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# Plan of Training

## AUTOMOTIVE SERVICE TECHNICIAN



Government of Newfoundland and Labrador  
Department of Advanced Education Skills and Labour  
Apprenticeship and Trades Certification Division

**November 2016**

# PLAN OF TRAINING

## Automotive Service Technician

NOVEMBER 2016



**Government of Newfoundland and Labrador  
Department of Advanced Education, Skills and Labour  
Apprenticeship and Trades Certification Division**

Approved by:

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Chairperson, Provincial Apprenticeship and Certification Board

Date: NOV 17, 2016

## Preface

This curriculum standard is aligned with the 2016 edition of the Red Seal Occupational Standard (RSOS) and National Harmonization sequencing and levels for the Automotive Service Technician trade.

## Acknowledgements

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this pre-employment curriculum standard. Without their dedication to quality training, this document could not have been produced.

We offer you a sincere thank you.

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Document Status	Date Distributed	Mandatory Implementation Date	Comments
PACB approved October 2014	April 2014	September 2014	Updated 2010 POT to reflect 2013 Interprovincial Program Guide
PACB approved November 2016	November 2016	September 2017	Updated 2014 POT to reflect 2016 National Harmonization levels/ sequencing and 2016 RSOS

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**A. RSOS Comparison Table**

2016 RSOS Sub-task		2016 POT	
<b>TASK A-1 Performs safety-related functions</b>			
1.01	Maintains safe work environment	SV1105	Safety in the Shop
1.02	Uses personal protective equipment (PPE) and safety equipment	SV1105	Safety in the Shop
		SV1177	Shop Tools and Equipment
<b>TASK A-2 Uses tools, equipment and documentation</b>			
2.01	Uses tools and equipment	SV1165	Hand Tools
2.02	Uses fasteners, tubing, hoses and fittings	SV1187	Fasteners, Tubing and Fittings
2.03	Uses hoisting and lifting equipment	SV1177	Shop Tools and Equipment
2.04	Uses technical information	SV1157	Service Information Systems and Trade Related Documents
<b>TASK A-3 Uses communication and mentoring techniques</b>			
3.01	Uses communication techniques	CM2160	Communication Essentials
3.02	Uses mentoring techniques	SV4115	Mentoring Techniques
<b>TASK B-4 Diagnoses engine systems</b>			
4.01	Diagnoses cooling systems	SV1310	Cooling Systems
		SV2335	Engine Cooling Systems
4.02	Diagnoses lubricating systems	SV1197	Lubrication and Fluids Servicing
		SV2345	Engine Lubrication Systems
4.03	Diagnoses engine assembly	SV2182	Engine Removal and Installation
		SV1306	Engine Principles (Gasoline and Diesel)
		SV4010	Engine Diagnostics and Repair
4.04	Diagnoses accessory drive systems	SV1690	Accessory Drive Systems
		SV2355	Accessory Drive Systems II
<b>TASK B-5 Repairs engine systems</b>			
5.01	Repairs cooling systems	SV1310	Cooling Systems
		SV2335	Engine Cooling Systems
5.02	Repairs lubricating systems	SV1197	Lubrication and Fluids Servicing
		SV2345	Engine Lubrication Systems
5.03	Repairs engine assembly	SV2182	Engine Removal and Installation
		SV1306	Engine Principles (Gasoline and Diesel)
		SV4010	Engine Diagnostics and Repair
5.04	Repairs accessory drive systems	SV1690	Accessory Drive Systems
		SV2355	Accessory Drive Systems II
<b>TASK B-6 Diagnoses gasoline engine support systems</b>			

2016 RSOS Sub-task		2016 POT	
6.01	Diagnoses gasoline fuel delivery and injection systems	SV2850	Fuel Delivery Systems
		SV3060	Gasoline Fuel Systems
6.02	Diagnoses gasoline ignition systems	SV1600	Ignition Systems
		SV3065	Ignition Systems II
6.03	Diagnoses gasoline intake/exhaust systems	SV3070	Intake and Exhaust Systems
6.04	Diagnoses gasoline emission control systems	SV2221	Emission Control Systems
<b>TASK B-7 Repairs gasoline engine support systems</b>			
7.01	Repairs gasoline fuel delivery and injection systems	SV2850	Fuel Delivery Systems
		SV3060	Gasoline Fuel Systems
7.02	Repairs gasoline ignition systems	SV1600	Ignition Systems
		SV3065	Ignition Systems II
7.03	Repairs gasoline intake/exhaust systems	SV3070	Intake and Exhaust Systems
7.04	Repairs gasoline emission control systems	SV2221	Emission Control Systems
<b>TASK B-8 Diagnoses diesel engine support systems</b>			
8.01	Diagnoses diesel fuel delivery and injection systems	SV2850	Fuel Delivery Systems
		SV4110	Diesel Engine Support Systems
8.02	Diagnoses diesel intake/exhaust systems	SV4110	Diesel Engine Support Systems
8.03	Diagnoses diesel emission control systems	SV4110	Diesel Engine Support Systems
<b>TASK B-9 Repairs diesel engine support systems</b>			
9.01	Repairs diesel fuel delivery and injection systems	SV4110	Diesel Engine Support Systems
9.02	Repairs diesel intake/exhaust systems	SV4110	Diesel Engine Support Systems
9.03	Repairs diesel emission control systems	SV4110	Diesel Engine Support Systems
<b>TASK C-10 Diagnoses vehicle networking systems</b>			
10.01	Reads diagnostic trouble codes (DTCs)	SV2018	Vehicle Management Systems
10.02	Monitors data	SV2018	Vehicle Management Systems
10.03	Interprets test results	SV2018	Vehicle Management Systems
10.04	Tests system circuitry and components	SV2018	Vehicle Management Systems
<b>TASK C-11 Repairs vehicle networking systems</b>			



2016 RSOS Sub-task		2016 POT	
11.01	Updates component software	SV2018	Vehicle Management Systems
11.02	Replaces components	SV2018	Vehicle Management Systems
11.03	Verifies vehicle module communications system repair	SV2018	Vehicle Management Systems
<b>TASK D-12 Diagnoses driveline systems</b>			
12.01	Diagnoses drive shafts and axles	SV1287	Drive Shafts and Axle Shafts
12.02	Diagnoses manual transmissions/transaxles	SV3010	Manual Transmissions and Transaxles
12.03	Diagnoses automatic transmissions/transaxles	SV3050	Automatic Transmissions, and Transaxles
12.04	Diagnoses clutches	SV2331	Clutches
12.05	Diagnoses transfer cases	SV3031	Transfer Cases and Four-Wheel Drive (4WD) Systems
12.06	Diagnoses final drive assemblies	SV2372	Drive Axles, Differentials and Final Drive Assemblies
<b>TASK D-13 Repairs driveline systems</b>			
13.01	Repairs manual transmissions/transaxles	SV1287	Drive Shafts and Axle Shafts
13.02	Repairs manual transmissions/transaxles	SV3010	Manual Transmissions and Transaxles
13.03	Repairs automatic transmissions/transaxles	SV3050	Automatic Transmissions, and Transaxles
13.04	Repairs clutches	SV2331	Clutches
13.05	Repairs transfer cases	SV3031	Transfer Cases and Four-Wheel Drive (4WD) Systems
13.06	Repairs final drive assemblies	SV2372	Drive Axles, Differentials and Final Drive Assemblies
<b>Task E-14 Diagnoses electrical systems and components</b>			
14.01	Diagnoses basic wiring and electrical systems	SV1130	Electrical and Electronic Principles
14.02	Diagnoses starting/charging systems and batteries	SV1377	Batteries
		SV1385	Starting Systems
		SV2315	Starting Systems II
		SV1395	Charging Systems
		SV2325	Charging Systems II
14.03	Diagnoses lighting and wiper systems	SV2870	Lighting and Wiper Systems
14.04	Diagnoses entertainment systems	SV4100	Entertainment Systems
14.05	Diagnoses electrical options	SV2156	Body Electrical, Options and Accessories

2016 RSOS Sub-task		2016 POT	
14.06	Diagnoses instrumentation and information displays	SV2860	Instrumentation and Information Displays
14.07	Diagnoses electrical accessories	SV2156	Body Electrical, Options and Accessories
<b>Task E-15 Repairs electrical systems and components</b>			
15.01	Repairs basic wiring and electrical systems	SV1130	Electrical and Electronic Principles
15.02	Repairs starting/charging systems and batteries	SV1377	Batteries
		SV1385	Starting Systems
		SV2315	Starting Systems II
		SV1395	Charging Systems
		SV2325	Charging Systems II
15.03	Repairs lighting and wiper systems	SV2870	Lighting and Wiper Systems
15.04	Repairs entertainment systems	SV4100	Entertainment Systems
15.05	Repairs electrical options	SV2156	Body Electrical, Options and Accessories
15.06	Repairs instrumentation and information displays	SV2860	Instrumentation and Information Displays
15.07	Installs electrical accessories	SV2156	Body Electrical, Options and Accessories
15.08	Repairs electrical accessories	SV2156	Body Electrical, Options and Accessories
<b>Task E-16 Diagnoses heating, ventilation and air conditioning (HVAC) and comfort control systems</b>			
16.01	Diagnoses air flow control systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems
16.02	Diagnoses refrigerant systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems
16.03	Diagnoses heating systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems
<b>Task E-17 Repairs heating, ventilation and air conditioning (HVAC) and comfort control systems</b>			
17.01	Repairs air flow control systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems
17.02	Repairs refrigerant systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems
17.03	Repairs heating systems	SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems

2016 RSOS Sub-task		2016 POT	
<b>Task F-18 Diagnoses steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings</b>			
18.01	Diagnoses steering, suspension and control systems	SV1256	Suspension I
		SV4040	Suspension Systems II
		SV1227	Steering Systems
		SV2031	Electronic Power Steering
18.02	Diagnoses braking and control systems	SV1642	Braking Systems I (Non-ABS)
		SV3000	Braking Systems II (ABS)
18.03	Diagnoses tires, wheels, hubs and wheel bearings	SV1217	Tires, Wheels and Hubs
<b>Task F-19 Repairs steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings</b>			
19.01	Repairs steering, suspension and control systems	SV1256	Suspension I
		SV4040	Suspension Systems II
		SV1227	Steering Systems
		SV2031	Electronic Power Steering
19.02	Repairs braking and control systems	SV1642	Braking Systems I (Non-ABS)
		SV3000	Braking Systems II (ABS)
19.03	Repairs tires, wheels, hubs and wheel bearings	SV1217	Tires, Wheels and Hubs
<b>Task G-20 Diagnoses restraint systems, body components, accessories and trim</b>			
20.01	Diagnoses restraint systems	SV4060	Restraint Systems
20.02	Diagnoses wind noises, rattles and water leaks	SV1551	Body Components, Accessories and Trim
20.03	Diagnoses interior and exterior components, accessories and trim	SV1551	Body Components, Accessories and Trim
20.04	Diagnoses latches, locks and movable glass	SV1551	Body Components, Accessories and Trim
<b>Task G-21 Repairs restraint systems, body components, accessories and trim</b>			
21.01	Repairs restraint systems	SV4060	Restraint Systems
21.02	Repairs wind noises, rattles and water leaks	SV1551	Body Components, Accessories and Trim
21.03	Repairs interior and exterior components, accessories and trim	SV1551	Body Components, Accessories and Trim
21.04	Repairs latches, locks and movable glass	SV1551	Body Components, Accessories and Trim
<b>Task H-22 Diagnoses hybrid and electric vehicles (EV)</b>			
22.01	Implements specific safety protocols for hybrid and electric vehicles (EV)	SV1700	Hybrid Systems I
		SV2880	Hybrid Systems II

<b>2016 RSOS Sub-task</b>		<b>2016 POT</b>	
22.02	Diagnoses hybrid and electric vehicle (EV) systems	SV2880	Hybrid Systems II
<b>Task H-23 Repairs hybrid and electric vehicles (EV)</b>			
23.01	Repairs hybrid vehicle systems	SV2880	Hybrid Systems II
23.02	Repairs electric vehicles (EV) systems	SV2880	Hybrid Systems II

## B. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable.

The order of course delivery within each Level can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Upon completion of an entry level program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

<b>Pre-employment (Level I)</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
TS1510	Occupational Health and Safety	6	None
TS1520	WHMIS	6	None
TS1530	Standard First Aid	14	None
SV1105	Safety in the Shop	12	None
SV1165	Hand Tools	30	SV1105
SV1177	Shop Tools and Equipment	24	SV1165
SV1187	Fasteners, Tubing and Fittings	6	SV1177
SV1157	Service Information Systems and Trade Related Documents	12	None
SV1217	Tires Wheels and Hubs	24	SV1177
SV1551	Body Components and Trim	18	SV1177
SV1256	Suspension I	48	SV1177
SV1227	Steering Systems	60	SV1177
SV1642	Braking Systems I (Non-ABS)	60	SV1177
SV1130	Electrical and Electronic Principles	90	SV1177

<b>Level I</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SV1377	Batteries	18	SV1177
SV1287	Drive Shafts and Axle Shafts	30	SV1177
SV1306	Engine Principles (Gasoline and Diesel)	90	SV1177
SV1600	Ignition Systems	30	SV1377
SV1385	Starting Systems	30	SV1377
SV1395	Charging Systems	30	SV1377
SV1310	Cooling Systems	30	SV1177
SV1197	Lubrication and Fluids Servicing	24	SV1177
SV1690	Accessory Drive Systems	18	SV1177
SV1680	Preventative Maintenance Inspections (PMI)	18	SV1177
SV1700	Hybrid Systems I	24	SV1177
SV1125	Gaskets, Seals and Bearings	30	None
WD1301	Oxy-Fuel Welding/Cutting	30	SV1177
SV1710	Gas Metal Arc Welding (GMAW [MIG])	30	SV1177
AP1101	Introduction to Apprenticeship	15	None
*AM1100	Math Essentials	30	None
AM1220	Mechanical Math Fundamentals	30	AM1100
CM2160	Communication Essentials	45	None
SD1760	Workplace Essentials	45	None
MC1060	Computer Essentials	15	None
<b>Total Hours</b>		<b>1022</b>	

<b>Required Work Experience</b>
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**\*A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1100 - Math Essentials. Please check with your training institution.**

<b>Level II</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SV2031	Electronic Power Steering	6	Level I
SV4040	Suspension Systems II	30	Level I
SV3000	Braking Systems II (ABS)	30	Level I
SV2315	Starting Systems II	15	Level I
SV2325	Charging Systems II	16	Level I
SV2870	Lighting and Wiper Systems	30	Level I
SV3010	Manual Transmissions and Transaxles	48	Level I
SV2331	Clutches	15	Level I
SV2372	Drive Axles, Differentials and Final Drive Assemblies	24	Level I
SV2335	Engine Cooling Systems II	8	Level I
SV2345	Engine Lubrication Systems	6	Level I
SV2355	Accessory Drive Systems II	6	Level I
SV2182	Engine Removal and Installation	6	Level I
SV4010	Engine Diagnostics and Repair	60	Level I
<b>Total Hours</b>		<b>300</b>	

<b>Required Work Experience</b>
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<b>Level III</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SV2156	Body Electrical, Options and Accessories	48	Level II
SV2018	Vehicle Management Systems	48	Level II
SV3031	Transfer Cases and Four-Wheel Drive (4WD) Systems	24	Level II
SV2850	Fuel Delivery	18	Level II
SV3060	Gasoline Fuel Systems	30	Level II
SV3065	Ignition Systems II	24	Level II
SV3070	Intake and Exhaust Systems	18	Level II
SV2221	Emission Control Systems	30	Level II
<b>Total Hours</b>		<b>240</b>	

<b>Required Work Experience</b>
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<b>Level IV</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SV2860	Instrumentation and Information Displays	12	Level III
SV4100	Entertainment Systems	6	Level III
SV3050	Automatic Transmissions and Transaxles	72	Level III
SV4105	All-Wheel Drive(AWD) Systems	8	Level III
SV4110	Diesel Engine Support Systems	24	Level III
SV4050	Heating, Ventilation and Air Conditioning (HVAC) Systems	30	Level III
SV2880	Hybrid Systems II	12	Level III
SV4060	Restraint Systems	30	Level III
SV4115	Mentoring Techniques	4	Level III
SV4090	Provincial Government Inspections (MVI)	12	Level III
SV4080	Ozone Depletion Substances	6	Level III
SV4120	Program Review	24	Level III
<b>Total Hours</b>		<b>240</b>	
<b>Total Program Credits</b>		<b>1802</b>	

## **PRE-EMPLOYMENT (LEVEL I)**

### **TS1510 Occupational Health and Safety**

#### **Learning Outcomes:**

- Demonstrate knowledge of how to prevent accidents and illnesses.
- Demonstrate knowledge of how to improve health and safety conditions in the workplace.

**Duration:** 6 Hours

**Pre-Requisite(s):** None

#### **Objectives and Content:**

1. Interpret the Occupational Health and Safety Act laws and regulations.
  - i. Explain the scope of the act
    - application of the Act
    - Federal/Provincial jurisdictions
    - Canada Labour Code
    - rules and regulations
    - private home application
    - conformity of the Crown by the Act
2. Explain responsibilities under the Act and Regulations.
  - i. duties of employer, owner, contractors, sub-contractors, employees, and suppliers
3. Explain the purpose of joint health and safety committees.
  - i. formation of committee
  - ii. functions of committee
  - iii. legislated rights
  - iv. health and safety representation
  - v. reporting endangerment to health

- vi. appropriate remedial action
  - vii. investigation of endangerment
  - viii. committee recommendation
  - ix. employer's responsibility in taking remedial action
4. Examine right to refuse dangerous work.
- i. reasonable grounds for refusal
  - ii. reporting endangerment to health
  - iii. appropriate remedial action
  - iv. investigation of endangerment
  - v. committee recommendation
  - vi. employer's responsibility to take appropriate remedial action
  - vii. action taken when employee does not have reasonable grounds for refusing dangerous work
  - viii. employee's rights
  - ix. assigning another employee to perform duties
  - x. temporary reassignment of employee to perform other duties
  - xi. collective agreement influences
  - xii. wages and benefits
5. State examples of work situations where one might refuse work.
6. Describe discriminatory action.
- i. definition
  - ii. filing a complaint procedure
  - iii. allocated period of time a complaint can be filed with the Commission
  - iv. duties of an arbitrator under the Labour Relations Act
  - v. order in writing inclusion
  - vi. report to commission allocated period of time to request arbitrator to deal with the matter of the request
  - vii. notice of application
  - viii. failure to comply with the terms of an order
  - ix. order filed in the court
7. Explain duties of commission officers.
- i. powers and duties of officers
  - ii. procedure for examinations and inspections
  - iii. orders given by officers orally or in writing

- iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
  - v. service of an order
  - vi. prohibition of persons towards an officer in the exercise of his/her power or duties
  - vii. rescinding of an order
  - viii. posting a copy of the order
  - ix. illegal removal of an order
8. Interpret appeals of others.
- i. allocated period of time for appeal of an order
  - ii. person who may appeal order
  - iii. action taken by commission when person involved does not comply with the order
  - iv. enforcement of the order
  - v. notice of application
  - vi. rules of court
9. Explain the process for reporting of accidents.
- i. application of act
  - ii. report procedure
  - iii. reporting notification of injury
  - iv. reporting accidental explosion or exposure
  - v. posting of act and regulations

**Practical Requirements:**

- 1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.
- 2. Conduct a safety inspection of shop area.

## **TS1520    Workplace Hazardous Materials Information System (WHMIS)**

### **Learning Outcomes:**

- Demonstrate knowledge of Interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health and Safety Act.

**Duration:**           6 Hours

**Pre-requisite(s):**   None

### **Objectives and Content:**

1.    Define WHMIS safety.
  - i.     rational and key elements
  - ii.    history and development of whmis
  - iii.   whmis legislation
  - iv.    whmis implementation program
  - v.     definitions of legal and technical terms
  
2.    Examine hazard identification and ingredient disclosure.
  - i.     prohibited, restricted and controlled products
  - ii.    classification and the application of WHMIS information requirements
  - iii.   responsibilities for classification
    - the supplier
    - the employer
    - the worker – Classification: rules and criteria
    - information on classification
    - classes, divisions and subdivision in WHMIS
    - general rules for classification
    - class A – compressed gases
    - class B – flammable and combustible materials
    - class C – oxidizing material

- class D – poisonous and infectious material
  - class E – corrosive material
  - class F – dangerously reactive material
  - iv. products excluded from the application of WHMIS legislation
    - consumer products
    - explosives
    - cosmetics, drugs, foods and devices
    - pest control products
    - radioactive prescribed substances
    - wood or products made of wood
    - manufactured articles
    - tobacco or products of tobacco
    - hazardous wastes
    - products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act
  - v. comparison of classification systems – WHMIS and TDG
  - vi. general comparison of classification categories
  - vii. detailed comparison of classified criteria
3. Explain labeling and other forms of warning.
- i. definition of a WHMIS label
    - supplier label
    - workplace label
    - other means of identification
  - ii. responsibility for labels
    - supplier responsibility
    - employer responsibility
    - worker responsibility
  - iii. introduce label content, design and location
    - supplier labels
    - workplace labels
    - other means of identification
4. Introduce material safety data sheets (MSDS).
- i. definition of a material safety data sheet
  - ii. purpose of the data sheet
  - iii. responsibility for the production and availability of data sheets
    - supplier responsibility
    - employer responsibility

- workers responsibility

**Practical Requirements:**

1. Locate WHMIS label and interpret the information displayed.
2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

## **TS1530     Standard First Aid**

### **Learning Outcomes:**

- Demonstrate knowledge of recognizing situations requiring emergency action.
- Demonstrate knowledge of making appropriate decisions concerning first aid.

Complete a **St. John Ambulance or Canadian Red Cross** Standard First Aid Certificate course.

**Duration:**             14 Hours

**Pre-requisite(s):**     None



## SV1105 Safety in the Shop

### Learning Outcomes:

- Demonstrate knowledge of various types of shop hazards.
- Demonstrate knowledge of safe work practices
- Demonstrate knowledge of regulatory requirements pertaining to safety.
- Demonstrate knowledge of PPE their applications, limitations and procedures for use.
- Demonstrate knowledge of safety equipment their applications and procedures for use.

**Duration:** 12 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

1. Identify various safety hazards.
  - i. fire hazards
    - classification of fire types
    - purpose and use of fire extinguishers
  - ii. explosion hazards
    - detection and prevention
    - spontaneous combustion
    - storage and handling of fuels
  - iii. hazardous gases
    - refrigerants
    - carbon monoxide
    - ventilation
    - storage and handling of batteries
2. Identify types of PPE and describe their applications and limitations for use.
3. Describe the care and maintenance of PPE.

4. Identify types of shop safety equipment and describe their applications.
5. Describe the care and maintenance of shop safety equipment.
6. Describe safe work practices to maintain a safe work environment.
  - i. avoiding personal hazards
  - ii. following good housekeeping practices
  - iii. reporting injuries
7. Identify and describe jurisdictional requirements for handling and disposing of hazardous materials.
8. Identify workers' rights regarding safety.
  - i. Workers Compensation Act

**Practical Requirements:**

1. Locate exits, fire alarms.
2. Locate MSDS sheets; manual and electronic copies.
3. Locate shop ventilation systems.
4. Prepare a floor plan showing fire exit routes.

## SV1165 Hand Tools

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to select, use and maintain various cutting and non-cutting hand tools.
- Demonstrate knowledge of measuring and testing devices, their applications, maintenance and procedures for use.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1105

### Objectives and Content:

1. Describe the procedures to select, use, maintain and store non-cutting hand tools.
  - i. screwdrivers
    - standard
    - Phillips
    - Robertson
    - Torx
  - ii. pliers
    - combination
    - gripping
    - cutting
    - vise-grips
    - snap ring
    - needle nose
  - iii. special hose clamp tools
  - iv. wrenches
    - open-end
    - box ends
    - ratcheting box ends
    - flex-head box ends
    - obstruction wrenches
    - special-purpose box wrenches

- adjustable wrenches
- pipe wrenches
- spanner wrenches
- Allen and multi-spline wrenches (recognition of sizes – metric and imperial)
- v. sockets and drives (recognition of sizes – metric and imperial)
  - drive sizes
  - socket points
  - deep sockets
  - flexible sockets
  - drive handles
  - speed handles
  - ratchets
  - universal joints
  - adapters
  - extensions
- vi. hammers
  - ball peen
  - cross peen
  - plastic tip
  - brass-headed
  - rubber mallets
  - dead blow
  - sledgehammers
  - hammer handles
- vii. punches
  - starting
  - pin
  - centre
  - aligning
- viii. torque wrenches
  - types
  - sizes
  - purpose
- ix. torque multiplier
- x. torque rods (stick)

2. Describe the procedures to select, use, maintain and store cutting hand tools.
  - i. chisels
    - flat
    - cape
    - round nose cape
    - diamond point
    - rivet buster
  - ii. chisel holder
  - iii. hacksaws
    - types and designs
    - blade classification and selection
  - iv. files
    - types, designs and application
    - file handles
    - file cards
  - v. twist drills (recognition of sizes – metric and imperial)
    - types and designs
    - sharpening procedures
  - vi. taps (recognition of pipe tap sizes – metric and imperial)
    - taper taps
    - plug taps
    - bottoming taps
    - tap handles
  - vii. dies (recognition of sizes – metric and imperial)
    - types
    - dies stock
  - viii. thread restorers (recognition of sizes – metric and imperial)
    - types and designs
3. Describe the procedures to recondition cutting and non-cutting hand tools.
  - i. screwdrivers
  - ii. chisels
  - iii. screw starters
  - iv. punches
4. Identify types of scan tools and digital voltage ohmmeters (DVOM) and describe their applications.

5. Describe the procedures to select, use, maintain and store metric and imperial measuring tools.
  - i. steel rules and squares
  - ii. calipers
  - iii. micrometers
  - iv. dial indicators
  - v. vernier calipers
  - vi. protractors
  - vii. dividers
  - viii. small hole gauges
  - ix. telescoping gauges
  - x. wire gauges
  - xi. drill gauges
  - xii. screw pitch gauges
  - xiii. feeler gauges
  
6. Describe the procedures to select, use, maintain and store miscellaneous tools.
  - i. stud extractors
  - ii. bushing and seal drivers
  - iii. magnetic pickup tools
  - iv. mechanical pickup tools
  - v. inspection mirrors
  - vi. stamping sets
  - vii. stethoscopes
  - viii. air blowgun

**Practical Requirements:**

1. Demonstrate the procedures to select, use, inspect, maintain and store hand tools
  
2. Demonstrate the procedures to select, use, inspect, maintain and store precision measuring instruments.

## **SV1177    Shop Tools and Equipment**

### **Learning Outcomes:**

- Demonstrate knowledge of shop tools and equipment, their applications, maintenance and procedures for use
- Demonstrate knowledge of vehicle hoisting and lifting equipment, their applications and procedures for use.
- Demonstrate knowledge of shop lifting equipment, their applications and procedures for use

**Duration:**            24 Hours

**Pre-Requisite(s):**    SV1165

### **Objectives and Content:**

1. Identify safety considerations pertaining to vehicle hoisting and lifting.
2. Describe the procedures to select, inspect, store, use and maintain shop equipment.
  - i. hoists, floor, cable, and chain
  - ii. floor jacks
  - iii. safety stands
  - iv. hydraulic presses
  - v. drill presses
  - vi. bench grinders
  - vii. bench vises
  - viii. pullers
  - ix. pneumatic equipment
  - x. mobile cranes
  - xi. high pressure washers (heated)
  - xii. parts cleaners
  - xiii. portable air tanks
  - xiv. caustic cleaning tanks
  - xv. sand/glass bead blasters

- xvi. air compressors
  - xvii. brake cleaning equipment
  - xviii. spring compressors
  - xix. transmission jacks
  - xx. creepers
3. Describe the procedures to select, inspect, store, use and maintain shop tools.
    - i. air tools (pneumatic)
    - ii. electric tools
    - iii. torque multipliers
  4. Describe procedures to select, inspect, store, use and maintain vehicle protective equipment.
    - i. seat covers
    - ii. fender covers
    - iii. floor mats
  5. Identify types of hoisting and lifting equipment and accessories and describe their applications.
  6. Interpret information pertaining to hoisting and lifting found on drawings and specifications.
  7. Describe the procedures used when hoisting and lifting.
  8. Describe the procedures used to inspect, maintain hoisting and lifting equipment.

**Practical Requirements:**

1. Use hoist safely.
2. Raise vehicles by means of a floor jack and place on safety stands.
3. Demonstrate various pieces of shop equipment, their application and procedures for use.
4. Prepare a shop equipment maintenance plan.



## SV1187 Fasteners, Tubing and Fittings

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to select and use common fasteners, different types of tubing, hoses, fittings, and flaring tools.

**Duration:** 6 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Describe the procedures to select and use fasteners.
  - i. types of fasteners
    - bolts
    - nuts
    - studs
    - washers
      - flat
      - lock
      - external spring
      - internal spring
    - screws
      - cap screws
      - machine screws
      - sheet metal screws
      - self-tapping screws
    - keys and pins
      - woodruff keys
      - square keys
      - cotter pins
      - spring pins
      - tapered pins
      - clevis pins

- locking devices (functions and types)
    - compounds
      - liquid compounds
      - lock-type compounds
      - anti-seizure compounds
  - ii. thread classification (metric and imperial)
  - iii. grade markings
  - iv. theory of torquing
    - torque pattern
    - torque charts
- 2. Describe the procedures to select and use different types of tubing and hoses.
  - i. types of tubing
    - steel
    - copper
    - non-metallic
    - rubber
  - ii. recognition of sizes
- 3. Describe the procedures to select and use different types of fittings.
  - i. types of low pressure fittings
  - ii. types of flares (metric and imperial)
  - iii. types of threads
  - iv. torque limitation of fittings
  - v. thread sealers
- 4. Identify various types of flaring tools.
  - i. flaring tool kit
  - ii. ISO flaring
  - iii. tubing cutter
  - iv. deburring tool
  - v. tubing bender
  - vi. tubing wrenches

5. Describe the procedures to use flaring tools.
  - i. cutting
  - ii. bending
  - iii. flaring

**Practical Requirements:**

1. Install compression fittings.
2. Cut, flare, bend and connect tubing.
  - i. bubble flare(ISO)
  - ii. double flare(SAE)
  - iii. cut and bend tubing

## **SV1157 Service Information Systems and Trade Related Documents**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to select and use various types of service information systems.
- Demonstrate knowledge of trade related documents and their use.
- Demonstrate knowledge of the procedures used to prepare, interpret, and complete documentation.

**Duration:** 12 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Locate service information related to identification codes found on the vehicle and vehicle components.
2. Identify and interpret types of trade related documents and describe their applications.
  - i. estimates
  - ii. industry standard labour guides
  - iii. manufacturers' specifications
  - iv. codes and standards
  - v. company policies
  - vi. pre-delivery inspections (PDI)
  - vii. preventative maintenance
  - viii. schedules
3. Explain how to use an operator's manual and how to interpret its sections.

4. Explain how to decode motor vehicle serial numbers for identification purposes through use of appropriate service manual.
  - i. make
  - ii. model
  - iii. year
  
5. Explain how to use paper and electronic copies of various manuals.
  - i. maintenance and lubrication manual
  - ii. service manual
  - iii. parts manual
  - iv. operator/owner
  - v. special bulletins
    - purpose
    - TSB
  
6. Explain how to use computerized information systems.
  - i. introduction to computers
    - computerized parts information
    - computerized service and repair information
  - ii. work orders
  - iii. warranty claims
  - iv. time tickets
  - v. vehicle service tracking
  - vi. electronic service

**Practical Requirements:**

1. Using manuals and several different vehicles, identify the model and year for each vehicle.
2. Complete a work order, document findings and recommendations.
3. Use manuals, to locate removal and installation procedures.
4. Use diagnostic charts to troubleshoot a problem.
5. Use electronic data retrieval systems to locate service information.

## **SV1217 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.

**Duration:** 24 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Define terminology associated with tires, wheels and hubs.
2. Identify hazards and safety considerations and describe safe work practices pertaining to tires and wheels.
  - i. tire inflation
    - under inflation
    - over inflation
    - misalignment
    - improper balance
  - ii. tire sizing
3. Interpret tire codes and sidewall markings.
4. Identify tools and equipment relating to tires, wheels and hubs and describe their applications and procedures for use.
5. Identify types of tires and describe their construction.
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.
  - i. worn suspension
  - ii. ply steer / radial drag
  - iii. improper load distribution
12. Describe the procedures used to diagnose tires, wheels and hubs.
13. Describe the procedures used to repair and/or replace tires and wheel hub assemblies.
14. Describe the procedures used to adjust, repair and/or replace hubs and bearings.

**Practical Requirements:**

1. Perform radial and lateral run-out check.
2. Perform a tire puncture repair using recommended procedures.
3. Dismount and mount a tire on a wheel with and without a TPMS sensor.
4. Balance a wheel and tire assembly.
5. Service a tapered wheel bearing.

## **SV1551 Body Components, Accessories and Trim**

### **Learning Outcomes:**

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

**Duration:** 18 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Identify hazards, safety considerations and describe safe work practices pertaining to body components, accessories and trim.
  - i. interior
    - restraint systems
  - ii. exterior
2. Identify body components, accessories and trim and describe their purpose and operation.
  - i. interior
    - doors
    - seats
    - dashes
  - ii. exterior
    - bumpers
    - mirrors
    - add-on accessories
    - mounts
3. Identify flaws related to interior and exterior components, accessories and trim.
4. Describe the procedures used to diagnose interior and exterior components, accessories and trim.



5. Identify types of electrical/electronic systems and describe their components and operation.
  - i. locks
  - ii. latches
  - iii. windows
  - iv. remote entry
6. Identify types and sources of wind and water leaks.
7. Identify types of seals, adhesives, cleaners and sealing materials and fasteners and describe their applications and procedures for use.
8. Explain the principles of basic aerodynamics related to body design.
9. Identify types and sources of noise, vibration and harshness (NVH).
  - i. chuckles / loose lumber
  - ii. rattles
  - iii. knocks and whines
  - iv. offensive noises
10. Identify materials used to dampen or interrupt vibration.
  - i. tapes
  - ii. adhesives
  - iii. insulators
11. Identify diagnostic tools and equipment for interior and exterior components, accessories and trim and describe their applications and procedures for use.
12. Describe the procedures used to diagnose body components, accessories and trim.
  - i. verify complaint
  - ii. visually inspect
  - iii. special considerations for paint on sensors and tint on windows.
  - iv. retrieve diagnostic codes
  - v. access service information
  - vi. conduct tests and measurements
  - vii. isolate problem and root cause
  - viii. special considerations for paint on sensors and tint on windows.

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

**Practical Requirements.**

None.

## SV1256 Suspension I

### Learning Outcomes:

- Demonstrate knowledge of suspension systems and their components and operation.
- Demonstrate knowledge of the procedures used to remove, replace and/or adjust suspension components.
- Demonstrate knowledge of the procedures used to diagnose and repair computer-controlled active suspension systems.

**Duration:** 48 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Identify and describe suspension systems and components and their operation.
  - i. design of suspension
  - ii. associated terminology
    - sprung
    - unsprung
    - spring rate
  - iii. types of suspension systems (front and rear)
    - independent
    - solid axle
    - twin beam
    - McPherson strut
    - flex axle
    - air
  - iv. frames
    - types
    - purpose
  - v. bumpers
    - energy absorbing bumpers
    - energy absorbing bumper shocks

- vi. front and rear suspension components and systems
  - vii. operation of SLA, strut and wish-bone suspensions
2. Describe the procedures to inspect suspension systems.
  3. Identify types of dampers and describe their components and operation.
  4. Describe procedures to remove and replace dampers.
    - i. checking for serviceability
    - ii. removing and replacing
  5. Identify types of stabilizer bars and their operation.
  6. Describe procedures to inspect, remove and replace stabilizer bars.
  7. Identify types of ball joints and tie rod ends and their operation.
  8. Describe procedures to inspect, remove, replace and service ball joints and tie rod ends.
  9. Identify types of struts and their operation.
  10. Describe procedures to inspect, remove, replace and service struts.
  11. Identify types of coil springs and control arms and their operation.
  12. Describe procedures to inspect, remove, replace and service coil springs and control arms.
  13. Identify types of leaf springs and their operation.
  14. Describe procedures to inspect, remove, replace and service leaf springs.
  15. Identify types of torsion bars and their operation.
  16. Describe procedures to inspect, remove, replace and adjust torsion bars.

17. Identify types of air ride systems and their operation.
  - i. active suspension
  - ii. computer-controlled active suspension system
  
18. Identify air ride system components.
  - i. height sensor
  - ii. control module
  - iii. air control solenoids
  
19. Describe procedures to inspect, remove, replace and adjust air ride systems.
  
20. Describe procedures to diagnose and repair computer-controlled active suspension systems.
  - i. obtaining diagnosis
  - ii. repairing system

**Practical Requirements:**

1. Remove and replace shock absorbers (dampers).
2. Remove and replace stabilizer bars.
3. Remove and replace ball joint.
4. Remove and replace struts.
5. Remove and replace coil springs and control arms.
6. Remove and replace leaf spring.
7. Remove, replace and adjust torsion bars.

## **SV1227     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.

**Duration:**            60 Hours

**Pre-Requisite(s):**   SV1177

### **Objectives and Content:**

1. Define terminology associated with steering systems.
2. Identify hazards and describe safe work practices pertaining to steering systems.
  - i. passive restraints
    - air bags
    - clock springs
    - procedures used to disarm
  - ii. collapsible columns
3. Identify tools and equipment relating to steering systems 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
  - ii. rack-and-pinion
  - iii. four-wheel steering

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 diagnose steering systems.
11. Describe the procedures used to adjust, repair and/or replace steering system components.

**Practical Requirements:**

1. Remove and install a steering gear assembly.
2. Diagnose power steering systems.
3. Remove, disassemble and reassemble a steering column.

## **SV1642 Braking Systems I (Non-ABS)**

### **Learning Outcomes:**

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

**Duration:** 60 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Define terminology associated with braking systems.
2. Identify hazards and describe safe work practices pertaining to braking systems.
  - i. hydraulic pressure
3. Explain the fundamentals of braking systems.
4. Explain hydraulic principles related to braking systems.
5. Explain hydraulic systems safety switches and valves.
6. Identify tools and equipment relating to braking systems and describe their applications and procedures for use.
7. Identify types of braking systems and describe their components and operation.
  - i. disc
  - ii. drum
  - iii. parking
8. Identify types of power assists and describe their components and operation.
  - i. vacuum
  - ii. hydraulic



- iii. electric
- 9. Identify types of brake fluids and describe their applications and procedures for use.
- 10. Identify types of fittings, flaring, tubing and hoses and describe their applications and procedures for use.
- 11. Identify types of trailer brakes and controls and describe their components and operation.
- 12. Describe the procedures used to diagnose braking systems.
- 13. Describe the procedures used to flush and bleed hydraulic brakes.
- 14. Describe the procedures used to measure and machine components.
- 15. Describe the procedures used to adjust, repair and/or replace braking system components.

**Practical Requirements:**

- 1. Inspect, test and repair drum brakes.
- 2. Inspect, test and repair disc brakes.
- 3. Inspect, test and repair hydraulic brake components.
- 4. Inspect, remove and diagnose power brake system components.
- 5. Machine drums and disc rotors.

## SV1130 Electrical and Electronic Principles

### Learning Outcomes:

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

**Duration:** 90 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Identify and explain basic electrical principles.
  - i. safety practices and procedures when working with electrical equipment
  - ii. terminology – abbreviations and glossary of electrical terms
  - iii. sources of electricity
    - generation of electricity
    - use of chemical, magnetic, heat, light, mechanical and DC power supply, crystals, AC circuits
  - iv. theories and laws
    - electricity
    - magnetism and inductance
    - Ohm's law (volts, ohms and amperes, power)
  - v. symbols and schematics
    - common automotive symbols
    - how to read schematics/wiring diagrams
  
2. Explain electrical principles using Ohm's law to calculate volts, ohms and amperes, and power.
  - i. application of Ohm's law to electrical circuits
    - series circuit
    - parallel circuit

- series and parallel circuit
3. Interpret electrical schematics.
  4. Identify and explain the types of diagnostic tools and equipment used to test components of series, parallel and series-parallel circuits.
    - i. circuit testing devices
      - scan tools
      - multi-meters
        - volt
        - ohm
        - current
        - duty cycle
        - frequency
        - pulse width
        - meter ranges
        - correct hook-up of meters
      - test lights
        - analog
        - digital
      - short finder
  5. Describe the procedures used to diagnose electrical circuits and components.
    - i. circuit problems and testing problems
      - short, open, ground, and high resistance
      - diagnostic troubleshooting procedures
      - testing procedures and equipment
  6. Identify types of electronic/electrical components and describe their characteristics, composition and applications.
    - i. wires and terminals
      - types and sizes
      - terminals and connectors
      - conductors, semi-conductors, and insulators
    - ii. fibre optics (basics)
    - iii. capacitors
      - construction
      - purpose
      - uses

- iv. resistors
    - identification
    - purpose
    - uses
  - v. transistors
    - identification
    - purpose
    - uses
  - vi. diodes
    - identification
    - purpose
    - uses
  - vii. piezoelectric crystal
  - viii. hall effect switches
  - ix. permanent magnet sensors/switches
  - x. circuit protectors
    - fuses
    - fuse links
    - circuit breakers
  - xi. relays
7. Explain basic computer operation.
8. Describe the procedures used to replace electrical components.
- i. crimping
  - ii. soldering
  - iii. terminal replacement
  - iv. splicing

**Practical Requirements:**

1. Read schematics and wiring diagrams.
2. Use circuit testing devices.
  - i. ampmeter
  - ii. ohmmeter
  - iii. voltmeter
  - iv. test lights
3. Apply Ohms Law to electrical circuit.
4. Demonstrate wire and terminal repair.
  - i. demonstrate back probing
  - ii. solder and solderless repair.
5. Test electronic circuits.

## SV1377 Batteries

### Learning Outcomes:

- Demonstrate knowledge of battery construction and operation.
- Demonstrate knowledge of the procedures used to diagnose battery problems.
- Demonstrate knowledge of the procedures used to service batteries.

**Duration:** 18 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Identify safety considerations pertaining to batteries.
2. Identify types of batteries, and describe their components and operation.
3. Describe relationship of batteries to the vehicle electrical system.
4. Identify warning indicators.
5. Explain the principles of batteries.
  - i. storage of batteries
  - ii. battery construction
    - positive plates
    - negative plates
    - separators
    - electrolytes
    - chemical action
    - terminals
  - iv. chemical action when discharging
  - v. chemical action when charging
  - vi. sulfated batteries
  - vii. maintenance-free batteries

- viii. temperature effects on batteries
  - ix. battery polarity
  - x. battery ratings
    - cold cranking amps
    - reserve capacity rating
  - xi. battery selection
  - xii. terminal pullers
  - xiii. hold-down clamp
  - xiv. battery maintenance
    - procedures to clean batteries
    - battery inspection
    - electrolyte level
6. Describe the procedures to remove and install batteries and battery cables.
7. Identify battery connections.
- i. parallel circuits
  - ii. series circuits
  - iii. series-parallel circuits
8. Identify and explain the function of equipment used to perform battery tests.
- i. hydrometer
  - ii. refractometer
  - iii. built-in hydrometer
9. Describe procedures to test batteries.
- i. testing electrolyte levels
  - ii. testing batteries
    - specific gravity variation (correcting specific gravity readings to allow for temperature)
    - parasitic draw
    - light-load test
    - high-discharge test
    - cold-cranking test
    - reserve capacity test

10. Identify and describe methods used to recharge batteries and explain the precautions to take when recharging a battery.
  - i. methods
    - slow charge method
    - fast charge method
    - trickle charging
  - ii. precautions
    - battery temperature precautions
    - importance of good ventilation
    - safety precautions with highly explosive gases
  
11. Identify types of cable terminals and explain how to select the proper cable size.
  - i. types of cable terminals
  - ii. cable size selection
  
12. Describe procedures to replace battery cables and/or terminals.
  - i. fastening terminals to cable (soldered and crimped)
  - ii. installing corrosion inhibitor over terminals (importance)
  
13. Identify precautions to consider when starting engines with a booster battery.
  - i. importance of proper booster cables
  - ii. proper polarity and connections
  - iii. series connections
  - iv. protective glasses
  - v. safety precautions
  
14. Describe procedures to start engines with a booster battery.
  
15. Identify causes of battery problems.
  - i. effects on battery life
    - electrolyte level
    - overcharging
    - undercharging
    - cycling
  - ii. battery hold-down loose or too tight
  - iii. corroded terminals
  - iv. frayed or broken cables
  - v. cracked case



- vi. damaged battery trays and covers
  - vii. causes of battery discharge
16. Describe the procedure to diagnose battery problems (voltage drop test).

**Practical Requirements:**

1. Perform a parasitic draw test.
2. Remove and replace a battery.
3. Perform a voltage drop test.
4. Test batteries.
  - i. load test
  - ii. specific gravity
5. Charge battery.
  - i. slow
  - ii. fast

## SV1287 Drive Shafts and Axle Shafts

### 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1377

### Objectives and Content:

1. Identify types of drive shafts and axles and describe their composition.
2. Identify safety considerations pertaining to drive shafts and axles.
3. Identify tools and equipment used with drive shafts and axles and describe their applications and procedures for use.
4. Identify rear wheel drive components and explain their function.
  - i. types of drive lines
    - hotchkiss
    - torque tube
    - insulated
    - two-piece
  - ii. types of universal joints
    - cross and roller
    - constant velocity
5. Explain operation of front-wheel drive axle shafts.
  - i. axle retainers and shafts
  - ii. support bearing
  - iii. steering knuckles
  - iv. constant velocity joints

- v. bearings and seals
  - vi. lubricants
6. Describe procedures to inspect, diagnose, remove, service and install axle shaft systems and components.
- i. constant velocity(CV) joint
  - ii. drive axle joint boots and clamps
  - iii. steering knuckles
  - iv. wheel bearings and seals
  - v. support bearings
7. Describe procedures to inspect, diagnose, remove, service and install drive shaft systems on rear drive vehicles.
- i. removing
  - ii. rear-end torqueing
  - iii. balancing (causes of unbalance and effects)
  - iv. phasing
  - v. installing
8. Describe procedures to service universal joints on rear drive vehicles.
- i. inspecting
  - ii. lubricating
9. Describe procedures to check drive line angles on rear drive vehicles and explain the purpose of doing so.
10. Describe procedures to adjust drive line angles on rear drive vehicles.
- i. transmission
  - ii. rear axle
  - iii. drive shaft

**Practical Requirements:**

1. Perform service on drive shafts/axle shafts and related components rear wheel front wheel.
2. Remove, dismantle, inspect, lubricate and reassemble universal joints.
3. Check and adjust drive line angles on rear drive vehicles.
4. Balance drive shaft and check installation phase and angles of rear wheel drive shaft.

## **SV1306 Engine Principles (Gasoline and Diesel)**

### **Learning Outcomes:**

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

**Duration:** 90 Hours

**Pre-Requisites:** SV1177

### **Objectives and Content:**

1. Define terminology associated with engines.
  - i. gasoline
  - ii. diesel
2. Explain internal combustion principles.
  - i. gasoline
  - ii. diesel
3. Identify types of engine classifications.
  - i. fuel
    - diesel
    - gasoline
    - alternate fuels
  - ii. stroke
4. Identify types of engine configurations and describe their construction.
5. Identify types of valve train configurations and describe their construction.
  - i. push rod
  - ii. overhead cam
  - iii. multi-valve
  - iv. variable valve lift, variable valve timing

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.
9. Identify oil classifications.
  - i. diesel
  - ii. gasoline

**Practical Requirements:**

1. Disassemble an engine, identify various components and reassemble.

## SV1600 Ignition Systems

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to test and service ignition systems.
- Demonstrate knowledge of the procedures used to diagnose repair ignition system problems.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1377

### Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to ignition systems.
  - i. high voltage
  
2. Identify and describe electronic ignition systems and components and their operation.
  - i. principles of operation of ignition systems
    - distributor type
    - distributor-less type
  - ii. components
    - triggering devices
      - optical
      - hall effect switches
      - magnetic generators
      - ignition points
    - reductor
    - control unit
    - distributor assembly
    - rotor
    - coil

3. Describe procedures to check and test the condition of components of electronic ignition systems.
  - i. pick-up coil
  - ii. control unit
  - iii. ignition coil
  - iv. distributor cap
  - v. rotor
  - vi. wires
  
4. Identify and describe spark plugs.
  - i. construction of spark plugs
  - ii. types
  - iii. heat range
  
5. Describe procedures to remove, service and install spark plugs.
  - i. removing
  - ii. inspecting
  - iii. gapping
  - iv. testing
  - v. installing/torqueing
  
6. Describe procedures to diagnose the following ignition system problems on conventional and distributor less systems.
  - i. no spark at plugs
  - ii. weak or intermittent spark at plugs
  - iii. missing at idle or low speed
  - iv. missing during acceleration
  - v. missing at all speeds
  - vi. coil failure
  - vii. short spark plug life
  - viii. pre-ignition problems
  - ix. detonation problems
  - x. backfiring in intake manifold
  - xi. backfiring in exhaust manifold
  - xii. incorrect timing



**Practical Requirements:**

1. Check and adjust ignition timing.
2. Perform a coil output test.
3. Check and adjust spark plug gap.
4. Perform a secondary wire resistance test.
5. Use specialized diagnostic equipment.

## SV1385 Starting Systems

### Learning Outcomes:

- Demonstrate knowledge of the purpose and operation of all major parts of the starting system.
- Demonstrate knowledge of the procedures to diagnose and repair starting systems.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1377

### Objectives and Content:

1. Identify types of starter systems.
  - i. direct drive
  - ii. gear reduction
  - iii. permanent magnet
2. Identify the components of a starting system and their operation.
  - i. starter switches
  - ii. starter relays
  - iii. starter solenoids
3. Identify types of starting control systems and describe their components and operation.
  - i. anti-theft
  - ii. safety
  - iii. keyless start/stop
4. Describe procedures to diagnose starting problems.
  - i. following safety procedures
  - ii. using test meters
    - meters/equipment
  - iii. performing starting system diagnosis

- battery
  - cables and grounds
  - ring gear and flywheel
  - starter damage
  - neutral and clutch safety switches
  - theft deterrents
  - iv. testing starter
    - current test
    - circuit voltage drop
    - load test / no load test
    - torque test
  - v. testing starter (internal)
    - armature
    - commutator
    - field windings
    - solenoids
    - relays
    - brushes
    - bushings
5. Describe the procedures to test, and repair or replace starting systems and components.
- i. testing system
  - ii. servicing starter
  - iii. replacing bushing
  - iv. replacing brush

**Practical Requirements:**

1. Diagnose starting problems.
2. Repair/replace starting systems on vehicle.
3. Remove and replace starter.
4. Perform a starter test (internal).

## SV1395 Charging Systems

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to test and service charging systems and components.
- Demonstrate knowledge of the procedures used to diagnose charging system problems.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1377

### Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to charging systems.
2. Identify and describe AC generators and components and explain their principles of operation.
  - i. basic charging systems
  - ii. operating principles of AC generators
  - iii. identification of parts
    - stator
    - rotor
    - diodes
    - rectifier bridge
    - brushes
  - iv. types and functions of regulators
    - transistorized regulator
    - remote mounted regulator
    - integral type regulator
    - computer controlled regulator
  - v. types of AC generators
    - brushless AC generator
    - 12 volt AC generator
    - 12/24 volt AC generator

3. Describe procedures to disassemble, test, repair and reassemble AC generators.
  - i. disassembling AC generators
    - internal circuitry
  - ii. testing AC generator components
    - stator
    - rotor
    - diodes
    - regulator
  - iii. testing AC generator performance
    - AC generator output test
      - voltage
      - amperage
      - appropriate testing equipment
  - iv. checking bearing condition
  - v. checking slip ring condition
  - vi. cleaning
  - vii. reassembling
  
4. Describe procedures to diagnose the following charging system problems.
  - i. no AC generator output
  - ii. low AC generator output
  - iii. high AC generator output
  - iv. noisy AC generator
  - v. battery uses excessive electrolyte

**Practical Requirements:**

1. Perform charging system tests using equipment recommended by manufacturer.
2. Make adjustments and repairs to charging system components.
3. Diagnose charging system components.
4. Remove and replace generator.
5. Generator and regulator test (internal).

## SV1310 Cooling Systems

### Learning Outcomes:

- Demonstrate knowledge of the purpose and operation of all major parts of cooling systems.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Identify and describe cooling systems.
  - i. function
  - ii. types
    - air cooled
    - liquid cooled
  - iii. recovery system
    - pressurized
    - non-pressurized
  
2. Identify and describe components of an engine cooling system and their purpose/function.
  - i. radiator
    - types
      - cross flow
      - down flow
    - construction
      - metal
      - plastic
      - aluminum
  - ii. radiator cap
  - iii. radiator and heater hoses
    - types
    - hose clamp

- thermostat
  - iv. water pump
    - drives
  - v. fan assembly
    - types of drive
      - clutch
      - electric
      - hydraulic
    - shroud
    - controls
  - vi. coolant
    - types
      - gasoline
      - diesel
    - mixing
    - additives
  - vii. block heater
    - types
      - in block
      - in line
      - metal heating element
  - viii. warning systems and indicators
    - lights
    - gauges
    - audible
- 3. Describe procedures to inspect, test and replace the following engine cooling system components.
  - i. radiator
  - ii. heater core assembly
  - iii. radiator cap
  - iv. radiator hoses
  - v. heater hoses
  - vi. water pump
  - vii. mechanical/electric driven fan
  - viii. coolant

4. Describe procedures to diagnose the following problems with cooling systems.
  - i. overheating
  - ii. overcooling
  - iii. leaks
5. Describe procedures to bleed air from cooling systems.
6. Identify types of antifreeze.
7. Describe procedures to mix, install and recycle antifreeze.
  - i. mixing
  - ii. testing
  - iii. adding additives
8. Describe procedures to drain, clean and refill cooling systems.

**Practical Requirements:**

1. Diagnose problems with a cooling system.
2. Drain and flush a coolant system.
3. Mix, install and recycle antifreeze.



## SV1197 Lubrication and Fluids Servicing

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to change engine oil and filter, and lubricate a vehicle's chassis.

**Duration:** 24 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Identify different types of oil and describe procedures to select and use them based on the following criteria.
  - i. oil classification
    - API
    - SAE
    - synthetic
  - ii. oil viscosity
  - iii. oil additives
  - iv. function of the oil
  - v. contamination (recognition of contaminated fluid)
  - vi. oil selection
    - hydraulic oil (transmission and steering)
      - function
      - classification
    - gear oil
      - function
      - classification
2. Describe procedures to change engine oil.
  - i. draining the oil
  - ii. handling hot oil
  - iii. cleaning and inspecting drain plug and gasket for serviceability
  - iv. filling

- v. checking oil level
  - vi. properly torquing drain plug
  - vii. storing used oil
  - viii. following precautions after performing an oil change
  - ix. install/record service date and reminder
  - x. service intervals
  - xi. super/turbocharger precautions
3. Describe procedures to change engine oil filters.
- i. selecting filter
    - construction of filter
    - types of filters
  - ii) removing oil filter
  - iii) installing/replacing oil filter seals
  - iv) ensuring cleanliness
  - v) analyzing filter failure
    - physical filter failure
      - filter case expanded
      - filter leaking at seams
4. Describe procedures to start and run engines.
- ii. inspecting for oil leaks
  - ii. checking engine oil pressure
  - iii. checking oil level
  - iv. check warning indicators
  - v. audible
  - vi. gauges
  - vii. lights
  - viii. operating and resetting engine monitoring system according to manufacturer's specifications
5. Identify different types of grease and the criteria for selecting and using them.
- i. types of grease
    - wheel bearing grease
    - chassis grease
    - high temperature grease
    - multipurpose grease
    - extreme pressure grease

- ii. properties
  - iii. function
  - iv. classification
6. Identify equipment used to lubricate a vehicle's chassis.
- i. grease gun (hand and pneumatic)
  - ii. grease fitting
  - iii. grease gun adapters
7. Describe procedures to lubricate vehicle's chassis.
- i. refilling the grease gun
  - ii. storing and handling grease
  - iii. interpreting lubricating charts
8. Identify issues surrounding the disposal of used lubricants.
- i. environmental issues
  - ii. health issues
  - iii. filter crushers
  - iv. proper disposal procedures
9. Describe the procedures used to perform oil analysis.
- i. collecting specimen
  - ii. determining contamination of sample
  - iii. identifying contaminants in sample
  - iv. interpreting analysis
10. Identify types of warning systems and indicators and describe their purpose and operation.

**Practical Requirements:**

- 1. Lubricate a chassis following the manufacturer's recommendations.
- 2. Change engine oil and filter(s).

## **SV1690    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.

**Duration:**            18 Hours

**Pre-Requisite(s):**    SV1177

### **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 tools and equipment relating to accessory drive systems and describe their applications and procedures for use.
4. Identify 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.
6. Describe the procedures used to adjust, repair and/or replace accessory drive system components.

**Practical Requirements:**

None

## **SV1680 Preventative Maintenance Inspections (PMI)**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures to perform a preventative maintenance - inspection.
- Demonstrate knowledge of the procedures to replace minor components.

**Duration:** 18 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Explain the background and rationale for designing a preventative maintenance schedule.
  - i. background on preventative maintenance inspections
  - ii. reasons for performing a PM inspection
    - prevent expensive breakdowns
    - prevent small problems from becoming large ones
    - establish regular service patterns and help scheduling
    - provide better feedback on operating costs
  - iii. example of PM inspection form
  - iv. levels of PM inspection (e.g., minor inspection vs. major inspection)
2. Describe the procedures to design a preventative maintenance schedule.
  - i. methods used to arrive at PM schedules and forms
3. Describe the procedures to perform a preventative maintenance inspection.
  - i. procedures to be followed when performing a PM inspection
    - inspection only
    - inspection plus scheduled replacement of some items
    - same as above plus repairs up to a certain dollar figure
  - ii. inspection during maintenance
    - air filter

- battery electrolyte level
- battery connections
- cooling liquid level
- cooling liquid concentration
- automatic transmission fluid level
- manual transmission fluid level
- transfer case fluid level
- rear axle fluid level
- front axle fluid level (4x4)
- oil leaks
- windshield washer fluid level
- power steering fluid level
- brake fluid level
- belts (condition)
- constant velocity boots (visual inspection)
- exhaust system (visual inspection)
- shock absorbers and struts (visual inspection)
- tires (visual inspection)
- gas tanks (visual inspection)
- transmission filters
- brake fluid flush
- timing belt
- spark plugs
- fuel injection cleaning
- lighting
- wiper blades

**Practical Requirements:**

1. Locate pm inspection lists, vehicle owner's manuals and vehicle manufacturer's manuals.
2. Perform a PMI.
3. Repair or replace minor components such as:
  - i. wiper blades
  - ii. light bulbs
  - iii. accessory belts



## **SV1700 Hybrid Systems I**

### **Learning Outcomes:**

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

**Duration:** 24 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Define terminology associated with hybrid systems.
2. Identify hazards and describe safe work practices pertaining to hybrid systems.
  - i. PPE
  - ii. high voltage
  - iii. extreme cold temperatures
  - iv. braking systems
3. Identify tools and equipment relating to hybrid vehicles and describe their applications and procedures for use.
4. Identify types of hybrid vehicles and their related components.
  - i. series
  - ii. parallel
  - iii. series-parallel
  - iv. plug-in
5. Describe high voltage vehicle disconnect procedures.

### **Practical Requirements:**

None

## SV1125 Gaskets, Seals and Bearings

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to select, remove and install various types of bearings, gaskets, seals, and sealing compounds.
- Demonstrate knowledge of the procedures used identify causes of friction bearing failures.

**Duration:** 30 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

1. Identify and describe friction bearings.
  - i. definition
  - ii. location
  
2. Identify causes of friction bearing failure.
  - i. contamination
  - ii. insufficient lubrication
  - iii. improper installation
  - iv. misalignment
  - v. overloading
  - vi. corrosion
  
3. Identify and describe anti-friction bearings.
  - i. definition
  - ii. location
  - iii. types
    - ball
    - roller
    - needle
  - iv. loading design

- radial
    - thrust
    - combination
  - v. identification methods
- 4. Identify causes of anti-friction bearing failure.
  - i. spalling
  - ii. brinelling
  - iii. over-heating
  - iv. cracked race
  - v. broken or dented cage
  - vi. dented shields
  - vii. corrosion
  - viii. dirt wear
  - ix. electrical pitting
  - x. improper installation
- 5. Describe procedures to remove and install anti-friction bearings.
  - i. removing and installing
  - ii. cleaning
  - iii. inspecting
  - iv. lubricating
  - v. adjusting
  - vi. storing and handling
  - vii. following safety precautions
- 6. Identify and describe oil seals.
  - i. function
  - ii. classification
    - static
    - dynamic
  - iii. types
  - iv. materials
  - v. construction
- 7. Identify causes of oil seal failure.

8. Describe procedures to remove and install oil seals.
  - i. removing and installing
  - ii. inspecting
  - iii. cleaning (knowing the importance of cleanliness)
  - iv. using proper tools (knowing the importance of using proper tools)
  - v. storing and handling
  
9. Identify and describe gaskets.
  - i. function
  - ii. types
  - iii. materials
  - iv. making a gasket (methods)
  
10. Identify causes of gasket failure.
  
11. Describe procedures to remove and install gaskets.
  - i. removing and installing
  - ii. cleaning (knowing the importance of cleanliness)
  - iii. torquing bolts
  
12. Identify and describe sealing compounds.
  - i. types
  - ii. purpose
  
13. Identify causes of sealing compound failure.
  
14. Describe procedures to select and use sealing compounds and the precautions to follow when using them.

**Practical Requirements:**

1. Remove, service and install a tapered bearing.
2. Fabricate and install a gasket.
3. Remove and replace a non-serviceable bearing.
4. Remove and install an oil seal.
5. Apply sealer as a gasket.

## WD1301 Oxy-Fuel Welding/Cutting

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts.
- Demonstrate knowledge of the procedures used to perform braze welding and flame cutting using oxy-fuel equipment.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1177

### Objectives and Content:

1. Describe procedures to operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts.
  - i. following safety precautions
    - safety apparel
    - storage and handling of welding gases
    - pre-operational inspection
  - ii. setting up equipment
    - cylinders
    - gauges
    - regulators
    - valves-flame arrestor
    - torches and tips
    - hoses
    - testing for leaks
  - iii. operating the torch
    - lighting procedures
    - types of flames and effect on materials
    - shutting down procedures
2. Describe procedures to perform braze welding using oxy-acetylene equipment.

3. Describe procedures to perform flame cutting with oxy-acetylene equipment.
  - i. selecting cutting torch and tips
  - ii. using cutting torch

**Practical Requirements:**

1. Assemble, test, light and adjust oxy-fuel welding and cutting equipment.
2. Perform braze welding on sheet metal using oxy-fuel equipment.
3. Perform flame cutting with oxy-fuel equipment.
4. Perform proper shut down procedures.

## **SV1710 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** SV1177

### **Objectives and Content:**

1. Define terminology associated with gas metal arc welding GMAW (MIG).
2. Identify hazards and describe safe work practices pertaining to GMAW (MIG).
  - i. personal
  - ii. shop/facility
  - iii. equipment
3. Identify GMAW (MIG) equipment and accessories and describe their applications.
  - i. equipment
  - ii. shielding gases
  - iii. filler wire
4. Identify types of GMAW (MIG) processes and describe their characteristics and applications.
5. Describe the procedures used to set-up, adjust and shut-down GMAW (MIG) equipment to industrial standards as needed for various motorized equipment.
6. Describe the procedures used to operate GMAW (MIG) equipment.



7. Describe the procedures used to inspect, maintain and store GMAW (MIG) equipment.
8. Identify types of weld defects and describe their causes.
9. Describe the procedures used to prevent and correct weld defects.

**Practical Requirements:**

1. Weld using MIG equipment.
2. Perform set up and shut down procedures.

## **AP1101 Introduction to Apprenticeship**

### **Learning Outcomes:**

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

**Duration:** 15 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

1. Define the following terms:
  - i. apprenticeship
  - ii. apprentice vs. registered apprentice
  - iii. Journeyperson vs. Certified Journeyperson
  - iv. Certificate of Apprenticeship
  - v. Certificate of Qualification
  - vi. Recognition of Prior Learning
  - vii. dual certification
  
2. Explain the apprenticeship system in Newfoundland and Labrador and the roles and responsibilities of those involved.
  - i. registered apprentice
  - ii. training institution
  - iii. employer
  - iv. Journeyperson
  - v. Department of Advanced Education and Skills
    - Industrial Training Section
    - Standards and Curriculum Section
  - vi. Provincial Trade Advisory Committees
  - vii. Provincial Apprenticeship and Certification Board

3. Identify the Conditions Governing Apprenticeship.
4. Describe the training and educational requirements.
  - i. pre-employment (entry level) training
  - ii. block release
  - iii. on-the-job
5. Explain the steps in the registered apprenticeship process.
  - i. criteria for eligibility
    - entrance requirements as per Conditions of Apprenticeship
    - employment
  - ii. registration process
    - application requirements
  - iii. Memorandum of Understanding
    - probation period
    - cancellation
  - iv. Record of Occupational Progress (Logbook)
    - signing off skills
    - recording hours
    - updating PDO on progress
  - v. class calls
    - schedule
    - EI Eligibility
    - Direct Entry
    - advanced level
  - vi. Level Exams
  - vii. progression
    - schedule
    - wage rates
  - viii. cancellation of apprenticeship
  - ix. Practical Examinations
  - x. Provincial and Interprovincial examinations
  - xi. certification
    - Certification of Apprenticeship
    - Certification of Qualification
    - Provincial certification
    - Interprovincial Red Seal endorsement

6. Explain the Interprovincial Standards Red Seal Program.
  - i. designated Red Seal trade
  - ii. the National Occupational Analysis (NOA)
  - iii. Interprovincial (IP) Red Seal Endorsement Examination
  - iv. relationship of NOA to IP Examination
  - v. qualification recognition and mobility
7. Identify the current financial incentives available to apprentices.
8. Explain the NL apprenticeship and trades certification division's out-of- province apprenticeship policy.

**Practical Requirements:**

1. Use the Provincial Apprenticeship and Trades Certification web site at [www.gov.nl.ca/app](http://www.gov.nl.ca/app) to:
  - i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
  - ii. locate, download, and complete the Out of Province registration forms
    - Application for Apprenticeship (out of province)
    - Letter of Understanding (LOU)
    - Acceptance of Conditions Letter
  - iii. locate, download, and complete the Work Experience Credits form
  - iv. identify the locations of all Industrial Training offices
  - v. locate and review the following learning resources relevant to the trade:
    - Study Guide
    - Exam Preparation Guide
    - Plan of Training
2. Use a logbook for this trade to:
  - i. identify the hours for the trade (in-school and on-the-job)
  - ii. identify the number of Levels
  - iii. identify the courses in each Level
  - iv. identify the workplace skills to be completed and verified

3. Use the Red Seal Web site, <http://www.red-seal.ca> to retrieve the National Occupational Analyses (NOA) for this trade.
  - i. identify the following components of the NOA:
    - Trends
    - Scope
    - Key Competencies
    - Blocks
    - Tasks
    - Subtasks
    - Pie Charts
    - Table of Specifications

## **AM1100 Math Essentials**

Note: It is recommended that AM1100 be delivered in the first semester of the Entry Level training program.

### **Learning Outcomes:**

- Demonstrate knowledge of the numeracy skills required to begin the 2<sup>nd</sup> level math course.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

**Duration:** 30 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

*Wherever possible, the instructor should use trade specific examples to reinforce the course objectives*

1. Use multiplication tables from memory.
2. Perform whole number operations.
  - i. read, write, count, round off, add, subtract, multiply and divide whole numbers
3. Apply the order of operations in math problems.
4. Perform fraction and mixed number operations.
  - i. read, write, add, subtract, multiply and divide fractions
5. Perform decimal operations.

- i. read, write, round off, add, subtract, multiply and divide decimals
6. Perform percent/decimal/fraction conversion and comparison.
  - i. convert between fractions, decimals and percents
7. Perform percentage operations.
  - i. read and write percentages
  - ii. calculate base, rates and percentages
8. Perform ratio and proportion operations.
  - i. use a ratio comparing two quantities with the same units
  - ii. use a proportion comparing two ratios
9. Use the imperial measurement system in math problems.
  - i. identify units of measurement for:
    - length
    - mass
    - area
    - volume
    - capacity
10. Use the metric measurement system in math problems.
  - i. identify units of measurement for:
    - length
    - mass
    - area
    - volume
    - capacity

**Practical Requirements:**

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

## AM1220 Mechanical Math Fundamentals

### Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of solving mathematical word problems.
- Demonstrate knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

**Duration:** 30 Hours

**Pre-Requisite(s):** AM1100

### Objectives and Content:

*The instructor is required to use trade specific examples to reinforce the course objectives.*

1. Employ percent/decimal/fraction conversion and comparison in trade specific situations.
2. Apply ratios and proportions to trade specific problems.
3. Use the Imperial Measurement system in trade specific applications.
4. Use the Metric Measurement system in trade specific applications.
5. Complete Imperial/Metric conversions in trade specific situations.
  - i. convert between imperial and metric measurements
  - ii. convert to another unit within the same measurement system



6. Manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems, such as:
  - i. right angle triangles
  - ii. area
  - iii. volume
  - iv. perimeter
  
7. Perform calculations involving geometry that are relevant to the trade, such as:
  - i. angle calculations
  - ii. circle calculations
  
8. Use practical math skills to complete administrative trade tasks.
  - i. material estimation
  - ii. material costing
  - iii. time & labour estimates
  - iv. taxes & surcharges
  - v. markup & projecting revenue

**Practical Requirements:**

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

Note:

This course has been designated as NON-TRANSFERABLE to other trades programs, and NOT ELIGIBLE FOR PRIOR LEARNING ASSESSMENT. Students completing training in this trade program are required to complete this math course.

## CM2160 Communication Essentials

### Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing skills in the workplace and in career development.
- Demonstrate knowledge of the purpose of various types of workplace correspondence.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of standard formats for letters and memos.
- Demonstrate knowledge of principles related to writing effective letters and memos.
- Demonstrate the ability to prepare and deliver an oral presentation.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.

**Duration:** 45 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify the principles for writing clear, concise, complete sentences and paragraphs which adhere to the conventions of grammar, punctuation, and mechanics.
2. Identify the principles of effective workplace writing.
  - i. describe the value of well-developed writing skills to career success
  - ii. discuss the importance of tone, and language or word choice in workplace communication, regardless of the circumstances
  - iii. demonstrate an awareness of cultural differences when preparing workplace correspondence
  - iv. describe the writing process as it applies to workplace communication

- planning
  - writing
  - editing/revising
  - v. identify the parts of a business letter and memo, and when each should be used in the workplace
  - vi. identify the standard formats for business letters and memos
  - vii. identify guidelines for writing sample letters and memos which convey:
    - acknowledgment
    - routine request
    - routine response
    - complaint
    - refusal
    - persuasive request
    - letters of appeal
3. Identify types of informal workplace documents.
- i. identify types & purposes of reports
    - incident
    - process
    - progress
  - ii. identify common trade specific forms
  - iii. describe primary and secondary methods used to gather information
  - iv. discuss the importance of accuracy and completeness in reports and forms
4. Identify the elements of presentations used in the workplace.
- i. identify presentation types
    - impromptu
    - informative
    - demonstration
    - persuasive
  - ii. identify the components of an effective presentation
    - eye contact
    - body language
    - vocal qualities
    - audience analysis
    - multimedia tools
    - keeping on topic

5. Demonstrate an understanding of interpersonal communications in the workplace.
  - i. identify listening techniques
  - ii. demonstrate an understanding of group dynamics
  - iii. describe the importance of contributing information and expertise in the workplace
  - iv. describe the importance of respectful and open communication in the workplace
  - v. identify methods to accept and provide feedback in a constructive and considerate manner
  - vi. explain the role of conflict in a group to reach solutions
  
6. Identify acceptable workplace uses of communication technologies.
  - i. cell / Smart Phone etiquette
  - ii. voice mail
  - iii. e-mail
  - iv. teleconferencing / videoconferencing for meetings and interviews
  - v. social networking
  - vi. other emerging technologies

**Practical Requirements:**

1. Write well-developed, coherent, unified paragraphs.
2. Write sample letters and memos.
3. Write one short informal report.
4. Complete a selection of at least 3 trade-related forms.
5. Deliver an effective oral presentation.

## **SD1760    Workplace Essentials**

Note: It is recommended that SD1760 be delivered in the second half of the Entry Level training program.

### **Learning Outcomes:**

- Demonstrate knowledge of workplace essentials in the areas of meetings, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of good customer service practices.
- Demonstrate knowledge of effective job search techniques.

**Duration:**                45 Hours

**Pre-Requisite(s):**    None

### **Objectives and Content:**

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify common practices related to workplace meetings.
  - i. identify and discuss meeting format and preparation required for a meeting
  - ii. explain the purpose of an agenda
  - iii. explain the expected roles, responsibilities, and etiquette of meeting participants
2. Define unions and identify their role in the workplace.
  - i. identify the purpose of unions
  - ii. identify a common union structure
  - iii. identify the function of unions in this trade
3. Demonstrate an understanding of the Worker's Compensation process.
  - i. describe the aims, objectives, regulations and benefits of the Workplace Health, Safety and Compensation Commission

- ii. explain the role of the Workers Advisor
  - iii. explain the internal review process
4. Demonstrate an understanding of workers' rights.
- i. define labour standards
  - ii. identify regulations, including:
    - hours of work & overtime
    - termination of employment
    - minimum wages & allowable deductions
    - statutory holidays, vacation time, and vacation pay
5. Demonstrate an understanding of Human Rights issues.
- i. examine the Human Rights Code and explain the role of the Human Rights Commission
  - ii. define harassment in various forms and identify strategies for prevention
    - direct
    - systemic
    - adverse effect
  - iii. identify gender and stereotyping issues in the workplace
  - iv. define basic concepts and terms related to workplace diversity including age, race, culture, religion, socio-economic status, and sexual orientation
6. Demonstrate an understanding of quality customer service.
- i. explain why quality service is important
  - ii. identify barriers to quality customer service
  - iii. identify customer needs & common methods for meeting them
  - iv. identify and discuss the characteristics & importance of a positive attitude
  - v. identify the importance of demonstrating good communication skills including body language, listening, questioning, and when using electronic communication devices
  - vi. identify techniques for interacting with challenging customers to address complaints and resolve conflict

7. Demonstrate an understanding of effective job search techniques.
  - i. identify and explain employment trends, opportunities, and sources of employment
  - ii. identify and discuss essential skills for the trades as outlined by Human Resources and Skills Development Canada
  - iii. review job ads and identify the importance of fitting qualifications to job requirements
  - iv. identify the characteristics of effective resumes, the types of resumes, and principles of resume formatting
  - v. identify the characteristics of an effective cover letter
  - vi. identify the components of a portfolio, and discuss the value of establishing and maintaining a personal portfolio
  - vii. identify the common characteristics of the job interview process:
    - pre-interview preparation
    - interview conduct
    - post-interview follow up

**Practical Requirements:**

1. Create a resume.
2. Create a cover letter.
3. Participate in a mock job interview.

## MC1060 Computer Essentials

### Learning Outcomes:

- Demonstrate knowledge of computer systems and their operation.
- Demonstrate knowledge of popular software packages and their applications.
- Demonstrate knowledge of security issues related to computers.

**Duration:** 15 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify the major external components of a microcomputer system.
  - i. input devices
  - ii. output devices
  - iii. central control unit
  
2. Use operating system software.
  - i. start and quit a program
  - ii. use the help function
  - iii. use the find function
  - iv. maximize and minimize a window
  - v. use the task bar
  - vi. adjust desktop settings such as screen savers, screen resolution, and backgrounds
  - vii. shut down a computer
  
3. Perform file management commands.
  - i. create folders
  - ii. copy files and folders
  - iii. move files and folders



- iv. rename files and folders
  - v. delete files and folders
4. Use word processing software to create documents.
- i. enter text
  - ii. indent and tab text
  - iii. change text attributes (bold, underline, font, etc.)
  - iv. change layout format (margins, alignment, line spacing)
  - v. spell check and proofread
  - vi. edit text
  - vii. save document
  - viii. print document
  - ix. close document
  - x. retrieve documents
5. Use spreadsheet software to create spreadsheets.
- iv. enter data in cells
  - v. create formulas to add, subtract, multiply and divide
  - vi. save spreadsheet
  - vii. print spreadsheet
  - viii. close spreadsheet
  - ix. retrieve spreadsheet
6. Access the Internet.
- i. access websites using the world wide web(www)
  - ii. identify examples of web browsers
  - iii. use search engines with common searching techniques
  - iv. describe security issues
7. Use electronic mail.
- i. describe e-mail etiquette
    - grammar and punctuation
    - privacy and legal issues when sharing and forwarding e-mail
    - work appropriate content
    - awareness of employer policies
  - ii. manage e-mail using the inbox, sent, and deleted folders
  - iii. send an e-mail message with attachment(s)
  - iv. print e-mail

**Practical Requirements:**

None.

## LEVEL II

### SV2031 Electronic Power Steering

#### Learning Outcomes:

- Demonstrate knowledge of the function of various electronic power steering components.
- Demonstrate knowledge of the procedures to diagnose service and/or replace electronic power steering systems.

**Duration:** 6 Hours

**Pre-Requisite(s):** Level I

#### Objectives and Content:

1. Identify electronic power steering components and their functions, and explain their principles of operation.
  - i. components
  - ii. principles of operation
    - four wheel steering
    - computer
    - sensor inputs
    - outputs – control of hydraulics
    - operating modes
2. Describe procedures to test, service and/or replace electronic power steering systems.
  - i. diagnostic strategy
  - ii. quick tests and visual inspections
  - iii. trouble codes
  - iv. test equipment
  - v. airbag safety

**Practical Requirements:**

None.

## **SV4040 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Explain steering geometry principles and their applications.
  - i. alignment angles
  - ii. Ackerman principle
2. Identify diagnostic and repair tools and equipment relating to electronically controlled suspension systems and describe their applications and procedures for use.
3. Identify safety considerations pertaining to electronically controlled suspension systems repair.
4. Identify types of electronically controlled suspension systems and describe their components and operation.
  - i. ride control systems
  - ii. height control systems
5. Identify related systems and describe their relationship to electronically controlled suspension systems.
6. Describe the procedures used to diagnose electronically controlled suspension systems.

7. Describe the procedures used to adjust, repair and/or replace electronically controlled suspension systems components.
8. Describe the procedures used to diagnose wheel alignment problems.
9. Describe the procedures to perform wheel alignment.

**Practical Requirements:**

1. Pre-inspect vehicle for wheel alignment.
2. Perform a four wheel alignment.

## **SV3000 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Identify hazards and describe safe work practices pertaining to ABS and their components.
2. Identify tools and equipment relating to ABS and describe their applications and procedures for use.
3. Identify types of ABS and describe their components and operation.
4. Describe ABS and their modes of operation.
5. Identify types of braking control systems and describe their components and operation.
  - i. traction control system (TCS)
  - ii. anti-lock brake system (ABS)
  - iii. stability control
6. Describe the procedures used to diagnose ABS.
7. Describe the procedures used to flush and bleed ABS.
8. Describe the procedures used to adjust, repair and/or replace ABS components.

**Practical Requirements:**

1. Diagnose then repair ABS components.



## **SV2315 Starting Systems II**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to diagnose starting systems.
- Demonstrate knowledge of the procedures to repair starting system components.

**Duration:** 15 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Identify starting systems and describe their components and operation.
2. Identify safety considerations pertaining to starting systems.
3. Identify control systems and describe their components and operation.
4. Describe relationship of starting systems to the vehicle networking system.
5. Describe the procedures used to diagnose starting systems.
6. Describe the procedures used to adjust, repair and/or replace starting system components.

### **Practical Requirements:**

None

## **SV2325 Charging Systems II**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to diagnose charging systems.
- Demonstrate knowledge of the procedures to repair charging system components.

**Duration:** 16 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Identify charging systems and describe their components and operation.
2. Identify safety considerations pertaining to charging systems.
3. Identify control systems and describe their components and operation.
4. Describe relationship of charging systems to the vehicle networking system.
5. Describe the procedures used to diagnose charging systems.
6. Describe the procedures used to adjust, repair and/or replace charging system components.

### **Practical Requirements:**

None

## SV2870 Lighting and Wiper Systems

### 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level I

### Objectives and Content:

1. Describe types of lighting systems associated with a vehicle.
  - i. exterior lighting and circuits
    - bulb identification
    - headlights and circuits
    - park lights and circuits
    - brake lights and circuits
    - signal lights and circuits
    - emergency flashers and circuits
    - LED lighting
    - Fibre optic lighting
    - High intensity discharge(HID)
  - ii. interior lighting and circuits
    - dome lights
    - dash lights
    - glove compartment lights
    - courtesy lights
    - illuminated entry
  - iii. accessory lighting and circuits
    - trailer lights
    - roof lights
    - fog lights

- iv. daytime running lights and circuits
2. Identify jurisdictional requirements pertaining to lighting and wiper systems.
3. Describe relationship of lighting and wiper systems to the vehicle networking system.
4. Describe procedures to use test equipment to locate opens, shorts and grounds in lighting systems.
5. Describe procedures to replace various lighting components.
6. Describe various procedures that apply to lighting systems.
  - i. wiring harness
  - ii. replacing bulbs, fuses or circuit breakers using wiring diagrams to locate circuits and components of circuits
  - iii. using meters and test lights
  - iv. removing trim components using special tools
  - v. using aiming equipment
7. Describe procedures to diagnose motor vehicle lighting system problems.
  - i. using wiring diagrams
  - ii. using wire and terminal connection
8. Define terminology associated with wiper systems.
9. Identify types of wiper systems and describe their components and operation.
10. Describe the procedures used to diagnose wiper systems.
11. Describe the procedures used to adjust, repair and/or replace wiper system components.

**Practical Requirements:**

1. Aim vehicle headlights.
2. Diagnose and repair lighting and wiper systems.

## **SV3010    Manual Transmissions and Transaxles**

### **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.

**Duration:**            48 Hours

**Pre-Requisite(s):**    Level I

### **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 diagnostic and repair tools and equipment relating to manual transmissions and transaxles and describe their applications and procedures for use.
4. Identify types of manual transmissions and transaxles and describe their components and operation.
5. Identify types of driveline mounts, their construction and application.
6. Describe the procedures used to replace driveline mounts
7. Explain power flow as it relates to manual transmissions and transaxles.
8. Describe gear ratios, their purpose and calculation.

9. Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to diagnose manual transmissions and transaxles.
11. Describe the procedures used to remove and reinstall manual transmissions and transaxles.
12. Describe the procedures used to adjust, repair and/or replace manual transmissions and transaxles and their related components.

**Practical Requirements:**

1. Disassemble, inspect and re-assemble a manual transmission or transaxle as per manufactures specifications.

## **SV2331 Clutches**

### **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.

**Duration:** 15 Hours

**Pre-Requisite(s):** Level I

### **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 diagnostic and repair tools and equipment relating to clutches and flywheels and describe their applications and procedures for use.
4. Describe clutch system power flow.
5. Identify related systems and describe their relationship to clutch systems.
6. Identify types of clutches and describe their components and operation.
7. Identify types of flywheels and describe their components and operation.
8. Identify mechanical and hydraulic clutch operating systems and describe their components and operation.
9. Identify types of fluids, fasteners, tubing, hoses and seals and describe their applications.



10. Describe the procedures used to diagnose clutches and flywheels.
11. Describe the procedures used to remove and reinstall clutches.
12. Describe the procedures used to adjust, repair and/or replace clutches and flywheels and their related components.

**Practical Requirements:**

1. Diagnose and adjust a clutch.

## **SV2372 Drive Axles, Differentials and Final Drive Assemblies**

### **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.

**Duration:** 24 Hours

**Pre-Requisite(s):** Level I

### **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 diagnostic and repair tools and equipment relating to differentials and final drive assemblies and describe their applications and procedures for use.
4. Identify types of differential housings.
  - i. integral
  - ii. removable
5. Identify types of differentials and final drive assemblies and describe their components and operation.
  - i. locking
  - ii. non-locking
6. Identify types of differential control systems and final drive assemblies and describe their components and operation.
  - i. electronically controlled/electric
  - ii. vacuum

- iii. mechanical
7. Identify types of axles and rear axle bearings and retainers.
    - i. types of axles
      - semi-floating
      - three-quarter floating
      - full-floating
    - ii. types of rear axle bearings and retainers
      - straight roller type
      - tapered roller type
      - ball bearing type
  8. Explain power flow as it relates to differentials and final drive assemblies.
  9. Describe gear ratios, their purpose and calculations.
  10. Identify types of lubricants, additives, fasteners, gaskets, seals and sealants and describe their applications.
  11. Identify related systems and describe their relationship to differentials and final drive assembly.
  12. Describe the procedures used to diagnose differentials, final drive assemblies and their related components.
  13. Describe the procedures used to adjust, repair and/or replace differentials and final drive assemblies their related components.

**Practical Requirements:**

1. Dismantle, inspect, and reassemble a drive axle assembly as per manufacturer's specifications.

## **SV2335 Engine Cooling Systems**

### **Learning Outcomes:**

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

**Duration:** 8 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Identify types of cooling systems.
2. Identify cooling system components and describe their purpose and operation.
3. Identify types of coolants and chemical additives and describe their characteristics and applications.
4. Identify types of hoses, tubing, belts, gaskets, seals and sealants and describe their applications.
5. Identify types of fan systems and describe their components and operation.
6. Identify related systems and describe their relationship to cooling systems.
7. Identify warning systems and indicators and describe their purpose and operation.
8. Identify types of repair and diagnosis tools and equipment and describe their applications and procedures for use.

9. Describe the procedures used to diagnose cooling systems.
10. Describe the procedures used to repair and replace cooling system components.
11. Describe the procedures used to flush and recycle or dispose of coolants according to jurisdictional regulations.

**Practical Requirements:**

None

## **SV2345 Engine Lubrication Systems**

### **Learning Outcomes:**

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

**Duration:** 6 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Identify types of engine lubricants and describe their characteristics and applications.
2. Identify types of oil pumps and describe their purpose and operation.
3. Identify types of oil coolers and describe their purpose and operation.
4. Identify types of hoses, tubing, gaskets, seals and sealants and describe their applications.
5. Describe oil flow, filtration and pressure regulation.
6. Identify related systems and describe the relationship to lubricating systems.
  - i. superchargers
  - ii. turbochargers
7. Identify testing procedures for checking oil contaminations.

8. Identify types of warning systems and indicators and describe their purpose and operation.
9. Describe the procedures used to diagnose engine lubricating systems.
10. Describe the procedures used to perform repairs on lubrication systems.

**Practical Requirements:**

None

## **SV2355    Accessory Drive Systems II**

### **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.

**Duration:**            6 Hours

**Pre-Requisite(s):**    Level I

### **Objectives and Content:**

1. Identify the types of accessory drive systems and describe their components and operation.
2. Identify types of diagnostic and repair tools and equipment and describe their applications and procedures for use.
3. Identify related components and describe their relationship to accessory drive systems.
4. Describe the procedures used to diagnose and repair accessory drive systems.
5. Describe the procedures used to reinstall and adjust accessory drive systems and their components.

### **Practical Requirements:**

None



## SV2182 Engine Removal and Installation

### Learning Outcomes:

- Demonstrate knowledge of procedures used to remove and reinstall engines to manufacturer's specifications.
- Demonstrate knowledge of procedures used to and inspect parts for wear.

**Duration:** 6 Hours

**Pre-Requisite(s):** Level II

### Objectives and Content:

1. Describe procedures to remove an engine.
  - i. draining systems
    - oil
    - coolant
  - ii. disconnecting and identifying electrical wires, hydraulic lines, and accessories hood
  - iii. disconnecting engine from transmission
  - iv. supporting the transmission
  - v. selecting suitable engine hoist
  - vi. removing engine from chassis
  - vii. following precautions
  - viii. following service manual recommendations
  - ix. removing and installing accessory drive belts
2. Describe procedures to inspect parts for wear.
  - i. inspecting engine mounts
  - ii. checking for loose or worn parts
  - iii. checking linkages operation
3. Describe procedures to install engines.
  - i. installing procedures
  - ii. aligning parts properly (knowing the importance)

- iii. using torque attaching fasteners
  - iv. reconnecting all attaching components and accessories
  - v. refilling system fluids
4. Describe procedures to test engine operation.
- i. starting engine
  - ii. checking oil pressure
  - iii. checking for leaks
  - iv. checking for abnormal noise
  - v. following manufacturer's recommendations

**Practical Requirements:**

None

## **SV4010 Engine Diagnostics and Repair**

### **Learning Outcomes:**

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

**Duration:** 60 Hours

**Pre-Requisite(s):** Level I

### **Objectives and Content:**

1. Define terminology associated with engine repair.
  - i. gasoline
  - ii. diesel
2. Identify hazards and describe safe work practices pertaining to gasoline/diesel engine repair.
3. Identify tools and equipment relating to gasoline/diesel engine repair and describe their applications and procedures for use.
4. Identify types and sources of gasoline/diesel 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. gasoline
  - ii. diesel
6. Describe the procedures used to adjust, repair and/or replace engine components.

- i. gasoline
  - ii. diesel
  
7. Describe the procedures to re-build engines.
  - i. gasoline
  - ii. diesel
  
8. Describe procedures to disassemble, inspect and service engines.
  - i. cylinder head
  - ii. cylinder block
  
9. Describe the procedures used to diagnose engine lubrication systems.

**Practical Requirements:**

1. Perform engine diagnostics using testing equipment.
2. Disassemble and inspect a cylinder head to manufacturer's specifications.
3. Disassemble and inspect a cylinder block to manufacturer's specifications

## LEVEL III

### SV2156 Body Electrical, Options and Accessories

#### Learning Outcomes:

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

**Duration:** 48 Hours

**Pre-Requisite(s):** Level II

#### Objectives and Content:

1. Define terminology associated with body, electrical options and accessories.
2. Identify hazards and describe safe work practices pertaining to body, electrical options and accessories.
3. Identify diagnostic and repair tools and equipment relating to body electrical, options and accessories and describe their applications and procedures for use.
4. Identify types of body electrical, options and accessories and describe their components and operation.
  - i. accessories
  - ii. theft deterrents
  - iii. audio/video
  - iv. navigation
  - v. remote starter

5. Describe relationship of body, electrical options and accessories to the vehicle networking system.
6. Describe the procedures used to diagnose body, electrical options and accessories.
7. Describe the procedures used to adjust, calibrate, repair and/or replace body, electrical options and accessories and their related components.
8. Describe the procedures used to install body, electrical options and accessories.

**Practical Requirements:**

1. Diagnose and repair body electrical, options and accessories.

## SV2018 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.

**Duration:** 48 Hours

**Pre-Requisite(s):** Level II

### 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 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)
  - ii. OBD II
    - drive cycles and monitors
    - DTC

5. Identify types of network protocols and describe their purpose.
6. Describe the networking of modules and multi-plexing.
  - i. wiring designs
  - ii. wireless
7. Identify the parameters of inputs and outputs and describe their relationships.
8. Describe the procedures used to diagnose vehicle management systems.
9. Identify methods used to access/transfer and reprogram software and describe their associated procedures.
10. Describe the procedures used to repair and/or replace vehicle management system components.

**Practical Requirements:**

1. Diagnose and repair OBD II systems.



## SV3031 Transfer Cases and Four-Wheel Drive (4WD) Systems

### Learning Outcomes:

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

**Duration:** 24 Hours

**Pre-Requisite(s):** Level II

### Objectives and Content:

1. Define terminology associated with transfer cases and 4WD drive systems.
2. Identify types of transfer cases and 4WD systems and describe their components and operation.
3. Describe the relationship between transfer cases, locking hubs, and axle disconnects.
4. Identify diagnostic and repair tools and equipment relating to transfer cases and 4WD systems and describe their applications and procedures for use.
5. Identify related systems describe their relationship to transfer cases.
6. Identify types of transfer case and 4WD systems control systems and describe their components and operation.
  - i. vacuum
  - ii. manual
  - iii. electronic
7. Explain power flow as it relates to transfer cases and 4WD systems.
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 and 4WD systems.
11. Describe the procedures used to adjust, repair and/or replace transfer cases 4WD systems and their related components.

**Practical Requirements:**

1. Diagnose a 4WD system.
2. Dismantle, inspect, and reassemble a transfer case assembly as per manufacturer's specifications.

## **SV2850 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.

**Duration:** 18 Hours

**Pre-Requisite(s):** Level II

### **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, disposal and storage of fuels
  - ii. depressurize fuel systems and fuel recovery
  - iii. alternate fuel high pressure and flammability
3. Identify types of fuels and describe their characteristics and properties.
  - i. gasoline
  - ii. diesel
  - iii. flex/E85
  - iv. hydrogen
  - v. bio-diesel
  - vi. LPG
  - vii. CNG

4. Identify types of fuel delivery systems and describe their components and operation.
  - i. mechanical
  - ii. electrical
  - iii. fuel gauges
    - types
    - low fuel level sensor
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. gasoline
  - ii. diesel
7. Describe the procedures used to adjust, repair and/or replace fuel delivery systems and their components.
  - i. gasoline
  - ii. diesel

**Practical Requirements:**

1. Check fuel system delivery and operation while observing safety precautions.
2. Perform fuel injection cleaning.

## SV3060 Gasoline Fuel Systems

### Learning Outcomes:

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

**Duration:** 30 Hours

**Pre-Requisite(s):** Level II

### Objectives and Content:

1. Define terminology associated with gasoline fuel injection systems.
2. Identify hazards and describe safe work practices pertaining to fuel injection systems.
  - i. high pressure
  - ii. flammability
3. Identify diagnostic and repair tools and equipment relating to gasoline fuel injection systems and describe their applications and procedures for use.
4. Identify types of gasoline fuel injection systems and describe their components and operation.
  - i. electronic injection
  - ii. direct injection
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.
7. Describe the procedures used to adjust, repair and/or replace gasoline fuel injection systems components.

**Practical Requirements:**

1. Perform fuel pressure test.
2. Perform an injector balance test.
3. Perform injector tests.

## **SV3065 Ignition Systems II**

### **Learning Outcomes:**

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

**Duration:** 24 Hours

**Pre-Requisite(s):** Level II

### **Objectives and Content:**

1. Identify safety considerations pertaining to ignition systems.
2. Identify types of ignition systems and describe their components and operation.
3. Identify the types of ignition circuits and describe their purpose and operation.
4. Identify types of diagnostic and repair tools and equipment and describe their applications and procedures for use.
5. Identify related systems and describe their relationship to ignition systems.
6. Describe the procedures used to diagnose and repair ignition systems and their components.
7. Describe the procedures used to adjust, remove, replace and reinstall ignition system components.

**Practical Requirements:**

1. Perform ignition tests.



## **SV3070 Intake and Exhaust Systems**

### **Learning Outcomes:**

- Demonstrate knowledge of the operation and purpose of all major parts of intake systems.
- Demonstrate knowledge of the operation of all major parts of the exhaust system and their purpose.
- Demonstrate knowledge of the procedures used to diagnose and repair intake / exhaust systems.

**Duration:** 18 Hours

**Pre-Requisite(s):** Level II

### **Objectives and Content:**

1. Identify hazards and describe safe work practices pertaining to intake and exhaust systems.
2. Identify types of diagnostic and repair tools and equipment and describe their applications and procedures for use.
3. Identify related systems and describe their relationship to intake/exhaust systems.
4. Identify the types of intake and exhaust systems and describe their components and operation.
5. Identify related systems and describe their relationship to intake/exhaust systems.
6. Identify and describe air filters.
  - i. principles
  - ii. types

7. Describe the operating principles of intake manifolds.
  - i. cold air
  - ii. hot air
  - iii. control
  - iv. distribution
  - v. tuning
  - vi. variable induction
8. Identify and describe turbochargers and superchargers, their operation and use.
9. Describe induction systems and their relationship to turbochargers and superchargers.
10. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
11. Describe the operating principles and characteristics of intake and air charge systems and their components.
  - i. design
  - ii. intercoolers
  - iii. volumetric efficiency
12. Describe the procedure to test and service components of intake and air filtration exhaust systems.
13. Describe the components of exhaust systems.
  - i. manifolds
    - types
    - designs (combined, separate)
  - ii. mufflers and resonators
    - types
    - purpose
  - iii. catalytic converters
  - iv. pipes, supports, clamps
  - v. oxygen sensors
  - vi. induction systems (turbochargers)

14. Describe the procedures used to diagnose and repair intake / exhaust systems.
15. Describe the procedures used to inspect supercharger systems and turbocharger systems.
16. Describe the procedures to service components of intake and exhaust systems.
  - i. selecting and using proper tools
  - ii. aligning
  - iii. removing, replacing
  - iv. checking system for leaks and/or restrictions
    - noise
    - vibration
  - v. following safety precautions (carbon monoxide)

**Practical Requirements:**

1. Diagnose intake and exhaust systems.

## SV2221 Emission Control Systems

### 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level II

### 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 diagnostic and repair tools and equipment relating to emission control systems and describe their applications and procedures for use.
4. Identify types of on-board diagnostic systems and describe their applications.
  - i. OBD I
  - ii. OBD II
5. Identify warning systems and indicators.
6. Identify types of emission gases.
  - i. CO
  - ii. CO<sup>2</sup>
  - iii. NO<sub>x</sub>
  - iv. HC
  - v. O<sup>2</sup>

7. Identify emission control systems and describe their components and operation.
  - i. exhaust gas recirculation (EGR)
  - ii. evaporative emission control systems (EVAP)
  - iii. secondary air injection
  - iv. exhaust system
  - v. positive crankcase ventilation (PCV)
  - vi. induction system
  - vii. variable cam-timing (VCT)
  - viii. particulate filter
  - ix. diesel exhaust fluid (DEF)
  
8. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
  
9. Describe the procedures used to diagnose emission control systems and their components.
  - i. gasoline
  - ii. diesel
  
10. Describe the procedures used to adjust, repair and/or replace emission control systems and their components.
  - i. gasoline
  - ii. diesel

**Practical Requirements:**

1. Diagnose and repair emission systems while maintaining industry standards.

## LEVEL IV

### SV2860 Instrumentation and Information Displays

#### 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.

**Duration:** 12 Hours

**Pre-Requisite(s):** Level III

#### 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.
3. Identify diagnostic and repair tools and equipment relating to instrumentation and information displays and describe their applications and procedures for use.
4. Identify types of instrumentation systems and describe their components and operation.
  - i. gauges
  - ii. warning indicators
5. Identify types of information displays and describe their purpose and operation.
6. Describe the procedures used to diagnose instrumentation and information displays.

7. Describe the procedures used to adjust, calibrate, repair and/or replace instrumentation and information displays and their related components.

**Practical Requirements:**

None

## **SV4100 Entertainment Systems**

### **Learning Outcomes:**

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

**Duration:** 6 Hours

**Pre-Requisite(s):** Level III

### **Objectives and Content:**

1. Identify safety considerations pertaining to entertainment systems.
2. Identify types of entertainment systems and describe their components and operation.
3. Identify types of diagnostic and repair tools and equipment and describe their applications and procedures for use.
4. Identify the relationship of the entertainment system to the vehicle networking system.
5. Describe the procedures used to diagnose, adjust, repair and/or replace entertainment systems.

### **Practical Requirements:**

None



## **SV3050 Automatic Transmissions, and Transaxles**

### **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.

**Duration:** 72 Hours

**Pre-Requisite(s):** Level III

### **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 diagnostic and repair tools and equipment relating to automatic transmissions and transaxles 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
  - iii. continuously variable transmission (CVT)
5. Explain hydraulic principles related to automatic transmissions and transaxles.
  - i. Pascal's law
6. Explain power flow as it relates automatic transmissions and transaxles.
7. Interpret electric and hydraulic schematics.

8. Describe gear ratios, their purpose and calculation.
9. Identify types of lubricants, fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to diagnose automatic transmissions and transaxles.
11. Describe the procedures used to adjust, calibrate, repair and/or replace automatic transmissions and transaxles and their related components.

**Practical Requirements:**

1. Diagnose mechanical/hydraulic problems in automatic transmissions or transaxles.
2. Dismantle, inspect, and reassemble automatic transmissions or transaxles as per manufactures specifications.
3. Diagnose and repair transmissions with electronic control systems.

## **SV4105 All-Wheel Drive (AWD) Systems**

### **Learning Outcomes:**

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

**Duration:** 8 Hours

**Pre-Requisite(s):** Level III

### **Objectives and Content:**

1. Define terminology associated with all-wheel drive AWD systems.
2. Identify safety considerations pertaining to AWD systems.
3. Identify related systems and describe their relationship to AWD systems.
4. Identify types of AWD systems and describe their components and operation.
5. Identify tools and equipment relating to transfer cases and AWD systems and describe their applications and procedures for use.
6. Identify types of AWD systems control systems and describe their components and operation.
7. Explain power flow as it relates to transfer cases AWD systems.
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 and AWD systems.
11. Describe the procedures used to adjust, repair and/or replace transfer cases and AWD systems and their related components.

**Practical Requirements:**

None

## **SV4110 Diesel Engine Support Systems**

### **Learning Outcomes:**

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

**Duration:** 24 Hours

**Pre-Requisite(s):** Level III

### **Objectives and Content:**

1. Define terminology associated with diesel engine support systems.
2. Identify hazards and describe safe work practices pertaining to diesel engine support-systems.
  - i. high pressure
  - ii. high amperage/voltage
  - iii. starting fluids
  - iv. emergency shut-off
3. Identify diagnostic and repair tools and equipment relating to diesel engine support systems and describe their applications and procedures for use.
  - i. fuel
  - ii. intake
  - iii. exhaust
  - iv. electrical
  - v. mechanical
  - vi. emission control
4. Identify types of diesel fuel injection systems and describe their components and operation.
  - i. electronic

- ii. mechanical
5. Identify types of diesel intake, exhaust systems and their components and operation.
6. Identify types of diesel emission control systems and their components and operation.
7. Identify types of cold start systems, such as pre-heaters, and describe their purpose and operation.
8. Describe procedures to diagnose diesel engine support systems.
  - i. fuel
  - ii. intake
  - iii. exhaust
  - iv. electrical
  - v. mechanical
  - vi. emission control
9. Identify methods to test fuel quality and describe their associated procedures.
10. Identify types of tubing, hoses, gaskets, seals and sealants and describe their applications.
11. Describe the procedures used to adjust, repair and/or replace diesel engine support system components.
  - i. fuel
  - ii. intake
  - iii. exhaust
  - iv. electrical
  - v. mechanical
  - vi. emission control

### **Practical Requirements:**

1. Perform diagnostic procedures on a diesel engine.

## **SV4050 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level III

### **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
3. Explain the principles of the refrigeration cycle.
4. Identify tools and equipment relating to HVAC systems and describe their applications and procedures for use.
5. Identify types of heating systems and describe their components and operation.
6. Identify types of refrigerants and lubricants and describe their applications and procedures for use.
7. Identify types of refrigeration systems and describe their components and operation.
  - i. orifice tube
  - ii. thermal expansion valve

8. Identify types of HVAC systems and describe their components and operation.
  - i. manual
  - ii. automatic
9. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.
10. Describe the procedures used to retrofit A/C systems.
11. Describe the procedures used to identify, recover, evacuate and recharge refrigerant systems.
12. Describe the procedures used to diagnose HVAC systems.
13. Describe the procedures used to adjust, repair and/or replace HVAC system components.

**Practical Requirements:**

1. Check operation of heater and vent controls.
2. Diagnose and repair problems with A/C system controls.
3. Recover, recycle, vacuum and recharge an A/C system.



## SV2880 Hybrid Systems II

### Learning Outcomes:

- Demonstrate knowledge of operations of hybrid and EV systems.
- Demonstrate knowledge of the procedures used to diagnose and repair hybrid systems.
- Demonstrate knowledge of safety protocols for hybrid and EV systems.

**Duration:** 12 Hours

**Pre-Requisite(s):** Level III

### Objectives and Content:

1. Identify safety protocols pertaining to hybrid and EV systems.
2. Describe electrical concepts and components.
  - i. DC/DC converters
  - ii. AC/DC inverters
  - iii. capacitors
  - iv. snubbers
  - v. 3 phase electricity
3. Describe electric motors and concepts.
  - i. magnetic principles
    - induction
    - generation
  - ii. brushless motors
    - AC induction motors
    - AC synchronous motors
4. Describe hybrid vehicle components.
  - i. gasoline engine
  - ii. wiring and cables
  - iii. hybrid control modules

- iv. driver information center/instrument panel
- 5. Describe modes of operation.
  - i. idle shut off
  - ii. lean burn
  - iii. acceleration assist
  - iv. full electric
  - v. high voltage battery charging
  - vi. vehicle towing
- 6. Describe regenerative braking.
  - i. advantages and disadvantages
  - ii. types of regeneration
    - series
    - parallel
  - iii. brake electronic control unit operation
    - pressure sensors
    - travel sensors
  - iv. engine cylinder shut off
  - v. safety procedures
    - disabling self-test before pad replacement
- 7. Describe high voltage battery operation.
  - i. dual-voltage system
  - ii. disconnect procedures for different manufacturers
  - iii. re-connect procedures for different manufacturers
  - iv. high voltage interrupt relays
  - v. state of charge
  - vi. battery cooling
    - fans
    - temperature sensors
  - vii. testing
  - viii. battery control module
  - ix. charging procedures
  - x. boosting procedures
- 8. Describe transmission operation and design.
  - i. constant variable transmissions

- power-split system
    - belt and pulley system
  - ii. motor/generators
  - iii. auxiliary transmission fluid pump
  - iv. driving modes
  
- 9. Describe HVAC system components and operation.
  - i. motor generator cooling
  - ii. ECU cooling
  - iii. electric water pump
  - iv. coolant heater storage system
  - v. PTC heaters
  - vi. A/C electric compressor
    - POE oil to prevent loss of high voltage isolation
    - preventing oil cross-contamination
  - vii. A/C modes
  - viii. auxiliary A/C for battery cooling
  
- 10. Describe electric power steering operation and components.
  - i. electric motor
  - ii. torque sensor
  - iii. reduction gear
  - iv. intermediate voltage

**Practical Requirements:**

None

## **SV4060 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.

**Duration:** 30 Hours

**Pre-Requisite(s):** Level III

### **Objectives and Content:**

1. Define terminology associated with restraint systems.
2. Identify hazards and describe safe work practices related to restraint systems.
  - i. handling
  - ii. disposal
3. Identify diagnostic and repair tools and equipment relating to restraint systems and describe their applications and procedures for use.
4. Identify types of restraint systems and describe their components and operation.
  - i. active
  - ii. passive
5. Identify types of restraint system warning indicators and describe their purpose.
6. Describe the procedures used to diagnose restraint systems.
7. Describe the procedures to adjust, repair and/or replace restraint system components.

**Practical Requirements:**

1. Diagnose and repair SIR system failure.

## **SV4115    Mentoring Techniques**

### **Learning Outcomes:**

- Identify, explain and demonstrate strategies for learning skills in the workplace.
- Identify, explain and demonstrate strategies for teaching workplace skills.

**Duration:**            4 Hours

**Pre-Requisite(s):**    Level III

### **Objectives and Content:**

1.    Describe the importance of individual experience.
2.    Describe the shared responsibilities for workplace learning.
3.    Identify different ways of learning and determine one's own learning preference and explain how these relate to learning new skills.
4.    Describe the importance of different types of skills in the workplace.
5.    Describe the importance of essential skills in the workplace.
6.    Identify different ways of learning.
7.    Identify different learning needs and strategies to meet learning needs.
8.    Identify strategies to assist in learning a skill.
9.    Identify different roles played by a workplace mentor.
10.   Describe the steps involved in teaching skills.

11. Explain the importance of identifying the point of a lesson.
12. Identify how to choose the effective time to present a lesson.
13. Explain the importance of linking the lessons.
14. Identify the components of the skill (the context).
15. Describe considerations in setting up opportunities for skill practice.
16. Explain the importance of providing feedback.
17. Identify techniques for giving effective feedback.
18. Describe a skills assessment.
19. Identify methods of assessing progress.
20. Explain how to adjust a lesson to different situations.

**Practical Requirements:**

None

## **SV4090 Provincial Government Inspections (MVI)**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures to perform provincial safety inspections.

**Duration:** 12 Hours

**Pre-Requisites:** Level III

### **2016 RSOS reference:**

NA

### **Objectives and Content:**

1. Explain the purpose of a provincial government safety inspection and its history.
  - i. purpose of inspection
  - ii. people or authorities involved in inspections
  - iii. responsibilities of those involved
  
2. Describe provincial government safety inspection procedures.
  - i. inspection instructions
  - ii. specifications and tolerances
  - iii. documentation of inspections
    - inspection forms
    - reject stickers
    - stickers used when vehicle passes inspection
    - liability – unsafe vehicles

### **Practical Requirements:**

1. Perform government motor vehicle safety inspection.



## **SV1110 Ozone-Depletion Substances**

### **Learning Outcomes:**

- Demonstrate knowledge of regulations on ozone-depleting substances.

**Duration:** 6 Hours

**Pre-Requisite(s):** Level III

### **Objectives and Content:**

1. Describe procedures for handling ozone-depletion substances (refrigerants) used in motor vehicles as per Regulations.
2. Identify the Act relating to ozone-depletion substances regulations.

**NOTE: Curriculum and certification supplied by HRAI are to be delivered by instructors who are certified to teach ODS courses for motive power occupations.**

### **Practical Requirements:**

None.

## **SV4120    Program Review**

### **Learning Outcomes:**

- Demonstrate knowledge of the Red Seal Occupational Standard and its relationship to the Interprovincial Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Examination.

**Duration:**                24 Hours

**Pre-Requisite(s):**    Level III

### **Objectives and Content:**

1. Define terminology associated with an RSOS.
  - i. blocks
  - ii. tasks
  - iii. sub-tasks
  
2. Explain how an RSOS is developed and the link it has with the Interprovincial Red Seal Examination.
  - i. development
  - ii. validation
  - iii. block and task weighting
  - iv. examination breakdown (pie-chart)
  
3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Examination.
  - i. Red Seal website
  - ii. examination preparation guide
  - iii. sample questions
  - iv. examination counselling sheets

4. Explain the relationship between the RSOS and the Provincial Plan of Training (POT).
5. Review Common Occupational Skills for the Automotive Service Technician trade as identified in the RSOS.
  - i. performs safety-related functions
  - ii. uses tools, equipment and documentation
  - iii. uses communication and mentoring techniques
6. Review Diagnoses and Repairs Engine and Engine Support Systems for the Automotive Service Technician trade as identified in the RSOS.
  - i. diagnoses engine systems
  - ii. repairs engine systems
  - iii. diagnoses gasoline engine support systems
  - iv. repairs gasoline engine support systems
  - v. diagnoses diesel engine support systems
  - vi. repairs diesel engine support systems
7. Review Diagnoses and Repairs Vehicle Module Communications Systems for the Automotive Service Technician trade as identified in the RSOS.
  - i. diagnoses vehicle networking systems
  - ii. repairs vehicle networking systems
8. Review Diagnoses and Repairs Driveline Systems for the Automotive Service Technician trade as identified in the RSOS.
  - i. diagnoses driveline systems
  - ii. repairs driveline systems
9. Review Diagnoses and Repairs Electrical and Comfort Control Systems for the Automotive Service Technician trade as identified in the RSOS.
  - i. diagnoses electrical systems and components
  - ii. repairs heating, ventilation and air conditioning (hvac) and comfort control systems
  - iii. diagnoses heating, ventilation and air conditioning (hvac) and comfort control systems
  - iv. repairs electrical systems and components

10. Review Diagnoses and Repairs Steering and Suspension, Braking, Control Systems, Tires, Hubs and Wheel Bearings for the Automotive Service Technician trade as identified in the RSOS.
  - i. repairs steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings
  - ii. diagnoses steering and suspension, braking, control systems, tires, wheels, hubs and wheel bearings
  
11. Review Diagnoses and Repairs Restraint Systems, Body Components, Accessories and Trim for the Automotive Service Technician trade as identified in the RSOS.
  - i. diagnoses restraint systems, body components, accessories and trim
  - ii. repairs restraint systems, body components, accessories and trim
  
12. Review Diagnoses and Repairs Hybrid and Electric Vehicles (EV) for the Automotive Service Technician trade as identified in the RSOS.
  - i. repairs hybrid and electric vehicles (EV)
  - ii. diagnoses hybrid and electric vehicles (EV)

**Practical Requirements:**

None

## **C. Conditions Governing Apprenticeship Training**

### **1.0 General**

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the *Apprenticeship Training and Certification Act (1999)*. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

### **2.0 Entrance Requirements**

#### **2.1 Entry into the occupation as an apprentice requires:**

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

#### **2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.**

#### **2.3 At the discretion of the Director of Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.**

- 2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.
- 2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

### **3.0 Probationary Period**

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

### **4.0 Termination of a Memorandum of Understanding**

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated in Section 14.

### **5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria**

Progression Schedule, Wage Rate and Advanced Training Criteria are stated in the specific occupational Plan of Training for each designated apprenticeship occupation.

## Progression Schedule

Automotive Service Technician-7200 Hours			
APPRENTICESHIP LEVEL AND WAGES			
Year	Wage Rate At This Level	Requirements for progression to next level of apprenticeship	When requirements are met, the apprentice will progress to...
1 <sup>st</sup>	60 %	<ul style="list-style-type: none"> <li>▪ Completion of Level 1 training</li> <li>▪ Pass Level 1 exam</li> <li>▪ Minimum 1800 hours of combined relevant work experience and training</li> </ul>	2 <sup>nd</sup> Year
2 <sup>nd</sup>	70%	<ul style="list-style-type: none"> <li>▪ Completion of Level 2 training</li> <li>▪ Pass Level 2 exam</li> <li>▪ Minimum 3600 hours of combined relevant work experience and training</li> </ul>	3 <sup>rd</sup> Year
3 <sup>rd</sup>	80%	<ul style="list-style-type: none"> <li>▪ Completion of Level 3 training</li> <li>▪ Pass Level 3 exam</li> <li>▪ Minimum 5400 hours of combined relevant work experience and training</li> </ul>	4 <sup>th</sup> Year
4 <sup>th</sup>	90%	<ul style="list-style-type: none"> <li>▪ Completion of Level 4 training</li> <li>▪ Minimum 7200 hours of combined relevant work experience and training</li> <li>▪ Sign-off of all workplace skills in apprentice logbook</li> <li>▪ Pass certification exam</li> </ul>	Journey person Certification
<p><b>Wage Rates</b></p> <ul style="list-style-type: none"> <li>▪ Rates are percentages of the prevailing journey person's wage rate in the place of employment of the apprentice.</li> <li>▪ Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order.</li> <li>▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace.</li> <li>▪ Employers are free to pay wage rates above the minimums specified.</li> </ul> <p><b>Level Exams</b></p> <p>This program may <b>not</b> currently contain Level Exams, in which case this requirement will be waived until such time as Level Exams are available.</p>			

Automotive Service Technician-7200 Hours		
CLASS CALLS		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry Apprentice: PLA & / or Level 1	<ul style="list-style-type: none"> <li>▪ Minimum of 1800 hours of relevant work experience</li> <li>▪ Prior Learning Assessment (PLA) at designated college (if applicable)</li> </ul>	To be determined by the number of courses completed after each class call
Level 2	<ul style="list-style-type: none"> <li>▪ Minimum of 2400 hours of relevant work experience and training</li> </ul>	240
Level 3	<ul style="list-style-type: none"> <li>▪ Minimum of 4000 hours of relevant work experience and training</li> </ul>	240
Level 4	<ul style="list-style-type: none"> <li>▪ Minimum of 5400 hours of relevant work experience and training</li> </ul>	240

Direct Entry Apprentice

- Must complete Level 1 courses through PLA and / or in school training.
- Level 1 training is to be completed via class calls; up to 16 weeks of training per calendar year.
- Must attend in-school training until Level 1 is complete before attending Levels 2 or higher.

Class calls at Minimum Hours

- Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices.



## **6.0 Tools**

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

## **7.0 Periodic Examinations and Evaluation**

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.
- 7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.
- 7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.
- 7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

## **8.0 Granting of Certificates of Apprenticeship**

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship.

## **9.0 Hours of Work**

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

## **10.0 Copies of the Registration for Apprenticeship**

The Director of Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

## **11.0 Ratio of Apprentices to Journeypersons**

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

## **12.0 Relationship to a Collective Bargaining Agreement**

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

## **13.0 Amendments to a Plan of Apprenticeship Training**

A Plan of Training may be amended at any time by the PACB.

## **14.0 Employment, Re-Employment and Training Requirements**

14.1 The Plan of Training requires apprentices to regularly attend their place of employment.

14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.

- 14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.
- 14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.
- 14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyperson supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyperson with respect to the task, activity or function that is being supervised.
- 14.6 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.
- 14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.
- 14.8 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a PACB authorized training institution and have sign-off done by instructors to meet the requirements for certification.

## **15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training**

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Advanced Education Skills and Labour within 30 days of the decision.

## **D. Requirements for Red Seal Endorsement**

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.
2. Successful completion of all required courses in the program.
3. A combination of training from an approved training program and suitable work experience totaling 7200 hours.

**Or**

A total of 9000 hours of suitable work experience.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

## **E. Roles and Responsibilities of Stakeholders in the Apprenticeship Process**

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

### **The Apprentice:**

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyman.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

### **The Employer:**

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyman is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Advanced Education, Skills and Labour.

### **The Training Institution:**

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

### **The Apprenticeship and Trades Certification Division:**

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers block, provincial and interprovincial examinations.

### **The Provincial Apprenticeship and Certification Board:**

- sets policies to ensure the provisions of the *Apprenticeship and Certification Act (1999)* are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.