaxles, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair automatic transmissions and transaxles.

Objectives and Content:

1. Define terminology associated with automatic transmissions and transaxles.
2. Identify hazards and describe safe work practices pertaining to automatic transmissions and transaxles.
3. Identify types of specialized tools and equipment and describe their applications and procedures for use.
4. Identify types of automatic transmissions and transaxles and describe their components and operation.
 - i) electrically controlled
 - ii) hydraulically controlled
5. Identify types of alternate transmissions and transaxle designs.
 - i) constant variable transmission (CVT)
6. Explain hydraulic principles related to automatic transmissions and transaxles.
 - i) Pascal's law
7. Explain power flow as it relates to automatic transmissions and transaxles.
8. Interpret electric and hydraulic schematics.
9. Describe gear ratios, their purpose and calculation.
10. Identify types of lubricants, fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.

11. Describe the procedures used to diagnose automatic transmissions and transaxles.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause

12. Describe the procedures used to remove and reinstall automatic transmissions and transaxles.

13. Describe the procedures used to adjust, repair and/or replace automatic transmissions and transaxles and their related components.
 - i) perform repair
 - ii) verify repair

AST-435 Heating, Ventilation and Air Conditioning (HVAC) Systems

Learning Outcomes:

- Demonstrate knowledge of HVAC systems, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair HVAC systems.

Objectives and Content:

1. Define terminology associated with HVAC systems.
2. Identify hazards and describe safe work practices pertaining to HVAC systems.
 - i) personal
 - ii) shop/facility
 - iii) environmental
 - handling of refrigerants
3. Identify regulatory requirements pertaining to refrigerants and lubricants.
 - i) handling and disposal
 - ii) storing and recycling
 - iii) Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) licensing and certification
4. Explain the principles of the refrigeration cycle.
5. Identify types of specialized tools and equipment and describe their applications and procedures for use.
6. Identify types of heating systems and describe their components and operation.
7. Identify types of refrigerants and lubricants and describe their applications and procedures for use.
8. Identify types of refrigeration systems and describe their components and operation.
 - i) orifice tube
 - ii) thermal expansion valve

9. Identify types of HVAC systems and describe their components and operation.
 - i) manual
 - ii) automatic
10. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
11. Describe the procedures used to retrofit systems to run on alternate refrigerants.
12. Describe the procedures used to identify, recover, recycle, evacuate and recharge refrigerant systems.
13. Describe the procedures used to diagnose HVAC systems.
 - i) verify complaint
 - ii) visually inspect
 - iii) retrieve diagnostic codes
 - iv) access service information
 - v) conduct tests and measurements
 - vi) isolate problem and root cause
14. Describe the procedures used to remove and reinstall HVAC system components.
15. Describe the procedures used to adjust, repair and/or replace HVAC system components.
 - i) perform repair
 - ii) verify repair

ASTA-1830

Program Review

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Upon successful completion of this unit, the apprentice will complete a study plan based on the National Occupational Analysis.

Objectives and Content:

1. Identify areas of the program where knowledge of theory is weakest.
2. Identify areas where workplace experience is lacking or weak.
3. Identify resources necessary to address areas of shortfall.
4. Identify timelines to address areas of weakness.

Suggested Learning Activities:

1. Pre-test to be used for diagnostic purposes.
2. Review of National Occupational Analysis.
3. Review of Apprentice Logbook.
4. Mock Interprovincial Examination post-test.

Resources:

- National Occupational Analysis, exam counseling sheets and sample questions found at www.red-seal.ca under Red Seal Examinations.
- Apprentice's personal logbook.
- Applicable codes and regulations
- Program texts
- Exam preparation videos
- The IP Exam Preparation Information Guide, exam preparation videos and other resources can be found at www.nsapprenticeship.ca on the home page under Quick Links, Exam Preparation Resources.

Evaluation: pass/fail

Nova Scotia Document Evaluation Form

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