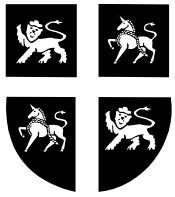

PROVINCIAL PLAN OF TRAINING

FOR THE

AUTOMOTIVE SERVICE TECHNICIAN

OCCUPATION

Document Status	Date Distributed	Mandatory Implementation Date	Comments
Original Version	April 2005	September 2005	

April 2005

Preface

This Provincial Plan of Training is based on the 1998 edition of the National Occupational Analysis for the Automotive Service Technician trade. It was developed through the cooperative efforts of the Atlantic Apprenticeship Council, which consists of both the Atlantic Directors of Apprenticeship and Apprenticeship Board Chairs. This document describes the curriculum content for the Automotive Service Technician apprenticeship training program and outlines each of the technical training units necessary for completion of apprenticeship.

Acknowledgement

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Training Standard. Without their dedication to quality apprenticeship training, this document could not have been produced. A sincere thank you.

Apprenticeship Training Standard Evaluation Form

Thank you for your interest in the development and revision of this Plan of Training. Upon review of this document, please record your feedback in relation to the following items:

- course division and organization
- relevancy of the content
- errors or omissions
- other suggestions for improvement and consideration

Overall comments are to be entered on this evaluation form and specific changes are to be entered directly on the document in the relevant area(s). When all feedback has been recorded, return this evaluation form along with the revised Plan of Training to the Apprenticeship Office noted at the bottom of the page.

(PLEASE PRINT)

Trade: Automotive Service Technician

Full Name: _____

Type of Position: (Trade Practitioner, Instructor, etc.): _____

Company: _____

Address: _____

Telephone: _____

Comments: (Use a separate sheet of paper if necessary)

_____

_____

_____

_____

_____

_____

_____

Return Evaluation Form and Plan of Training to:

Manager, Industrial Training
Division of Institutional and Industrial Education
Department of Education
P.O. Box 8700
St. John's, NF
A1B 4J6

Table of Contents

CONDITIONS GOVERNING APPRENTICESHIP TRAINING

1.0 GENERAL

The following general conditions will apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board in accordance with the Apprenticeship Training and Certification Act. Where an occupation requires additional conditions, these will be noted in the specific plan of training for that occupation. In no case should there be a conflict between these conditions and the additional requirements specified in certain plans of training.

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 this 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 particular plans of training. Mature students, at the discretion of the Director of Institutional and Industrial Education, 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 Institutional and Industrial Education, credit towards the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 A Registration for Apprenticeship form must be duly completed.

3.0 PROBATIONARY PERIOD

The probationary period for each memorandum of understanding will be six months. Within that period the memorandum may be terminated by either party upon giving the other party and the Provincial Apprenticeship and Certification Board one week notice in writing.

4.0 TERMINATION OF A MEMORANDUM OF UNDERSTANDING

After the probationary period referred to in Section 3.0 herein, the memorandum of understanding may be terminated by the Board by mutual consent of the parties thereto or cancelled by the Board for proper and sufficient cause in the opinion of the Board.

5.0 APPRENTICESHIP PROGRESSION SCHEDULE AND WAGE RATES

5.1 Progression Schedule

7200 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus relevant work experience totaling a minimum of 5400 hours	Fourth Year
Fourth Year Apprentice	Completion of advanced level (Block 4) courses and (Block 5) *if applicable,* plus sign-off of workplace skills required for certification totaling a minimum of 7200 hours**	Write Certification Examination
5400 Hour Programs	**Requirements for Progression**	**Progress To**
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 5400 hours	Write Certification Examination

4800 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	Completion of entry level courses (Block 1) courses, plus relevant work experience totaling a minimum of 1600 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3200 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 4800 hours	Write Certification Examination

* All direct entry apprentices must meet the **Requirements for Progression** either through Prior Learning Assessment and Recognition or course completion before advancing to the next year.

** Apprentices in a 7200 hour program which incorporates more than four blocks of training are considered fourth year apprentices pending completion of 100% course credits and workplace skills requirements.

5.2 For the duration of each Apprenticeship Training Period, the apprentice, who is not covered by a collective agreement, shall be paid a progressively increased schedule of wages which shall not be less than:

Program Duration	Wage Rates		Comments
7200 Hours	1st Year	55%	These wage rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. No apprentice shall be paid less than the wage rate established by the Labour Standards Act (1988), as now in force or as hereafter amended, or by other Order, as amended from time to time replacing the first mentioned Order.
	2nd Year	65%	
	3rd Year	75%	
	4th Year	90%	
5400 Hours and 4800 Hours	1st Year	55%	
	2nd Year	70%	
	3rd Year	85%	
4000 Hours			(Hairstylist Program) - The apprentice shall be paid no less than the minimum wage for hours worked and a commission agreed upon between the apprentice and the employer.

6.0 TOOLS

Apprentices shall be required to obtain hand tools as and when specified by the Board.

7.0 PERIODIC EXAMINATIONS AND EVALUATION

7.1 Every apprentice shall submit to such occupational tests and examinations as the Board shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Institutional and Industrial Education 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 Board 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. At the discretion of the instructor, the summative mark may be for completion of a theory examination or a combination of the theory examination and an assigned practical project.

8.0 GRANTING OF CERTIFICATES OF APPRENTICESHIP

Upon the successful completion of apprenticeship, the Board 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 Institutional and Industrial Education shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 RATIO OF APPRENTICES TO JOURNEYPERSONS

The ratio of Apprentices to Journeypersons normally shall not exceed one apprentice to every one journeyperson employed. Exceptions for specific occupations may occur with the approval of the Provincial Apprenticeship and Certification Board.

12.0 RELATIONSHIP OF THE PLAN OF TRAINING TO A COLLECTIVE BARGAINING AGREEMENT

Collective agreements take precedence over the conditions outlined in the plan of training.

13.0 AMENDMENTS TO A PLAN OF APPRENTICESHIP TRAINING

A plan of training may be amended at any time by the Provincial Apprenticeship and Certification Board.

14.0 EMPLOYMENT, RE-EMPLOYMENT AND TRAINING REQUIREMENTS

14.1 The plan of training requires Apprentices to attend regularly their place of employment.

14.2 The plan of training requires Apprentices to regularly attend training programs for that occupation as prescribed by The Provincial Apprenticeship and Certification Board.

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 M.O.U.'s reinstated by the Provincial Apprenticeship and Certification Board 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 registering as a Trade Qualifier.

14.5 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 opportunity to be re-employed before another is hired.

14.6 The employer will permit each apprentice to attend regularly training programs as prescribed by the Provincial Apprenticeship and Certification Board.

14.7 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 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 Education within 30 days of the decision.

REQUIREMENTS FOR RED SEAL CERTIFICATION

1. Evidence that the required work experiences outlined in this plan of training have been obtained. This evidence must be in a format that clearly outlines 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 program.

3. A combination of training from an approved training program and suitable work experience totalling 7200 hours

   OR

   A total of 9000 hours of suitable work experience in the occupation accompanied by sign-off of required work competencies.

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

5. Payment of the appropriate examination fee.

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 captures, in a broad sense, these roles and the responsibilities that result from them.

The Apprentice

- to complete all required technical training courses as approved by the Provincial Apprenticeship and Certification Board.
- to find appropriate employment.
- to complete all required work experiences in combination with the required hours.
- to ensure that the work experiences are well documented.
- to approach apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- to obtain the required hand tools as specified by the Board for each period of training of the apprenticeship program.

The Employer

- to provide high quality work experiences in an environment that is conducive to learning.
- to remunerate apprentices as set out in this Plan of Training or Collective Agreements.
- to provide feedback to Training Institutions, Industrial Training Division and Apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, to release apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- to ensure that work experiences of the apprentices are documented.

The Training Institution

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

The Industrial Training Division

- to establish and maintain program advisory committees under the direction of the Provincial Apprenticeship and Certification Board.
- to promote apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- to establish and maintain a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- to ensure that all apprentices are appropriately registered and records are maintained as required.
- to schedule all necessary technical training periods for apprentices to complete requirements for certification.
- to administer provincial/interprovincial examinations.

The Provincial Apprenticeship and Certification Board

- to set policies to ensure that the provisions of the Apprenticeship Training and Certification Act are implemented.
- to ensure that advisory and examination committees are established and maintained.
- to accredit institutions to deliver apprenticeship training programs.
- to designate occupations for apprenticeship training and/or certification.

Program Outcomes

Upon completion of the Automotive Service Technician Program, apprentices will have demonstrated the knowledge and skills required to perform the following tasks:

Task 1 Demonstrates safe working practices and techniques to ensure injury-free workplace.

Task 2 Complies with government and company policies and procedures, guidelines and standards.

Task 3 Performs preliminary diagnosis to isolate system fault.

Task 4 Locates and interprets specific information in service manuals and bulletins.

Task 5 Selects and operates hand, cutting and power tools.

Task 6 Operates shop equipment, such as cleaning equipment, lifting and jacking equipment, air compressors and observes maintenance requirements.

Task 7 Selects, operates and maintains dimensional measuring devices for service and repair of motor vehicles.

Task 8 Operates and maintains oxy-acetylene welding equipment and identifies uses for electric welding.

Task 9 Selects, installs and removes fastening and sealing devices.

Task 10 Inspects, tests engine components and isolates malfunctions to defective components or systems.

Task 11 Inspects, tests and repairs valve train components and assemblies.

Task 12 Dismantles, cleans, inspects, repairs and reassembles cylinder block assemblies.

Task 13 Removes and installs engines.

Task 14 Inspects, tests and repairs engine cooling systems.

Task 15 Diagnoses engine electronics to isolate driveability/performance/emission control problems caused by engine electronic components.

Task 16 Inspects, tests and repairs emission control systems.

Task 17 Repairs or replaces defective electronic components of engine management and emission control systems.

Task 18 Diagnoses and repairs ignition systems.

Task 19 Inspects, cleans, diagnoses, repairs and replaces fuel delivery components.

Task 20 Inspects, tests and repairs air induction systems, including turbochargers and intercoolers.

Task 21 Inspects and services diesel fuel systems.

Task 22 Inspects, services and repairs automatic transmissions/transaxles and components.

Task 23 Inspects, services and repairs clutches.

Task 24 Inspects, services and repairs manual transmission/transaxles.

Task 25 Inspects, services and repairs transfer cases.

Task 26 Inspects and repairs drive lines.

Task 27 Inspects and repairs components of front and rear differentials such as conventional and locking.

Task 28 Tests and replaces lead/acid storage batteries.

Task 29 Inspects and services electrical charging systems.

Task 30 Inspects and services starting systems.

Task 31 Tests and services body electrical systems.

Task 32 Inspects, tests and repairs heat, ventilation and air conditioning systems.

Task 33 Diagnoses and repairs occupant restraint systems.

Task 34 Inspects, tests and services braking systems.

Task 35 Inspects and repairs tires, wheels, steering linkage and adjusts wheel alignments.

Task 36 Inspects and services front and rear suspension systems.

Task 37 Inspects and repairs manual power steering gears.

Task 38 Inspects and repairs steering columns.

Task 39 Identifies problem area and repairs trim and body hardware.

Task 40 Installs and services accessories.

PROGRAM CONTENT

NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
TS-1510		Occupational Health & Safety	6		19
TS-1520		WHMIS	6		22
TS-1530		First Aid	14		25
SV-1100	MPO-0100	Safety in the Shop	15		26
SV-1110	ODS-0100	Ozone Depletion Substances	7	Completion of Block 4	27
SV-1125	AST-1120	Gaskets, Seals and Bearings	30	SV-1185	28
SV-1130	MPO-1125	Electrical and Electronic Principles	90	SV-1305	31
SV-1140	MPO-0120	Hydraulic Principles	25	SV-1195	34
SV-1155	AST-0285	Service Information Systems	20		36
SV-1165	AST-1290	Hand Tools	30	SV-1100	38
SV-1175	AST-1295	Shop Tools and Equipment	20	SV-1155; SV-1165; TS-1520	42
SV-1185	AST-1300	Fasteners, Tubing and Fittings	15	SV-1175	44
SV-1195	AST-1305	Lubrication and Fluids Servicing	25	SV-1125	46
SV-1215	AST-1310	Wheels and Tires	25	SV-1195	49
SV-1225	AST-1350	Manual Steering	10	Completion of Block 2	52
SV-1255	AST-1345	Suspension	45	SV-1215	53
SV-1285	AST-1395	Drive Lines	25		56
WD-1300	MPO-1115	Oxy-fuel Welding/Cutting	30	SV-1165	58
SV-1305	AST-1365	Engine Principles	60	SV-1195	60
SV-1315	AST-1370	Cooling Systems	30	SV-1305	63
SV-1375	AST-1330	Batteries	20	SV-1130	66
SV-1385	AST-1385	Starting Systems	30	SV-1375	69
SV-1395	AST-1390	Charging Systems	30	SV-1375	71
SV-1495	AST-1335	Lighting Systems	30	SV-1375	73
SV-1600	AST-1405	Ignition Systems	30	SV-1305; SV-1375	75
SV-1610	AST-1445	Steering Columns	15	SV-2160	77
SV-1625	AST-1360	Front-Wheel Drive	25		78
SV-1630	AST-1130	Hydraulic Brake Systems	75	SV-1140; SV-1215	79
SV-1640	AST-1320	Power Brake Systems	15	SV-1630	83
SV-1650	AST-1375	Fuel Delivery	30	SV-1130; SV-1305	84

NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
SV-1660	AST-1450	Intake and Air Filtration Systems	15	SV-1305	86
SV-1670	AST-1380	Exhaust Systems	15	SV-1305; TS-1510	87
SV-2011	AST-1500	On-Board Computer Diagnostics II (OBD-II)	30	SV-2015	88
SV-2015	AST-1495	On-Board Computer Diagnostics I (OBD-I)	75	Completion of Entry Level	90
SV-2020	AST-1355	Power Steering	25	SV-1225	93
SV-2030	AST-1505	Electronic Power Steering	15	SV-2020	95
SV-2040	AST-1455	Wheel Alignment	40	SV-2020	96
SV-2050	AST-1400	Engine Clutches	25	Completion of Block 3	97
SV-2060	AST-1415	Manual Transmissions and Trans-axles	40	Completion of Block 3	99
SV-2075	AST-1135	Automatic Transmissions and Trans-axles	90	Completion of Block 3	100
SV-2090	AST-1510	Electronic Transmission Controls	25	SV-2075	102
SV-2100	AST-1430	Transfer Cases and Hub Assemblies	25	Completion of Block 3	104
SV-2110	AST-1435	Differential and Axle Assemblies	25	Completion of Block 3	106
SV-2120	AST-1515	Anti-Locking Brake System and Traction Control	40	Completion of Block 2	108
SV-2130	AST-1325	Air Brake Systems	10	Completion of Block 2	111
SV-2144	AST-1140	Automotive Heating Systems	10	Completion of Block 4	113
SV-2145	AST-1145	Air Conditioning Systems	30	SV-2144	114
SV-2155	AST-1520	Power-Actuated Accessories	60	Completion of Block 2	117
SV-2160	AST-1525	Air Bag Systems	25	Completion of Block 2	119
SV-2170	AST-1460	Engine Diagnostics (Gasoline)	45	Completion of Block 4	121
SV-2180	AST-1340	Engine Removal and Installation	20	Completion of Block 4	123
SV-2220	AST-1530	Emission Control	45	SV-2235	125
SV-2235	AST-1535	Fuel Injection Systems	45	SV-2011	127
SV-2250	AST-1490	Alternative and Variable Fuels	15	Completion of Entry Level	129
SV-2260	AST-1555	Preventative Maintenance Inspections (PMI)	10		130
SV-2270	AST-1545	Provincial Government Inspections (MVI)	10	Completion of Block 3	132
SV-2280	AST-1550	Pre-Delivery Inspections (PDI)	10		133

NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
WD-2330	MPO-1110	GMAW Welding (MIG)	30	Completion of Entry Level	134
SV-2820	AST-1475	Diesel Engine Principles	30	Completion of Block 4	135
SV-2830	AST-1480	Diesel Engine Diagnostics	30	SV-2820	138
SV-2840	AST-1485	Diesel Engine Repair	8	SV-2820	140
SV-2900		Engine Rebuilding (Gasoline)	60	Completion of Block 4	141
*MA-1060		Basic Math	60		143
CM-2150		Workplace Communications	45		146
MR-1220		Customer Service	30		148
SP-2330		Quality Assurance/Quality Control	30		150
MC-1050		Introduction to Computers	30		152
SD-1700		Workplace Skills	30		156
SD-1710		Job Search Techniques	15		158
SD-1720		Entrepreneurial Awareness	15		160
Total Hours			**2061**		

PROGRAM STRUCTURE

Entry Level Courses					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
TS-1510		Occupational Health & Safety	6		19
TS-1520		WHMIS	6		22
TS-1530		First Aid	14		25
SV-1100	MPO-0100	Safety in the Shop	15		26
SV-1125	AST-1120	Gaskets, Seals and Bearings	30	SV-1185	28
SV-1130	MPO-1125	Electrical and Electronic Principles	90	SV-1305	31
SV-1140	MPO-0120	Hydraulic Principles	25	SV-1195	34
SV-1155	AST-0285	Service Information Systems	20		36
SV-1165	AST-1290	Hand Tools	30	SV-1100	38
SV-1175	AST-1295	Shop Tools and Equipment	20	SV-1155; SV-1165; TS-1520	42
SV-1185	AST-1300	Fasteners, Tubing and Fittings	15	SV-1175	44

Entry Level Courses					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
SV-1195	AST-1305	Lubrication and Fluids Servicing	25	SV-1125	46
SV-1215	AST-1310	Wheels and Tires	25	SV-1195	49
SV-1255	AST-1345	Suspension	45	SV-1215	53
SV-1285	AST-1395	Drive Lines	25		56
WD-1300	MPO-1115	Oxy-fuel Welding/Cutting	30	SV-1165	58
SV-1305	AST-1365	Engine Principles	60	SV-1195	60
SV-1315	AST-1370	Cooling Systems	30	SV-1305	63
SV-1375	AST-1330	Batteries	20	SV-1130	66
SV-1385	AST-1385	Starting Systems	30	SV-1375	69
SV-1395	AST-1390	Charging Systems	30	SV-1375	71
SV-1495	AST-1335	Lighting Systems	30	SV-1375	73
SV-1600	AST-1405	Ignition Systems	30	SV-1305; SV-1375	75
SV-1625	AST-1360	Front-Wheel Drive	25		78
SV-1630	AST-1130	Hydraulic Brake Systems	75	SV-1140; SV-1215	79
SV-1640	AST-1320	Power Brake Systems	15	SV-1630	83
SV-1650	AST-1375	Fuel Delivery	30	SV-1130; SV-1305	84
SV-1660	AST-1450	Intake and Air Filtration Systems	15	SV-1305	86
SV-1670	AST-1380	Exhaust Systems	15	SV-1305; TS-1510	87
SV-2260	AST-1555	Preventative Maintenance Inspections (PMI)	10		130
SV-2280	AST-1550	Pre-Delivery Inspections (PDI)	10		133
*MA-1060		Math	60		143
CM-2150		Workplace Communications	45		146
MR-1220		Customer Service	30		148
SP-2330		Quality Assurance/Quality Control	30		150
MC-1050		Introduction to Computers	30		152
SD-1700		Workplace Skills	30		156
SD-1710		Job Search Techniques	15		158
SD-1720		Entrepreneurial Awareness	15		160
Total Hours			**1101**		

REQUIRED WORK EXPERIENCE

Block #2					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
SV-2011	AST-1500	On-Board Computer Diagnostics II (OBD-II)	30	SV-2015	88
SV-2015	AST-1495	On-Board Computer Diagnostics I (OBD-I)	75	Completion of Entry Level	90
SV-2220	AST-1530	Emission Control	45	SV-2235	125
SV-2235	AST-1535	Fuel Injection Systems	45	SV-2011	127
SV-2250	AST-1490	Alternative and Variable Fuels	15	Completion of Entry Level	129
WD-2330	MPO-1110	GMAW Welding (MIG)	30	Completion of Entry Level	134
Total Hours			**240**		

REQUIRED WORK EXPERIENCE

Block #3					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
SV-1225	AST-1350	Manual Steering	10	Completion of Block 2	52
SV-1610	AST-1445	Steering Columns	15	SV-2160	77
SV-2020	AST-1355	Power Steering	25	SV-1225	93
SV-2030	AST-1505	Electronic Power Steering	15	SV-2020	95
SV-2040	AST-1455	Wheel Alignment	40	SV-2020	96
SV-2120	AST-1515	Anti-Locking Brake System and Traction Control	40	Completion of Block 2	108
SV-2130	AST-1325	Air Brake Systems	10	Completion of Block 2	111
SV-2155	AST-1520	Power-Actuated Accessories	60	Completion of Block 2	117
SV-2160	AST-1525	Air Bag Systems	25	Completion of Block 2	119
Total Hours			**240**		

REQUIRED WORK EXPERIENCE

Block #4					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
SV-2050	AST-1400	Engine Clutches	25	Completion of Block 3	97
SV-2060	AST-1415	Manual Transmissions and Trans-axles	40	Completion of Block 3	99
SV-2075	AST-1135	Automatic Transmissions and Trans-axles	90	Completion of Block 3	100
SV-2090	AST-1510	Electronic Transmission Controls	25	SV-2075	102
SV-2100	AST-1430	Transfer Cases and Hub Assemblies	25	Completion of Block 3	104
SV-2110	AST-1435	Differential and Axle Assemblies	25	Completion of Block 3	106
SV-2270	AST-1545	Provincial Government Inspections (MVI)	10	Completion of Block 3	132
Total Hours			**240**		

REQUIRED WORK EXPERIENCE

Block #5					
NL Course No.	**Atlantic Course No.**	**Course Name**	**Hours**	**Pre-Requisite**	**Page No.**
SV-1110	ODS-0100	Ozone Depletion Substances	7	Completion of Block 4	27
SV-2144	AST-1140	Automotive Heating Systems	10	Completion of Block 4	113
SV-2145	AST-1145	Air Conditioning Systems	30	SV-2144	114
SV-2170	AST-1460	Engine Diagnostics (Gasoline)	45	Completion of Block 4	121
SV-2180	AST-1340	Engine Removal and Installation	20	Completion of Block 4	123
SV-2820	AST-1475	Diesel Engine Principles	30	Completion of Block 4	135
SV-2830	AST-1480	Diesel Engine Diagnostics	30	SV-2820	138
SV-2840	AST-1485	Diesel Engine Repair	8	SV-2820	140
SV-2900		Engine Rebuilding (Gasoline)	60	Completion of Block 4	141
Total Hours			**240**		

*** A student who can meet the Mathematics requirement through an ACUPLACER online test may be exempted from Mathematics 1060.**

TS-1510 OCCUPATIONAL HEALTH AND SAFETY

Description:

This course is designed to give participants the knowledge and skills necessary to interpret the Occupational Health and Safety Act, laws and regulations; understand the designated responsibilities within the laws and regulations; the right to refuse dangerous work; and the importance of reporting accidents.

Course Outcomes:

Upon successful completion of this unit, the apprentice will be able to:
- prevent accidents and illnesses
- improve health and safety conditions in the workplace

Theory:

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 & 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 Industrial 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:

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

TS-1520 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Description:

This course is designed to give participants the knowledge and skills necessary to define WHMIS, examine hazard identification and ingredient disclosure, explain labeling and other forms of warning, and introduce material safety data sheets (MSDS).

Course Outcomes:

Upon successful completion of this course, the apprentice will be able to:

– interpret and apply the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health & Safety Act.

Required Knowledge and Skills:

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 form 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:

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

SUGGESTED RESOURCES:

1. WHMIS Regulation
2. Sample MSDS sheets

TS-1530 FIRST AID

Description:

This course is designed to give the apprentice the ability to recognize situations requiring emergency action and to make appropriate decisions concerning first aid.

Complete a **St. John Ambulance** Standard First Aid Certificate course.

SV-1100 SAFETY IN THE SHOP

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify various types of hazards in the shop and describe safe work habits.

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
     - – carbon monoxide
     - – ventilation
     - – storage and handling of batteries

2. Describe safe working habits.
   - i) avoiding personal hazards
   - ii) following good housekeeping practices
   - iii) reporting injuries

3. Identify workers rights regarding safety
   - i) Workers Compensation Act

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Locate exits, fire alarms.

2. Locate shop ventilation systems.

3. Prepare a floor plan showing fire exit routes.

SV-1110 OZONE-DEPLETION SUBSTANCES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to write an exam covering the regulation on ozone-depleting substances with a pass of 75%.

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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-1125 GASKETS, SEALS AND BEARINGS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to select, remove and install various types of bearings, gaskets, seals, and sealing compounds, and identify causes of failures.

Objectives and Content:

1. Identify and describe friction bearings.
   - i) definition
   - ii) location
   - iii) construction of precision insert bearings
     - backing materials
     - friction surface materials
     - thrust flange
     - spread
     - crush
     - locking devices
   - iv) sizes
     - standard
     - under size
   - v) construction of bushings
     - application
     - type of material
     - installation
     - sizing bushings to a shaft

2. Identify causes of friction bearing failure.
   - i) contamination
   - ii) insufficient lubrication
   - iii) improper installation
   - iv) misalignment
   - v) overloading
   - vi) corrosion

3. Describe procedures to remove and install friction bearings.
   - i) removing and installing
   - ii) measuring bearing oil clearance
   - iii) storing and handling

4. Identify and describe anti-friction bearings.
   - i) definition
   - ii) location

iii) types
- ball
- roller
- needle

iv) loading design
- radial
- thrust
- combination

v) identification methods

5. 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

6. 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

7. Identify and describe oil seals.
   i) function
   ii) classification
   - static
   - dynamic

   iii) types
   iv) materials
   v) construction

8. Identify causes of oil seal failure.

9. 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

10. Identify and describe gaskets.
    i) function
    ii) types
    iii) materials
    iv) making a gasket (methods)

11. Identify causes of gasket failure.

12. Describe procedures to remove and install gaskets.
    i) removing and installing
    ii) cleaning (knowing the importance of cleanliness)
    iii) torquing bolts

13. Identify and describe sealing compounds.
    i) types
    ii) purpose

14. Identify causes of sealing compound failure.

15. Describe procedures to select and use sealing compounds and the precautions to follow when using them.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove, service and install a tapered bearing

2. Remove, measure and install a friction bearing

3. Fabricate and install a gasket

4. Remove and replace a non-serviceable bearing

5. Remove and install an oil seal

6. Apply sealer as a gasket

SV-1130 ELECTRICAL AND ELECTRONIC PRINCIPLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to use instruments to test components of series, parallel and series-parallel circuits to determine cause of malfunctions in an electrical circuit.

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. Explain the use of instruments to test components of series, parallel and series-parallel circuits to determine cause of malfunctions in an electrical circuit.
   - i) circuit testing devices
     - meters
     - volt
     - ohm
     - current
     - duty cycle
     - frequency
     - pulse width
     - meter ranges
     - correct hook-up of meters
     - test lights

- circuit breakers

ii) circuit problems and testing problems
- short, open, ground, and high resistance
- diagnostic troubleshooting procedures
- testing procedures and equipment

4. Identify electronic components.

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

5. Describe the procedures used to replace electrical components.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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. Identify wires and terminals
   i) demonstrate back probing

5. Test electronic circuits

SV-1140 HYDRAULIC PRINCIPLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify hydraulic components and systems and their applications; interpret and use hydraulic symbols and diagrams; and identify safety practices when working around hydraulic fluid.

Objectives and Content:

1. Explain hydraulic principles in a shop environment.
   - i) definition of Pascal's law
   - ii) multiplication of force
   - iii) using formulas to calculate area, pressure, and force
   - iv) definition of Bernoulli's principle
   - v) advantages of hydraulic systems
   - vi) hydrodynamics
   - vii) hydrostatics
   - viii) properties of hydraulic fluid
     - viscosity
     - friction
     - flow
     - volume
     - laminar
     - turbulance
   - ix) pressure (metric, imperial)
     - pressure gauge
     - absolute pressure
   - x) force
   - xi) energy
   - xii) work
   - xiii) power
   - xiv) torque

2. Identify basic hydraulic components and systems and their applications.
   - i) pump
   - ii) hydraulic actuator (linear, rotary)
   - iii) pressure control valve
   - iv) directional control valve
   - v) flow control valve
   - vi) reservoir
   - vii) hoses

3. Identify symbols commonly used in hydraulic diagrams.

4. Explain how to interpret and use hydraulic symbols and diagrams.
   i) pictorial drawing
   ii) cut-away drawing
   iii) symbol drawing
   iv) exploded view

5. Identify safety practices when working around hydraulic fluids.
   i) support components which are statistically supported by hydraulic fluids before removal.
   ii) releasing system pressure

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-1155 SERVICE INFORMATION SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to select and use various types of service information systems.

Objectives and Content:

1. Explain how to use an operator's manual and how to interpret its sections.

2. Explain how to decode motor vehicle serial numbers for identification purposes through use of appropriate service manual.
   - i) make
   - ii) model
   - iii) year

3. Explain how to use paper and electronic copies of various other manuals.
   - i) maintenance and lubrication manual
   - ii) service manual
   - iii) parts manual
   - iv) special bulletins
     - purpose

4. 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) tracking
   - vi) electronic service

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Using manuals and several different vehicles, identify the model and year for each vehicle.

2. Using manuals, locate disc brake caliper removal and installation procedures.

3. Using appropriate service manual, locate information on removing and installing a clutch.

4. Use diagnostic charts to troubleshoot a tail light problem.

5. Use electronic data retrieval systems to locate service information.

SV-1165 HAND TOOLS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to select, use and maintain various cutting and non-cutting hand tools.

Objectives and Content:

1. Describe the procedures to select, use and maintain the following 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 and maintain the following 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 the following cutting and non-cutting hand tools.
   i) screwdrivers
   ii) chisels
   iii) screw starters
   iv) punches

4. Describe the procedures to select, use and maintain the following 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

5. Describe the procedures to select, use and maintain the following 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 blowguns

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Use hand tools for motorized equipment while working on different bench work projects.

2. Use precision measuring instruments

SV-1175 SHOP TOOLS AND EQUIPMENT

Outcomes:

Upon successful completion of this unit, the apprentice will be able to select, inspect, use and maintain shop tools and equipment.

Objectives and Content:

1. Describe the procedures to select, inspect, use and maintain the following 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

2. Describe the procedures to select, inspect, use and maintain the following shop tools.
   - i) air tools (pneumatic)
   - ii) electric tools
   - iii) torque multipliers

3. Describe procedures to select , inspect, use and maintain the following vehicle protective equipment.
   - i) seat covers
   - ii) fender covers
   - iii) floor mats

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Use hoist safely.

2. Raise vehicles by means of a floor jack and place on safety stands.

3. Use high pressure washer and/or parts cleaner to clean parts or components.

4. Prepare a shop equipment maintenance plan.

SV-1185 FASTENERS, TUBING AND FITTINGS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to select and use common fasteners, different types of tubing, hoses, fittings, and flaring tools.

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
            - capscrews
            - 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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Install compression fittings.

2. Cut, flare, bend and connect tubing.

SV-1195 LUBRICATION AND FLUIDS SERVICING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to change engine oil and filter, and lubricate a vehicle's chassis.

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

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.
   i) inspecting for oil leaks
   ii) checking engine oil pressure
   iii) checking oil level
   iv) operating and resetting engine monitoring system according to manufacturers 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

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Lubricate a chassis following the manufacturer's recommendations.

2. Change engine oil and filter(s).

SV-1215 WHEELS AND TIRES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to recognize tire, wheel and rim construction; inspect and service tires, wheels and rims; and perform wheel balancing.

Objectives and Content:

1. Describe tire construction.
   - i) radial
   - ii) bias-ply
   - iii) tube
   - iv) tubeless
   - v) tire size (low profile/aspect ratio)
   - vi) DOT coding
   - vii) load range (ply rating)
   - viii) tread design
   - ix) run-flat
   - x) temperature range
   - xi) speed rating
   - xii) unidirectional tires
   - xiii) tread wear

2. Identify causes of tire wear.
   - i) under inflation
   - ii) over inflation
   - iii) misalignment
   - iv) improper balance
   - v) improper load distribution
   - vi) ply steer / radial drag
   - vii) worn suspension

3. Describe procedures to inspect and service tires.
   - i) rotating
   - ii) deflating
   - iii) inspecting
   - iv) inflating
   - v) repairing a flat
     - – tubeless type tire
     - – tube type tire
   - vi) disposing of tire

4. Describe wheel/rim construction.
   - i) wheel/rim selection
     - p-metric
     - European
     - metric
   - ii) contours
   - iii) aluminum wheels/rims
   - iv) directional wheels/rims
   - v) temporary spares

5. Describe procedures to inspect and service wheels/rims.
   - i) following all occupational safety and health administration regulations and procedures pertaining to wheels
   - ii) removing wheel nuts/bolts from a vehicle
     - right hand threads
     - left hand threads
   - iii) deflating tire
   - iv) disassembling tire from wheel
   - v) inspecting
   - vi) cleaning and painting rim parts
   - vii) applying tire lubricant
   - viii) installing tire on wheel
   - ix) inflating tire
   - x) installing wheel
   - xi) lateral run-out
   - xii) radial run-out
   - xiii) dual tire matching

6. Explain the principles of wheel balancing.
   - i) static balance
   - ii) dynamic balance
   - iii) run-out
     - radial
     - lateral
   - iv) wheel weights
     - for steel wheels
     - for aluminum wheels
     - for magnesium wheels
   - v) effects of an out-of-balance wheel

7. Describe procedures to perform wheel balancing.
   - i) performing preliminary checks before balancing
   - ii) performing wheel balancing using the following methods:
     - spin balancing on vehicle (strobe light)
     - off the vehicle dynamic balancing
     - off the vehicle static balancing

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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

4. Balance a wheel and tire assembly

SV-1225 MANUAL STEERING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify types and components of steering gear, and apply procedures for the maintenance and repair of steering linkage.

Objectives and Content:

1. Identify and describe steering gears.
   - i) types
     - – cam and lever (identification only)
     - – worm and roller (identification only)
     - – recirculating ball
     - – rack and pinion
   - ii) operation
   - iii) ratio

2. Describe procedures to disassemble, assemble, test and adjust steering gears.
   - i) performing overhaul and adjustment procedures
   - ii) identifying problems
   - iii) testing
   - iv) performing failure analysis

3. Identify steering linkage components.

4. Explain steering geometry.

5. Describe procedures to disassemble, assemble, test and adjust steering linkages.
   - i) toe setting (without alignment machine)
   - ii) testing
   - iii) centering steering wheel
   - iv) performing linkage adjustments

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-1255 SUSPENSION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify suspension components and their purpose; remove, replace and/or adjust suspension components; and have basic understanding of the diagnoses and repair of computer-controlled active suspension systems.

Objectives and Content:

1. Identify and describe suspension systems and components and their purpose(s).
   - 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 shock absorbers and their purpose.

4. Describe procedures to remove and replace shock absorbers.
   - i) checking for serviceability
   - ii) removing and replacing

5. Identify types of stabilizer bars and their purpose.

6. Describe procedures to inspect, remove and replace stabilizer bars.

7. Identify types of ball joints and tie rod ends and their purpose.

8. Describe procedures to inspect, remove, replace and service ball joints and tie rod ends.

9. Identify types of struts and their purpose.

10. Describe procedures to inspect, remove, replace and service struts.

11. Identify types of coil springs and control arms and their purpose.

12. Describe procedures to inspect, remove, replace and service coil springs and control arms.

13. Identify types of leaf springs and their purpose.

14. Describe procedures to inspect, remove, replace and service leaf springs.

15. Identify types of torsion bars and their purpose.

16. Describe procedures to inspect, remove, replace and adjust torsion bars.

17. Identify types of air ride systems and their purpose.
    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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove and replace shock absorbers.

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

SV-1285 DRIVE LINES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of the major components of drive lines.

Objectives and Content:

1. Identify drive line 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

2. Describe procedures to remove, service and install drive shafts on rear drive vehicles.
   - i) removing
   - ii) rear-end torquing
   - iii) balancing (causes of unbalance and effects)
   - iv) phasing
   - v) installing

3. Describe procedures to service universal joints on rear drive vehicles.
   - i) inspecting
   - ii) lubricating

4. Describe procedures to check drive line angles on rear drive vehicles and explain the purpose of doing so.

5. Describe procedures to adjust drive line angles on rear drive vehicles.
   - i) transmission
   - ii) rear axle
   - iii) drive shaft

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform service on drive shafts on rear drive vehicles.

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.

WD-1300 OXY-FUEL WELDING/CUTTING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts, and perform braze welding and flame cutting using oxy-fuel equipment.

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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

SV-1305 ENGINE PRINCIPLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of all major parts of engines and their purpose.

Objectives and Content:

1. Explain engine operating theory.
   - i) matter
   - ii) mass
   - iii) energy
   - iv) inertia
   - v) force
   - vi) momentum
   - vii) torque
   - viii) work
   - ix) mechanical power
   - x) friction
   - xi) combustion
   - xii) atmospheric pressure
   - xiii) vacuum
   - xiv) laws of gases: Boyle's law, Charles' law

2. Explain engine principles and the operation of all major parts and their purpose within the engine.
   - i) principles of engine operation
     - stroke
     - bore
     - throw
     - top-dead centre
     - bottom-dead centre
     - valve timing (diagram)
     - firing order
     - compression ratio
     - volumetric efficiency
     - mechanical efficiency
     - reciprocating and rotating movement
     - piston displacement
     - clearance volume
     - total volume
     - scavenging
     - engine clutches
     - 2 strokes

- 4 strokes

ii) horsepower
- indicated HP
- friction HP
- flywheel or brake HP
- rated HP

iii) engine support system
- lubrication

iv) cylinder head
v) valves
vi) valve train
vii) camshaft
viii) cylinder block
ix) pistons
x) rings
xi) connecting rod
xii) crankshaft
xiii) bearings
xiv) lubrication pump
xv) oil cooler
xvi) water pump
xvii) flywheel
xviii) intake manifold
xix) exhaust manifold
xx) valve arrangements
xxi) in-line engine
xxii) V-engine
xxiii) overhead camshaft
xxiv) gasoline engine
xxv) diesel engine
xxvi) combustion chambers design
- open combustion
- pre-combustion
- turbulence combustion

3. Describe procedure to disassemble and assemble an engine, and to measure its dimensions.
   i) disassembling engine
   ii) assembling engine
   iii) measuring engine dimensions
   iv) following manufacturers' recommendations and specifications

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform a engine compression test.

2. Perform a engine vacuum test.

3. Remove and replace a timing belt

SV-1315 COOLING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the purpose and operation of all major parts of cooling systems.

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

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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose problems with a cooling system.

2. Drain and flush a coolant system

3. Mix, install and recycle antifreeze.

SV-1375 BATTERIES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose battery problems and service batteries.

Objectives and Content:

1. Explain the principles of batteries.
   - i) safety rules when working with batteries
   - ii) storage of batteries
   - iii) 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

2. Describe the procedures to remove and install batteries and battery cables.

3. Identify battery connections.
   - i) parallel circuits
   - ii) series circuits
   - iii) series-parallel circuits

4. Identify and explain the function of equipment used to perform battery tests.
   - i) hydrometer
   - ii) refractometer
   - iii) built-in hydrometer

5. 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

6. 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

7. Identify types of cable terminals and explain how to select the proper cable size.
   - i) types of cable terminals
   - ii) cable size selection

8. Describe procedures to replace battery cables and/or terminals.
   - i) fastening terminals to cable (soldered and crimped)
   - ii) installing corrosion inhibitor over terminals (importance)

9. 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

10. Describe procedures to start engines with a booster battery.

11. 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

12. Describe the procedure to diagnose battery problems (voltage drop test).

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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

SV-1385 STARTING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the purpose and operation of all major parts of the starting system.

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. Describe procedures to diagnose starting problems.
   - i) following safety procedures
   - ii) using test meters
     - ammeter
     - voltmeter
     - ohmmeter
   - 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

4. 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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose starting problems.

2. Repair/replace starting systems on vehicle

3. Remove and replace starter.

4. Perform a Starter test (internal).

SV-1395 CHARGING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to test and service charging systems and components and diagnose charging system problems.

Objectives and Content:

1. 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
     - 24 volt AC generator
     - 12/24 volt AC generator

2. 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

3. 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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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 alternator.

5. Alternator and regulator test (internal).

SV-1495 LIGHTING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of the major parts of the lighting systems and their purpose.

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
     - fuses and circuit breakers
     - fusible links and protected circuits
     - LED lighting
     - Fibre optic lighting
     - Gas discharge lighting
   - 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. Describe procedures to use test equipment to locate opens, shorts and grounds in lighting systems.

3. Describe procedures to replace various lighting components.

4. 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

5. Describe procedures to diagnose motor vehicle lighting system problems.
   i) using wiring diagrams
   ii) using wire and terminal connection

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Use test equipment to locate, opens, shorts and grounds in lighting systems.

2. Make repairs to lighting system; wiring harness, bulb replacement, fuses or circuit breakers using wiring diagrams to locate circuits and components of circuits.

3. Diagnose motor vehicle lighting systems.

4. Read Wiring Diagrams

5. Aim vehicle headlights.

SV-1600 IGNITION SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to test and service ignition systems and diagnose ignition system problems.

Objectives and Content:

1. 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
     - – reluctor
     - – control unit
     - – distributor assembly
     - – rotor
     - – coil

2. 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) spark plug/wires

3. Identify and describe spark plugs.
   - i) construction of spark plugs
   - ii) types
   - iii) heat range

4. Describe procedures to remove, service and install spark plugs.
   - i) removing
   - ii) inspecting
   - iii) gapping
   - iv) testing

v) installing/torquing

5. Describe procedures to diagnose the following ignition system problems on conventional and distributorless 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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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

SV-1610 STEERING COLUMNS

Outcomes:

Upon the successful completion of this unit, the apprentice will be able to describe the operation of all the major parts of the steering column.

Objectives and Content:

1. Describe the construction and functions of steering columns and their components.
   - i) steering columns and shafts
   - ii) air bags
   - iii) standard column
   - iv) tilt column
   - v) telescopic
   - vi) turn signal
   - vii) cruise
   - viii) ignition switch
   - ix) horn
   - x) dimmer
   - xi) lights
   - xii) radio
   - xiii) clock springs
   - xiv) steering locks

2. Describe procedures to remove, disassemble and reassemble steering columns and components.
   - i) disarming, removing, storing and installing air bags
   - ii) removing and replacing steering wheels
   - iii) removing and replacing clock springs
   - iv) servicing shaft and coupling
   - v) servicing energy absorbing steering columns
   - vi) removing and replacing steering locks

3. Describe procedures to identify problems with steering columns.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove, disassemble and reassemble a steering column.

SV-1625 FRONT-WHEEL DRIVE

Outcomes:

Upon the successful completion of this unit, the apprentice will be able to describe the operation of the major parts of a front-wheel drive system.

Objectives and Content:

1. Explain operation of the following front-wheel drive components.
   - i) axle retainers and shafts
   - ii) support bearing
   - iii) steering knuckles
   - iv) constant velocity joints
   - v) bearings and seals
   - vi) lubricants

2. Describe procedures to properly remove and install front-wheel drive components.
   - i) overhauling
   - ii) replacing

3. Describe the procedures to inspect, diagnose and service the following front-wheel drive components.
   - i) front drive axles
   - ii) support bearings
   - iii) steering knuckles
   - iv) constant velocity joints (drive axle joints) and boots
   - v) wheel bearings and seals (front drive axle)
   - vi) drive axle joint boots and clamps

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Disassemble, inspect, repair and assemble front wheel drive components.

2. Replace CV boot.

SV-1630 HYDRAULIC BRAKE SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to remove, repair or replace hydraulic brake systems and components.

Objectives and Content:

1. Explain the fundamentals of brake systems.
   - i) kinetic energy
   - ii) heat
   - iii) friction
   - iv) coefficient of friction
   - v) heat dissipation
   - vi) hydraulic principles (refresh)
   - vii) action of primary and secondary shoe
   - viii) servo brakes

2. Identify master cylinders and their components.
   - i) types
   - ii) parts
   - iii) types and function of hydraulic valves
     - proportional valve
     - metering valve
     - brake warning switch
     - combination valve
     - load proportioning valve

3. Describe procedures to remove, repair and replace master cylinders.
   - i) removing and installing
   - ii) cleaning
   - iii) repairing
   - iv) bleeding the master cylinder
   - v) adjusting brake pedal free play
   - vi) performing failure analysis

4. Identify drum type brakes and their components.
   - i) self-adjusting brakes
   - ii) hold-down springs
   - iii) return springs
   - iv) backing plates

5. Describe procedures to remove, repair and replace drum type brakes.
   - i) removing and installing brake drum
   - ii) removing brake shoes
     - – lining condition and wear
     - – brake shoe arc
     - – identification of primary and secondary shoe
   - iii) attaching lining to shoe
   - iv) lubricating
   - v) adjusting (minor and major adjustments)
   - vi) measuring drum for wear
   - vii) machining drum
   - viii) performing failure analysis

6. Identify wheel cylinders and their components.
   - i) types of wheel cylinders
   - ii) identification of parts

7. Describe procedures to remove, repair and replace wheel cylinders.
   - i) removing and installing
   - ii) inspecting
   - iii) cleaning
   - iv) repairing
   - v) bleeding the system
   - vi) performing failure analysis

8. Identify disc type brakes, their components and operating principles.
   - i) types
   - ii) component identification
   - iii) operating principles

9. Describe procedures to remove, repair and replace disc type brakes.
   - i) removing and installing brake disc
   - ii) inspecting
   - iii) removing and installing caliper
   - iv) reconditioning caliper
   - v) checking brake pads for wear and contamination
   - vi measuring disc wear
   - vii machining brake disc
   - viii performing failure analysis

10. Identify parking brakes and their application.
    - i) lever and fulcrum theory
    - ii) mechanical advantage
    - iii) application

iv) types and designs
- internal shoe
- caliper type
- drum lever type
- drive shaft type (at transmission)

v) parking brake lock mechanism

11. Describe procedures to remove, repair and replace parking brakes.
i) removing and installing
ii) adjusting
iii) performing failure analysis

12. Describe procedures to remove, repair and replace brake lines.
i) repairing and replacing
- brake lines
- fittings: joining and repairing lines
- brake line supports

ii) following safety rules

13. Identify and describe fluids used when bleeding brake systems.
i) types of fluids
ii) properties of fluids
iii) replacement of fluids

14. Describe the methods used to bleed brake systems.
i) pressure
ii) gravity
iii) scan tool usage

15. Describe procedures to diagnose hydraulic brake problems based on the following symptoms.
i) correct brake pedal operation
ii) one or more brakes drag
iii) all brakes drag
iv) vehicle pulls to one side
v) soft or spongy pedal
vi) poor braking action
vii) brakes too sensitive
viii) noisy brakes
ix) air in system
x) loss of brake fluid
xi) brakes do not self-adjust
xii) warning light comes on

16. Describe the procedures to verify brake job completion.

17. Identify safety issues related to components and operation of anti-locking brake systems (ABS).

18. Identify safety issues related to electric/hydraulic trailer brakes.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Inspect, test and repair drum brakes.

2. Inspect, test and repair disc brakes.

3. Inspect, test and repair master cylinder.

4. Machine drums and disc rotors.

SV-1640 POWER BRAKE SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to inspect power brake systems, diagnose problems with the systems and service and repair them.

Objectives and Content:

1. Describe the components and functions of power brake systems.
   - i) general purpose of power brake systems
   - ii) power boosters and theory of operation
     - vacuum operated
     - power steering pressure operated (hydro-boost)
     - electric pump operated
   - iii) power brake systems
     - troubleshoot problems
     - make adjustments
   - iv) vacuum pump
   - v) remote reservoir

2. Describe the procedures to diagnose problems in a power brake system.
   - i) performing failure analysis

3. Describe the procedures to service a power brake system.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Inspect, remove and diagnose power brake system components

SV-1650 FUEL DELIVERY

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of all major parts of the fuel system.

Objectives and Content:

1. Describe components used in fuel tank construction.
   - i) tanks
     - steel
     - plastic
     - aluminum
     - design
   - ii) filler tubes
     - vent pipes
     - flow back
   - iii) filler caps (pressure/vacuum type)
   - iv) pickup tubes
     - screen
     - return
   - v) sending units (types)
   - vi) fuel gauges
     - types
     - low fuel level sensor
   - vii) filtering
     - single stage
     - dual stage
   - viii) fuel lines and fittings
     - metallic
     - non-metallic
   - ix) fuel supply designs
     - return type
     - returnless

2. Describe the major characteristics and properties of fuels.
   - i) fuels
   - ii) gasoline
     - volatility
     - additives (ethanol, methanol)
     - ratings
     - combustion
     - contamination
   - iii) carburation

iv) principles
- atomization
- vaporization
- Venturi principle
- A/F ratios
- volumetric efficiency
- computer-controlled
- removal and replacement
- adjustments

v) safety precautions

3. Describe the operation and location of fuel delivery components.
   i) mechanical/electrical fuel pumps
   ii) electrical (control circuits)
   iii) reciprocating pump
   iv) rotary pump
   v) positive displacement pump

4. Describe procedures to replace pumps.

5. Describe procedures to pressure test and repair fuel systems.

6. Describe procedures to clean fuel delivery system.
   i) intake system;
   ii) fuel injector(s)

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Check fuel system delivery and operation while observing safety precautions

2. Pressure test and repair fuel systems.

3. Perform fuel injection cleaning

SV-1660 INTAKE AND AIR FILTRATION SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation and purpose of all major parts of the intake and air filtration systems.

Objectives and Content:

1. Identify and describe air filters.
   - i) principles
   - ii) types: oil bath, paper or dry type, polyurethane

2. Describe the operating principles of intake manifolds.
   - i) cold air
   - ii) hot air
   - iii) control
   - iv) distribution
   - v) tuning
   - vi) variable induction

3. Identify and describe turbochargers and superchargers, their operation and use.

4. Describe induction systems and their relationship to turbochargers and superchargers.

5. Describe the operating principles and characteristics of intake and air charge systems and their components.
   - i) design
   - ii) intercoolers
   - iii) volumetric efficiency

6. Describe the procedure to test and service components of intake and air filtration systems.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Inspect, test and repair intake system components

SV-1670 EXHAUST SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of all major parts of the exhaust system and their purpose.

Objectives and Content:

1. 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)

2. Describe the procedures to service components of exhaust systems.
   - i) selecting and using proper tools
   - ii) aligning
   - iii) using sealers
   - iv) removing and replacing
   - v) checking system for leaks and/or restrictions
   - vi) following safety precautions (carbon monoxide)

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Inspect, test and replace exhaust system and related components.

SV-2011 ON-BOARD COMPUTER DIAGNOSTICS II (OBD-II)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the various components of OBD-II systems and explain the logical approach to proper diagnostics.

Objectives and Content:

1. Describe diagnostic procedures for OBD-II systems.
    - i) comparison between OBD-I and OBD-II
    - ii) diagnostic self-testing
        - types
            - passive
            - active
            - intrusive
        - monitors
            - drive cycles
        - recording test results
    - iii) test fail actions (what happens if a test fails)
    - iv) Diagnostic Trouble Code (DTC)
        - identification
        - types
        - pass/fail reporting
        - conditions to set and conditions to clear DTC's
    - v) HO_2S (Heating Oxygen Sensor) and catalyst diagnostics
    - vi) misfire detection
        - misfiring causing more than 1½ times acceptable emissions
        - catalyst-damaging misfire
        - rough road detection (software approach, ABS approach)
    - vii) input monitoring
    - viii) output monitoring
        - idle speed
        - fuel trim
        - EGR (Exhaust Gas Recirculation)
    - ix) EVAP system diagnostics
        - non-enhanced systems
        - enhanced systems

2. Describe repair procedures for OBD-II systems including PCM re-programming.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose and repair OBD II systems

SV-2015 ON-BOARD COMPUTER DIAGNOSTICS I (OBD-I)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of all major components related to OBD-I.

Objectives and Content:

1. Explain the basics of computers.
   - i) rational reasons for using electronic controls
     - accuracy
     - better control of emissions
   - ii) computer systems
     - inputs - information to the computer
     - outputs - commands from the computer
   - iii) computer operation
     - CPU basics
     - memory types - RAM, ROM, PROM, EEPROM, KAM
     - computer wiring, feeds and grounds
   - iv) input circuits
     - discreet
     - analogue
     - one, two and three wire sensors
   - v) output circuits
     - positive and negative voltage control
     - pulse width modulation (PWM)
     - current limiting circuits (protection)
   - vi) sensing devices
     - switches
     - thermistors
     - potentiometers
     - pressure sensors
     - permanent magnet (PM) generators
     - hall effect switches
     - light emitting diode operated
     - knock sensors
   - vii) feedback operation
     - open loop
     - closed loop
     - oxygen sensors (O_2)
   - viii) adaptive learning
     - purpose
     - short term / long term

ix) output systems
- solenoids – on/off and PWM
- relays
- lights
- stepper motors
- by-directional communications

2. Identify components of on-board diagnostic systems that serve to identify and diagnose problems in vehicle systems.
   i) warning lights
      - oil pressure
      - charge indicator
      - engine overheat
      - service engine soon
      - check engine (MIL according to SAE J-1930)
      - air bag (SIR – Supplemental Inflatable Restraint)
      - ABS and TCS
      - service engine other than MIL (e.g., throttle system problems with electronic fuel injection pumps)
   ii) trouble codes (accessing codes)
   iii) grounding connectors
   iv) key cycles
   v) control button combinations
   vi) read-out devices
   vii) voltmeters, MIL, digital dashes
   viii) scan tools
   ix) sensors

3. Explain how on-board diagnostic systems serve to identify and diagnose problems in vehicle systems.
   i) means of checking light systems
      - bulb check position when turning ignition or run key to start
      - normal operation of light key-on with engine not running and with engine running
   ii) means of checking circuit operation
      - pressure switches
      - temperature switches
      - voltage differences (charge indicator)
      - solid state switches (modules or computers)
      - driver circuits
   iii) means of diagnosing light system problems (circuit checks)
      - load power source
      - ground (what completes circuit?)
      - computer circuits or voltage drop

iv) other means of diagnosing system problems
- scan tool data, sensor data, system status, history codes
- operating modes commanded by scan tool or diagnostic key
- operation of individual components
- system tests
- tests performed by vehicle computer

4. Describe service procedures.
   i) using shop manuals, step charts or diagnostic routines, specifications, and circuit operating modes
   ii) verifying repairs

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Demonstrate ability to use diagnostic tools.

2. Access trouble codes and analyze information received.

3. Interpret service manuals for wiring diagrams, flow charts and trouble shooting guides.

SV-2020 POWER STEERING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to apply proper procedures to diagnose, maintain and repair/replace power steering components.

Objectives and Content:

1. Identify and describe power steering components and their functions.
   - i) valves
   - ii) pumps
   - iii) steering boxes
   - iv) hoses
   - v) switches

2. Identify and describe power steering gear assemblies.
   - i) gear type integral
   - ii) linkage
   - iii) rack and pinion
   - iv) fluids and adjustments
   - v) hydraulic principles
   - vi) control valves

3. Describe procedures to remove, disassemble, assemble and adjust power steering gear assembly.
   - i) removing and installing
   - ii) inspecting, testing and repairing
   - iii) performing failure analysis

4. Identify and describe power steering pumps.
   - i) types
   - ii) drives

5. Describe procedures to remove, disassemble, assemble power steering pumps.
   - i) removing and installing
   - ii) inspecting, testing and repairing
   - iii) performing failure analysis

6. Describe procedures to diagnose power steering system problems.
   - i) checking for leaks
   - ii) testing pressure flow
   - iii) performing noise diagnosis
   - iv) performing failure analysis

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove and install a steering gear assemble

2. Disassemble, assemble and adjust a power steering gear box assembly.

3. Disassemble and assemble a power steering pump.

4. Diagnose power steering systems.

SV-2030 ELECTRONIC POWER STEERING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the function of various electronic power steering components and describe procedures to diagnose, service and/or replace electronic power steering systems.

Objectives and Content:

1. Identify electronic power steering components and their functions, and explain their principles of operation.
   - i) components
   - ii) principles of operation
     - – 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

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-2040 WHEEL ALIGNMENT

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe procedures to diagnose wheel alignment problems and to describe procedures to properly perform wheel alignment.

Objectives and Content:

1. Define wheel alignment terminology.
   - i) caster
   - ii) camber
   - iii) steering axis inclination
   - iv) included angle
   - v) toe-in
   - vi) tracking
   - vii) positive and negative scrub radius
   - viii) setback

2. Describe service manual procedures to pre-inspect vehicles for wheel alignment.

3. Identify and explain various alignment procedures.
   - i) shim pack
   - ii) eccentric
   - iii) slotted adjustment
   - iv) thread adjustment

4. Explain how to identify alignment problems.
   - i) tire wear
   - ii) handling problems

5. Describe procedures to perform two-wheel and four-wheel alignment.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Pre-inspect vehicle for wheel alignment.

2. Perform a four wheel alignment.

SV-2050 ENGINE CLUTCHES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of the major components of clutches.

Objectives and Content:

1. Identify engine clutch components and their functions.
   - i) clutch disc
     - facings
     - cushioning device
     - torsional device
   - ii) pressure plate assembly
     - types
     - coil spacing
     - semi-centrifugal
     - diaphragm spacing
   - iii) clutch release bearing and fork (types)
   - iv) clutch housing and clutch shaft
   - v) clutch linkage and pedal
     - types
       - mechanical
       - hydraulic
     - master and slave cylinders
     - adjustments (bleeding)

2. Explain the principles of operation of engine clutch components and safety concerns associated with them.
   - i) pressure plate assembly
   - ii) pilot bearings and bushings
   - iii) face (condition - refacing)
   - iv) flywheel and ring gear

3. Describe the procedures to diagnose the following clutch faults and how to make adjustments for proper operation.
   - i) chatter
   - ii) slippage
   - iii) noises
   - iv) transmission alignment
   - v) transmission mount condition

4. Describe the procedures to remove and replace engine clutch components.
   i) clutch release bearing and fork
   ii) transmission

NOTE: To service and repair clutches, some vehicles require that the engine be removed. Use service manual for vehicle being repaired.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose and adjust a clutch for proper operation.

2. Remove, check, reinstall and adjust a clutch assembly in a rear wheel drive or front wheel drive vehicle (transaxle or transmission removal only).

3. Perform a flywheel run-out check

SV-2060 MANUAL TRANSMISSIONS AND TRANS-AXLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose problems relating to manual transmissions, and service and overhaul manual transmissions.

Objectives and Content:

1. Identify and describe components of manual transmissions and trans-axles.
   - i) gears
     - – gear terminology
     - – gear mounting
     - – gear ratios
     - – gear selection
   - ii) transmissions and trans-axles
     - – types
     - – synchromesh
   - iii) synchronizers
   - iv) detent and interlock
   - v) trans-axle final drive
   - vi) shifting mechanisms
   - vii) lubricants
   - viii) seals and sealants

2. Explain the basic operation of manual transmissions and trans-axles.

3. Describe procedures to service manual transmissions and trans-axles.
   - i) using special tools
   - ii) diagnosing transmission/trans-axle problems and causes
   - iii) servicing transmissions and trans-axles
   - iv) overhauling procedures
   - v) disassembling and reassembling transmissions and trans-axles

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Service manual transmissions and transaxles.

2. Disassemble, inspect, repair, assemble and make adjustments to a manual transmission and or a manual transaxle.

SV-2075 AUTOMATIC TRANSMISSIONS AND TRANS-AXLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the operation of the major parts of automatic transmissions and trans-axles, and diagnose problems related to automatic transmissions.

Objectives and Content:

1. Identify and describe components (types, design and materials) of automatic transmissions and trans-axles.
   - i) planetary gear sets
   - ii) oil pumps
   - iii) pressure regulator valves
   - iv) servos
   - v) bands
   - vi) clutches
   - vii) spool valves
   - viii) balance valves
   - ix) manual control valves
   - x) shifter valves
   - xi) governors
   - xii) throttle valves
   - xiii) accumulators
   - xiv) valve body
   - xv) up shift valves/downshift valves
   - xvi) torque converters (construction)

2. Explain the principles of operation of automatic transmissions and trans-axles.
   - i) torque converters
   - ii) transmission cooling and lubrication
   - iii) power flow
   - iv) multiple speed
   - v) manual control mechanisms
   - vi) final drive

3. Describe the procedures to diagnose problems in automatic transmissions and trans-axles.
   - i) pressure test
   - ii) problem diagnosis
   - iii) road test

4. Describe procedures to repair automatic transmissions and trans-axles using the manufacturer's manual.

5. Describe procedures to maintain automatic transmissions and trans-axles.
   - i) selecting fluids
   - ii) checking fluids
     - – level
     - – cleanliness
     - – factors affecting life of fluids
   - iii) changing fluids and filters
   - iv) replacing external gaskets and seals
   - v) adjusting band
   - vi) adjusting throttle and shift linkage

6. Describe the procedures to remove and install automatic transmissions and trans-axles and components.
   - i) changing electrical components
   - ii) removing, checking and replacing torque converters
   - iii) removing and installing automatic transmissions and trans-axles

7. Identify towing and pushing precautions to follow when removing and installing automatic transmissions and trans-axles.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform maintenance service on automatic transmissions and transaxles as it is recommended by the vehicle manufacturer.
   - i) change fluid and filters
   - ii) adjust bands
   - iii) inspect for leaks

2. Diagnose problems in automatic transmissions and/or transaxles.

3. Remove and install automatic transmission/transaxles

4. Dismantle, inspect, repair and assemble automatic transmissions and/or transaxles

5. Perform a transmission pressure test

6. Flush a torque converter and transmission cooling system

SV-2090 ELECTRONIC TRANSMISSION CONTROLS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose problems relating to electronic transmission control systems, and service and repair electronic transmission control systems.

Objectives and Content:

1. Describe the components and functions of electronic transmission controls.
   - i) electronic transmission controls
     - computer systems used with automatic transmissions
     - components controlled by computer
     - computers used: dedicated computer, PCM (Powertrain Control Module), etc.
     - computer inputs
     - computer outputs
     - solenoids (state change)
     - P.W.M. (Pulse Width Modulated) solenoids and force motors
   - ii) hydraulic components used with computer controls
     - hydraulic versus electronic gear selection
     - shift valves
     - converter control circuits
     - pressure control circuits

2. Describe procedures to diagnose, and repair or replace transmissions electronic control systems.
   - i) diagnosing problems
     - diagnostic strategy
     - use of self-diagnostics
     - use of scan tool
     - road testing and use of check charts
     - failure modes
     - pressure tests
   - ii) repairing and adjusting
     - wiring repairs
     - clearing of trouble codes
     - clearing or resetting of adaptive memory after repairs
     - reprogramming
   - iii) replacing transmission components

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose and repair transmissions with electronic control systems.

SV-2100 TRANSFER CASES AND HUB ASSEMBLIES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose problems relating to transfer cases and hub assemblies, and service and repair transfer cases and hub assemblies.

Objectives and Content:

1. Identify and describe components of transfer cases, hub assemblies, and locking axles, and explain their function.
   - i) types of transfer cases
     - part-time four-wheel drive
     - full-time four-wheel drive
     - electronic controlled shift
     - all-wheel drive systems
   - ii) types of hub accessories
     - manual
     - automatic
   - iii) types of locking axels
     - manual operated
     - vacuum operated
     - electrically operated

2. Describe procedures to diagnose problems in a transfer case.
   - i) check lubricants
     - levels
     - quality

3. Describe procedures to service various types of front hub assemblies and locking axle systems on four-wheel drive vehicles.
   - i) automatic locking type
   - ii) manual locking type
   - iii) axle locking type

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose problems in a transfer case

2. Remove, inspect, repair, assemble and reinstall a transfer case assembly

3. Service front hub assemble on four wheel drive vehicles.

SV-2110 DIFFERENTIAL AND AXLE ASSEMBLIES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose problems relating to differential and axle assemblies; service and repair differential and axle assemblies; and overhaul differential and axle assemblies.

Objectives and Content:

1. Identify and describe differential assemblies and explain their operating principles.
   - i) differential (standard)
     - types (removable and integral carrier)
     - components
     - adjustments
     - lubrication
     - gear ratio
     - theory of operation: operating principles
   - ii) differential (limited slip/locking)
     - types
     - adjustments
     - lubrication
     - theory of operation: operating principles

2. Describe procedures to evaluate the condition of a differential to determine its serviceability.
   - i) diagnose noise origins

3. Describe procedures to service a differential assembly.
   - i) removing and replacing assembly
   - ii) replacing pinion seal

4. Describe procedures for overhauling a differential assembly.

5. 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

6. Describe procedures for servicing axles, bearings and seals.
   i) attaching axle in the housing
      - C-locks
      - axle retainer plate
   ii) measuring and adjusting axle end play

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove, inspect, repair and assemble a differential assembly.

SV-2120 ANTI-LOCKING BRAKE SYSTEM AND TRACTION CONTROL

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe diagnose ABS or traction control systems, and service and repair ABS or traction control systems.

Objectives and Content:

1. Describe components and functions of ABS and traction control systems.
   - i) computer
   - ii) hydraulic modulator
   - iii) wheel speed input
   - iv) sensor circuit
   - v) hydraulic channels
   - vi) automatic stability control

2. Describe operating principles and safety concerns of ABS and traction control systems.
   - i) safety concerns
   - ii) benefits and limitations of ABS
     - coefficient of friction: tire to road
     - maximum braking versus maximum steering
     - ABS stopping ability with different surfaces
     - operating modes of a brake system: apply, hold, release
     - cycling speeds of ABS
     - driver perception of ABS
     - construction of basic system: integral or add-on

3. Describe system variations.
   - i) types of wheel speed calculation (wheel speed averaging)
   - ii) hydraulic outputs
     - front/rear split
     - diagonal split
     - individual control
     - system control
       - computers
       - sensors
   - iii) computer EBCM (electronic brake control module) feeds and grounds
   - iv) computer inputs (wheel speeds, or vehicle speed)
     - brake switch
     - 4-wheel drive position
     - modulator inputs to EBCM
     - diagnostic request

v) computer outputs
   - hydraulic modulator
   - ABS warning lights
   - diagnostic output

vi) wheel speed sensor construction
   - operating frequency
   - mounting methods and air gaps

4. Describe hydraulic modulator construction.
   i) integral system
   ii) add-on

5. Describe system self-diagnostics.
   i) self-checks on start-up
   ii) continuous monitoring
   iii) failure modes and actions
   iv) trouble codes
   v) wheel speed sensor diagnostics
      - vehicle moving
      - vehicle not moving

6. Describe diagnostic procedures: logical approach to problem solving.

7. Describe procedures to distinguish between what is normal and what is not.
   i) mechanical condition of brake system
   ii) system cut-out speeds (no ABS below a pre-determined speed)
   iii) causes of brake grabbing or lock-up at low speed (a non-ABS problem)

8. Describe service procedures for a hydraulic system.
   i) checking brake fluid levels
   ii) bleeding brakes
   iii) selecting acceptable brake fluid type
   iv) brake fluid flushes
   v) checking for leaks

9. Describe precautions when performing non-ABS service.
   i) replacing wheel studs
   ii) using top quality parts
   iii) following electric welding precautions
   iv) replacing tires (air pressure)

10. Describe procedures to service or repair speed sensor circuits.
   i) replacing or adjusting sensors
   ii) repairing speed sensor wiring (repairs and locations)
   iii) reprogramming and changing speed sensor buffer (DRAC) (changes to accommodate different tire sizes on trucks)

iv) replacing speed sensor components on non-serviceable type wheel bearings

11. Identify components used with traction controls.
    i) manual controls
    ii) indicator lights
    iii) separate hydraulic actuators

12. Describe methods of achieving traction control (reduction of positive wheel slip).
    i) selective application of brakes on spinning drive wheels
    ii) throttle control
    iii) torque reduction; timing retard; fuel cutback or cut-off
    iv) operating speeds

13. Describe procedures to diagnose and repair ABS/traction control systems on light duty motor vehicles.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Check wheel speed sensor output.

2. Connect a scan tool and check system for codes and read data.

3. Perform resistance checks on system components.

4. Perform bleeding procedures for a 4-wheel ABS system.

5. Replace ABS components.

SV-2130 AIR BRAKE SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to test, service and diagnose air brake systems and components.

Objectives and Content:

1. Describe the operating principles of air brake components.
   - i) air compressors
   - ii) reservoirs
   - iii) valves
   - iv) brake chambers
   - v) brake shoes
   - vi) brake drums
   - vii) indicators and safety devices
   - viii) air lines and fittings
   - ix) brake slack adjusters
   - x) air dryers

2. Describe the procedures to test, remove, service, and replace the following air brake components.
   - i) air compressors
   - ii) air lines and fittings
   - iii) reservoirs
   - iv) valves
   - v) brake chambers
   - vi) brake shoes
   - vii) brake drums
   - viii) brake slack adjusters
   - ix) indicators and safety devices
   - x) air dryers

3. Describe the procedures to diagnose the following air brake problems.
   - i) reservoir leaking or water accumulation
   - ii) low or high air pressure
   - iii) water frozen in air lines
   - iv) brake cam and bushing wear
   - v) poor braking performance
   - vi) brake lag

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-2144 AUTOMOTIVE HEATING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe procedures to inspect, diagnose, service, and repair components of the auto heating system.

Objectives and Content:

1. Identify automotive heating system components and explain their purpose and operating principles.
   - i) components
   - ii) operating principles
   - iii) methods of temperature control
     - – solenoid controlled valves
     - – manual controlled valves
     - – vacuum controlled valves
     - – blend door control

2. Describe procedures to diagnose and correct problems with the following heating system components.
   - i) controls – vacuum, manual, and electronic
   - ii) hoses (carrying heated coolant)
   - iii) heater core (blockage)
   - iv) blend doors
   - v) inlet air filters (ventilation)

3. Describe procedures to diagnose the following heating system problems.
   - i) lack of heat
   - ii) excessive heat
   - iii) coolant (hot) leaks

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Check operation of heater and vent controls

2. Flush a heater core and check water flow

SV-2145 AIR CONDITIONING SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe procedures to inspect, diagnose, service, and repair air conditioning systems.

Objectives and Content:

1. Identify and describe the principles of refrigeration.
   - i) process of heat transfer
     - convection
     - radiation
     - evaporation
   - ii) states of matter (structure)
     - solid
     - liquid
     - gas
   - iii) measurement of heat
     - latent heat
     - specific heat
   - iv) pressure
     - atmospheric pressure
     - pressure measurement
     - temperature and pressure
   - v) process of refrigeration
     - heat flow
     - heat absorption
     - pressure and boiling points
   - vi) ton of refrigeration/BTU per hour

2. Identify automotive air conditioning system components, and explain their purpose and operating principles.
   - i) refrigerants
     - handling safety
     - R-12, R-134 and blends
     - temperature/pressure relationship
     - environmental concerns
   - ii) air conditioning system types
     - cycling clutch/orifice tube
     - variable displacement/orifice tube
     - cycling clutch/thermostatic expansion valve
     - variable displacement/thermostatic expansion valve

iii) air conditioning controls
- manual control systems
- components of manual control systems
- automatic temperature control systems
- components of auto temperature air conditioning systems

iv) basic refrigeration circuit
- basic circuit
- evaporator
- compressor
- condenser
- metering devices
  - orifice tubes
  - expansion valves
- receiver/dryer
- accumulator/dryer

v) compressors
- fixed displacement compressors
- variable displacement compressors

3. Describe procedures to diagnose problems with automotive air conditioning systems.

i) diagnosing air conditioning system problems
- function test
- performance test
- gauge and manifold sets

ii) identifying objectionable odors in air conditioning systems
- cause of odor
- removal of biological cause
- after blow systems for automotive air conditioning fan

4. Describe procedures to service automotive air conditioning systems.

i) servicing air conditioning systems
- controls
- hoses
- wiring

ii) servicing refrigerant systems
- refrigerant recovery and recycling
- system evacuation and leak testing
- recharging
- component replacement
- installing filters in contaminated refrigerant systems
- refrigerant oils

iii) servicing compressors – without discharge
- clutch repairs
- pulley bearing replacement

iv) servicing compressors – system discharge

- shaft seal replacement
- switch replacements
- control valve and pressure relief valve replacement

5. Describe procedures to convert air conditioning systems from R-12 refrigerant to R-134 or other accepted refrigerants.
   i) identifying factors affecting type of conversion needed
   ii) proceeding with basic conversion

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Diagnose and correct problems with automotive air conditioning systems

2. Recover, recycle, vacuum and recharge an A/C system.

3. Service the clutch on an A/C compressor.

SV-2155 POWER-ACTUATED ACCESSORIES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify power-actuated accessories, diagnose problems with power-actuated accessories, and service and repair power-actuated accessories

Objectives and Content:

1. Describe operation of power-actuated accessories.
   - i) power antenna
   - ii) convertible top
   - iii) cruise control (speed)
     - vacuum-operated
     - electronically operated
   - iv) power windows
   - v) power seats
   - vi) sun roof (moon)
   - vii) trailer brake hook-up
   - viii) power door locks
   - ix) power trunk opener and closer
   - x) power mirrors
   - xi) heated mirrors and windows
   - xii) RAP (retained accessory power) systems (memory)
   - xiii) remote control for locks, etc.
   - xiv) battery protection systems: timer disconnects
   - xv) comfort and convenience items
     - radio and antennas
     - cigarette lighter
     - 12-volt power outlets (acc)
   - xvi) theft deterrent systems
     - types
     - operation
   - xvii) seat belt systems
   - xviii) windshield wipers
   - xix) remote starter
   - xx) parking aid
   - xxi) cruise control

2. Describe the procedures to service power-actuated accessories.
   - i) reviewing diagnostic strategy
   - ii) verifying customer concerns
   - iii) performing preliminary checks
   - iv) using published diagnostic system checks

v) checking for service bulletins
vi) using trouble code diagnostics if codes are present
vii) using system diagnosis
viii) using diagnostics suitable for intermittent problems
ix) verifying repair

3. Describe procedures used to service power actuated accessories controlled by the following.
   i) solenoids
   ii) series-wound motors
   iii) permanent magnet (PM) motors
   iv) pneumatic controlled

4. Describe procedures to diagnose and repair problems associated with wind, water, and dust leaks, as well as rattles.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Locate feeds and grounds, and all components used in a power window or power door lock system.

2. Perform diagnostic tests on a power door lock or power window system.

3. Diagnosis power actuated accessories system failure

SV-2160 AIR BAG SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify, test, diagnose and repair air bag systems and their components.

Objectives and Content:

1. Describe SIR (Supplementary Inflatable Restraint) system design, operation and components.
   - i) system design and operation
     - system design
       - SDM (sensing and diagnostic module) systems
       - DERM (diagnostic energy reserve module) systems
       - difference between DERM and SDM systems
       - active and passive
     - occupant protection in a crash
     - system operation
   - ii) system components
     - inflator module
     - SIR clock spring (coil in steering wheel)
     - warning lamp
     - arming sensors
     - discriminating sensors
     - wiring harness
     - shorting devices
     - side impact (SIR)
     - seatbelt retractors

2. Describe procedures to service SIR systems.
   - i) disabling the SIR
   - ii) enabling (connecting) the SIR as per OEM manual
   - iii) following precautions when windshields are replaced
   - iv) handling components (precautions)
   - v) electrostatic discharge (ESD) – static electricity (precautions)
   - vi) using special tools for SIR service
   - vii) performing wiring repairs
   - viii) disposing of inflator module (air bag) and scrapping vehicle
   - ix) inspecting components after a crash
     - steering column dimension check
   - x) replacing sensors

3. Describe procedures to diagnose SIR system problems.
   - i) performing SIR diagnostic check
     - trouble codes
     - scan tool use
   - ii) interpreting service information

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Deactivate and reactivate an SIR system

2. Remove and replace an airbag

3. Perform a SIR diagnostic check

4. Diagnose an SIR system failure

SV-2170 ENGINE DIAGNOSTICS (GASOLINE)

Outcomes:

Upon the successful completion of this unit, the apprentice will be able to diagnose problems when engines fail to perform properly, understand symptoms, and follow procedures to isolate problems.

Objectives and Content:

1. Describe procedures to diagnose the following problems and replace components when gasoline engines fail to perform properly.
   - i) oil consumption
   - ii) coolant consumption
   - iii) oil contamination
   - iv) coolant contamination
   - v) oil pressure
     - – low
     - – high
   - vi) cooling/heating problems
   - vii) engine noise
   - viii) valve timing
   - ix) vacuum leaks

2. Identify testing equipment used to diagnose problems when gasoline engines fail to perform properly
   - i) positive and negative pressure testing gauge
   - ii) compression gauge
   - iii) leak down tests
   - iv) stethoscope
   - v) engine analyzer
   - vi) exhaust gas analyzer
   - vii) scan tool
   - viii) multimeters
   - ix) noid light
   - x) temperature sensing tools
   - xi) using dyes to find leaks

3. Describe procedures to diagnose gasoline engine problems based on the following symptoms.
   - i) engine will not crank
   - ii) engine cranks slowly, but will not start
   - iii) engine cranks normally, but will not start
   - iv) engine starts, but will not continue to run at idle
   - v) engine starts, idles rough without abnormal smoke or noise

vi) engine starts, idles rough with abnormal smoke and noise
vii) engine misfires above idle, but idles correctly
viii) engine will not return to idle
ix) fuel leaks on ground, engine runs normally
x) noticeable loss of power
xi) noise or rap from one or more cylinders
xii) above normal combustion noise with excessive black smoke
xiii) engine noise
xiv) engine overheats/underheats
xv) instrument panel oil warning light on at idle
xvi) engine will not shut off with key
xvii) combustion gas leakage

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Check cylinder compression.

2. Check engine oil pressure.

3. Perform engine diagnostics using specialized equipment.

4. Perform a cylinder leak down test.

5. Perform a engine vacuum test.

SV-2180 ENGINE REMOVAL AND INSTALLATION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to remove and reinstall engines to manufacturer's specifications and inspect parts for wear.

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) checking linkage operation
   - vi) following manufacturer's recommendations

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Remove engines from a vehicle, following manufacturers recommended procedures.

2. Install engines in vehicles using manufacturers recommended procedures.

3. Start and run engine.

SV-2220 EMISSION CONTROL

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify, test, remove, service and replace emission control systems or components.

Objectives and Content:

1. Identify and describe the components and their operating principles in an emission control system.
   - i) crankcase (ventilation)
     - positive
     - opened and closed
   - ii) air injectors
     - secondary
     - pulsed secondary
   - iii) catalytic converters (types and functions)
     - pellet type
     - monolithic type
     - 2-way
     - 3-way
     - gases produced
   - iv) EGR (exhaust gas recirculation)
     - positive back pressure valve
     - negative back pressure valve
     - delta back pressure valve
     - port gas recirculation valve
     - digital
     - linear
   - v) EVAP system components

2. Describe procedures to test emission control systems recommended under provincial guidelines and vehicle manufacturers' specifications.
   - i) EGR systems
   - ii) PCV
   - iii) converter

3. Describe the gases produced as a result of combustion.

4. Identify testing equipment used to inspect, test and repair emission control systems and describe the procedures to use them.
   - i) scope
   - ii) gas analysis
   - iii) scan tool

iv) EVAP tester

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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

SV-2235 FUEL INJECTION SYSTEMS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to diagnose problems in gasoline fuel systems and service them.

Objectives and Content:

1. Describe fuel injection system components and their functions.
   - i) single
   - ii) multiple

2. Describe the design and function of major EFI (Electronic Fuel Injection) components.
   - i) port fuel injection systems
     - multi-port
     - sequential
     - continuous
   - ii) injectors
     - construction
     - cold start
   - iii) pressure regulators
     - TBI (Throttle Body Injection)
     - Port
   - iv) throttle bodies
   - v) air flow sensors
   - vi) speed density system

3. Describe procedures to inspect and test fuel injection systems.
   - i) customer complaint interpretation
   - ii) preliminary checks
   - iii) cylinder balance test
   - iv) fuel pressure test
   - v) injector test
   - vi) road test
   - vii) procedure to clean a flooded engine

4. Describe procedures to repair or replace fuel injection systems.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform fuel pressure test
2. Perform a cylinder balance test
3. Perform an injector test

SV-2250 ALTERNATIVE AND VARIABLE FUELS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe other types of fuels used in combustion engines, components used, and the safety factors that must be followed.

Objectives and Content:

1. Describe alternative fuels and explain their advantages and disadvantages.
   - i) alternative fuels
     - – LPG (Liquified Petroleum Gas)
     - – hydrogen
     - – methane
     - – compressed natural gas
     - – licensing
     - – legal aspects
     - – inspect, test and repair
     - – emission reduction
   - ii) variable fuels
     - – principles
     - – components
   - iii) hybrids

2. Describe the components used in alternative-fueled vehicles.
   - i) LPG vehicles
   - ii) compressed natural gas vehicles
   - iii) electric vehicles
   - iv) hybrid electric vehicles
   - v) fuel cell-powered vehicles

3. Describe the safety related factors that must be followed when working on alternative-fueled vehicles.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-2260 PREVENTATIVE MAINTENANCE INSPECTIONS (PMI)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the procedures to perform a preventative maintenance inspection.

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

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Locate pm inspection lists, vehicle owner's manuals and vehicle manufacturer's manuals.

2. Perform a pm inspection.

SV-2270 PROVINCIAL GOVERNMENT INSPECTIONS (MVI)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the procedures to perform provincial safety inspections.

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:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform government motor vehicle safety inspection.

SV-2280 PRE-DELIVERY INSPECTIONS (PDI)

Outcomes:

Upon successful completion of this unit the apprentice will be able to perform a pre-delivery inspection on a light duty motor vehicle.

Objectives and Content:

1. Explain the background and rationale of the pre-delivery inspection.
   - i) reasons why inspection is necessary
   - ii) manufacturer's inspection forms

2. Describe the pre-delivery inspection procedures.
   - i) use of a system or routine for doing any inspection
   - ii) procedure to follow if problems are identified
   - iii) procedure to follow if doors, trunk and bumpers are misaligned
   - iv) inspection guidelines as outlined by manufacturer

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform a pre-delivery inspection on a light duty motor vehicle.

WD-2330 GMAW WELDING (MIG)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to operate MIG welding equipment to industrial safety standards as needed for various motorized equipment.

Objectives and Content:

1. Identify equipment/material used in MIG welding
   - i) equipment
   - ii) shielding gases
   - iii) filler wire

2. Describe procedures to operate MIG welding equipment to industrial standards as needed for various motorized equipment.
   - i) performing basic MIG welding
     - advantages of MIG welding
     - types of MIG welding
     - proper penetration
   - ii) ensuring safety
     - electrical system cautions when MIG welding
     - location of ground cables
     - possible bearing damage from welding
     - possible computer and electrical accessory damage from welding
     - procedures to prevent electrical and bearing damage
   - iii) setting-up and shutting-down equipment

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Weld using MIG equipment.

2. Perform set up and shut down procedures

SV-2820 DIESEL ENGINE PRINCIPLES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to describe the working principles of a diesel engine, describe the operation of the components, describe various systems on a diesel engine, and follow proper procedures to inspect and test delivery pumps and injectors.

Objectives and Content:

1. Describe the design, construction and operation of diesel engine components.
   - i) fuel delivery pump
   - ii) tanks, lines and filters
   - iii) water separators
   - iv) hydraulic injectors
   - v) in-line injector pumps
   - vi) distributor injector pumps
   - vii) fuel injectors
     - mechanical
     - electronically controlled
   - viii) governors

2. Describe the basic operating principles of a diesel engine assembly.
   - i) compression ignition (compression ratio)
   - ii) fuel efficiency of diesel engine
     - high compression
     - more heat energy per unit of fuel
   - iii) comparison of strength of engine parts and weight
     - gasoline versus diesel
   - iv) two-stroke and four-stroke engines
   - v) combustion chambers
     - direct injection
     - pre-combustion chamber
   - vi) head gasket considerations
     - compression or combustion space adjusted by head gasket thickness
   - vii) crankcase vent systems
     - vacuum regulator valves

3. Describe diesel fuel characteristics.
   - i) cetane rating
   - ii) grades
   - iii) specific gravity – quality, heat content
   - iv) sulfur content

v) clean fuel requirements (importance)

4. Describe fuel systems.
   i) fuel supply systems
      - tank
      - lines
      - filter
      - water separator
      - supply pumps
        - electric
        - mechanical - diaphragm
   ii) injection systems
      - types
      - in-line pumps
      - distributor type pumps
      - governors
      - injector nozzles
        - hole types
        - pintle types

5. Describe the diesel EGR system.
   i) purpose of having an EGR system on diesel engine
   ii) methods used to control EGR
      - vacuum switches or valves
      - ECM controlled
      - EPR (exhaust pressure regulator) valves

6. Describe the diesel lubrication system.
   i) engine oil
      - energy-conserving
      - API classifications
      - viscosity classifications

7. Describe cold starting procedures and running aids.
   i) glow plug systems
      - 6-12 systems
      - systems controls
   ii) cold start timing advance
   iii) fuel heaters
   iv) heated intake air systems

8. Describe procedures to inspect and test delivery pumps and injectors using proper tools and equipment.
   i) testing and adjusting injectors
   ii) identifying diesel fuel system faults

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-2830 DIESEL ENGINE DIAGNOSTICS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to identify symptoms and possible problems, test engine components, and diagnose problems related to electrical components.

Objectives and Content:

1. Describe procedures to identify the following symptoms and possible problems.
   - i) engine will not crank over
   - ii) engine cranks slowly, but will not start
   - iii) engine cranks normally, but will not start
   - iv) engine starts, but will not continue to run
   - v) engine starts, but idles rough
   - vi) engine misfires above idle, but idles correctly
   - vii) fuel leaks, but engine runs normally
   - viii) loss of power
   - ix) noise or rap from cylinders
   - x) abnormal combustion noise with black smoke
   - xi) engine overheats
   - xii) instrument panel oil warning light turns on at idle
   - xiii) engine will not shut off with key
   - xiv) presence of black/white/blue smoke

2. Describe the procedures to test the following fuel supply system components.
   - i) tank
   - ii) lines
   - iii) pumps
   - iv) filters and water separators
   - v) valves
   - vi) accelerator controls
   - vii) fuel solenoids

3. Describe the procedures to test diesel engine fuel injectors.
   - i) pump and injector system operation
   - ii) nozzle test
   - iii) inspection procedures

4. Describe the procedures to perform the following tests on diesel engine components.
   - i) compression test
   - ii) leak down test
   - iii) cranking speed test

iv) coolant leak test
v) combustion gas leakage test

5. Describe the procedures to diagnose problems with electrical/electronic components.
   i) fuel heaters – test operation
   ii) glow plugs
      – test operation
      – controls
      – test glow plug electrical systems
   iii) injection pumps
      – electrical control
   iv) electronic-controlled injectors and related systems
   v) heated air intake systems

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform diagnostics on a diesel engine using speciality tools

2. Perform a compression test on a diesel engine

3. Test the operation of a diesel engine cold start system

4. Perform a fuel pressure test on a diesel engine

SV-2840 DIESEL ENGINE REPAIR

Outcomes:

Upon successful completion of this unit, the apprentice will be able to service and repair diesel engine components.

Objectives and Content:

1. Describe procedures to install head gaskets.

2. Describe procedures to service injection nozzles.

3. Describe procedures to adjust governors.
   i) manual control
   ii) electronic

4. Describe procedures to service electrical/electronic components.
   i) replacing glow plugs
   ii) servicing electrical/electronic controls

5. Describe procedures to service and replace pumps and filters.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1.

SV-2900 ENGINE REBUILDING (GASOLINE)

Outcomes:

Upon successful completion of this unit the apprentice will be able to disassemble, service, and reassemble cylinder head and cylinder block assemblies.

Objectives and Content:

1. Describe procedures to disassemble a cylinder head

2. Describe procedures to inspect and service cylinder heads for defects and wear
   - i) visual inspection
   - ii) crack detection
   - iii) measuring dimensions
   - iv) valve and seat re-grinding
   - v) following manufactures' recommendations and specifications

3. Describe procedures to reassemble a cylinder head
   - i) cleaning
   - ii) guide clearance
   - iii) valve seating
   - iv) valve height
   - v) seals

4. Describe procedures to disassemble a cylinder block
   - i) marking
   - ii) ridge removal

5. Describe procedures to inspect and service the cylinder block and its components for defects and wear
   - i) visual inspection
   - ii) measuring dimensions
   - iii) de-glazing
   - iv) following manufactures' recommendations and specifications

6. Describe procedures to reassemble a cylinder block
   - i) cleaning
   - ii) piston clearances
   - iii) ring gaps
   - iv) bearing clearances
   - v) end play
   - vi) following manufactures' recommendations and specifications

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Disassemble cylinder head and its components.

2. Inspect and service cylinder head and its components according to manufactures specifications.

3. Reassemble cylinder head according to manufactures specifications.

4. Disassemble cylinder block and its components.

5. Inspect and service cylinder block and its components according to manufacturer's specifications.

6. Assemble cylinder block according to manufacturer's specifications.

MA-1060 BASIC MATH

Description:

This course in Basic Math requires knowledge of general mathematical concepts and processes to enable trades persons to function in the institutional setting by developing numeracy skills required for technical courses. This math course should also provide a foundation for experiential learning through a knowledge of math relating to on-the-job skills and practices.

Course Outcomes:

1. To develop numeracy skills and knowledge required for institutional and on-the-job learning.

2. To develop the capability to apply mathematical concepts in the performance of trade practices.

3. To develop an appreciation for mathematics as a critical element of the learning environment

4. To use mathematical principles accurately for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

Prerequisites:

Course Duration: 60 hrs.

Course Objectives (Knowledge):

1. Define and calculate using whole number operations

2. Define and demonstrate use of correct orders of operations

3. Demonstrate examples of operations with fractions and mixed numbers

4. Demonstrate examples of operations with decimals

5. Demonstrate examples of operations with percentages

6. Employ percent/decimal/fraction conversion and comparison

7. Define and calculate with ratios and proportions

8. Use the Imperial Measurement system in relevant trade applications

9. Use the Metric Measurement system in relevant trade applications

10. Perform Imperial/Metric conversions

11. Define and demonstrate the formulation of variables

12. Demonstrate and define the various properties of angles and make relevant calculations

Major Tasks/Sub-tasks (Skills):

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

REQUIRED RELATED COURSES

CM-2150 WORKPLACE COMMUNICATIONS

Description:

This course is designed to introduce students to the principles of effective communication including letters, memos, short report writing, oral presentations and interpersonal communications.

Course Outcomes:

Upon completion of the course, students will be able to:
- understand and apply communication skills as outlined in the Employability Skills 2000, Conference Board of Canada
- understand the importance of well-developed writing skills in business and in career development.
- understand the purpose of the various types of business correspondence.
- examine the principles of effective business writing.
- examine the standard formats for letters and memos.
- write effective letters and memos.
- examine the fundamentals of informal reports and the report writing procedure.
- produce and orally present an informal report
- examine effective listening skills and body language in communication

Objectives and Content:

1. Apply rules and principles for writing clear, concise, complete sentences which adhere to the conventions of grammar, punctuation, and mechanics.

2. Explain the rules of subject-verb agreement.

3. Define and describe the major characteristics of an effective paragraph

4. Examine the Value of Business Writing Skills
   i) Describe the importance of effective writing skills in business
   ii) Describe the value of well-developed writing skills to career success as referenced in the Employability Skills

5. Examine Principles of Effective Business Writing
   i) Discuss the rationale and techniques for fostering goodwill in business communication, regardless of the circumstances
   ii) Review the importance of revising and proofreading
   iii) Differentiate between letter and memo applications in the workplace & review samples
   iv) Identify the parts of a business letter and memo
   v) Review the standard formats for business letters and memos

vi) Examine samples of well-written and poorly written letters and memos
vii) Examine guidelines for writing sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal.

6. Examine the Fundamentals of Informal Business Reports
   i) Identify the purpose of the informal report
   ii) Identify the parts and formats of an informal report
   iii) Identify methods of information gathering
   iv) Describe the methods of referencing documents
   v) Review the importance of proof reading and editing

7. Examine types of presentations
   i) Review & discuss components of an effective presentation
   ii) Review & discuss delivery techniques
   iii) Review & discuss preparation & use of audio/visual aids
   iv) Discuss & participate in confidence building exercises used to prepare for giving presentations

8. Interpersonal Communications
   i) Examine and apply listening techniques
   ii) Discuss the importance of body language

Practical:

1. Write well-developed, coherent, unified paragraphs which illustrate the following: A variety of sentence arrangements; conciseness and clarity; and adherence to correct and appropriate sentence structure, grammar, punctuation, and mechanics.

2. Write sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal.

3. Gather pertinent information, organize information into an appropriate outline & write an informal report with documented resources.
   i) Edit, proofread, and revise the draft to create an effective informal report and present orally using visual aids
   ii) Participate in confidence building exercises

4. Present an effective presentation.

5. Evaluate presentations.

MR-1220 CUSTOMER SERVICE

Description:

This course focuses on the role of providing quality customer service. It is important to have a positive attitude and the necessary skills to effectively listen and interpret customer concerns about a product, resolve customer problems, and determine customer wants and needs. Students will be able to use the skills and knowledge gained in this course to effectively provide a consistently high level of service to the customer.

Course Outcomes:

Upon successful completion of this course, students will be able to:
- define customer service
- explain why service is important
- describe the relationship between “service” and “sales”
- demonstrate an understanding of the importance of a positive attitude
- demonstrate methods of resolving customer complaints

Objectives and Content:

1. Define quality service
   - i) Identify and discuss elements of customer service
   - ii) Explain the difference between Service vs. Sales or Selling
   - iii) Explain why quality service is important
   - iv) Identify the various types of customers & challenges they may present
   - v) Describe customer loyalty
   - vi) Examine barriers to quality Customer Service

2. Explain how to determine customers wants and needs
   - i) Identify customer needs
   - ii) Explain the difference between customer wants and needs
   - iii) Identify ways to ensure repeat business

3. Demonstrate an understanding of the importance of having a positive attitude
   - i) Identify & discuss the characteristics of a positive attitude
   - ii) Explain why it is important to have a positive attitude
   - iii) Explain how a positive attitude can improve a customer’s satisfaction
   - iv) Define perception and explain how perception can alter us and customers
   - v) Describe methods of dealing with perception

4. Communicating effectively with customers
   - i) Describe the main elements in the communication process
   - ii) Identify some barriers to effective communication

iii) Explain why body language is important
iv) Define active listening and state why it is important
v) Identify and discuss the steps of the listening process
vi) Identify and discuss questioning techniques

5. Demonstrate using the telephone effectively
   i) Explain why telephone skills are important
   ii) Describe the qualities of a professional telephone interaction

6. Demonstrate an understanding of the importance of asserting oneself
   i) Define assertiveness
   ii) Discuss assertive techniques
   iii) Explain the use of assertiveness when dealing with multiple customers

7. Demonstrate techniques for interacting with challenging customers in addressing complaints & resolving conflict
   i) Examine & discuss ways to control feelings
   ii) Examine & discuss ways to interact with an upset customer
   iii) Examine & discuss ways to resolve conflict/customer criticism
   iv) Examine & discuss ways to prevent unnecessary conflict with customers

Practical:

1. Participate in activities to demonstrate knowledge of the course objectives.

SP-2330 QUALITY ASSURANCE/QUALITY CONTROL

Description:

This course is designed to give students an understanding of the concepts and requirements of QA/QC such as, interpreting standards, controlling the acceptance of raw materials, controlling quality variables and documenting the process. It includes information on quality concepts, codes and standards, documentation, communications, human resources, company structure and policy, teamwork and responsibilities.

Course Outcomes:

Upon completion of this course, students will be able to:
- develop the skills and knowledge required to apply quality assurance/quality control procedures as related to the trade
- develop an awareness of quality principles and processes
- apply quality assurance/quality control procedures in a shop project

Objectives & Content:

1. Describe the reasons for quality assurance and quality plans.

2. Explain the relationship between quality assurance and quality control.

3. Describe quality control procedures as applied to the production and checking of specifications and processes in applicable occupations.

4. Describe quality control procedures as applied to the acceptance and checking of raw materials.

5. Explain the role of communications in a quality environment.

6. Explain why it is important for all employees to understand the structure of the company and its production processes.

7. Explain how human resource effectiveness is maximized in a quality managed organization.

8. Explain the role of company policy in quality management.

9. Explain the purpose of codes and standards in various occupations.

10. Explain the concepts of quality
    i) cost of quality
    ii) measurement of quality

iii) elements of quality
iv) elements of the quality audit
v) quality standards
vi) role expectations and responsibilities

11. Explain the structure of quality assurance and quality control
    i) Describe organizational charts
    ii) Identify the elements of a quality assurance system such as ISO, CSA, WHMIS, Sanitation Safety Code (SSC)
    iii) Explain the purpose of the quality assurance manual
    iv) Describe quality assurance procedures

12. Examine quality assurance/quality control documentation
    i) Describe methods of recording reports in industry
    ii) Describe procedures of traceability (manual and computer-based recording)
    iii) Identify needs for quality control procedures

Practical:

1. Apply quality control to a project
    i) Follow QA/QC procedures for drawings, plans and specifications in applicable occupations.
    ii) Calibrate measuring instruments and devices in applicable occupations.
    iii) Interpret required standards
    iv) Follow QA/QC procedures for accepting raw materials
    v) Carry out the project
    vi) Control the quality elements (variables)
    vii) Complete QA/QC reports

MC-1050 INTRODUCTION TO COMPUTERS

Description:

This course is designed to give the student an introduction to computer systems. Particular emphasis is given to word processing, spreadsheet, e-mail and the Internet and security issues.

Course Outcomes:

Upon completion of this course, students will have a basic understanding of:
– computer systems and their operation.
– popular software packages, their applications
– security issues of Computers

Objectives & Content:

1. Identify the major components of microcomputer system hardware and software system.

2. Describe the functions of the microprocessor.
   i) Describe and give examples of I/O DEVICES.
   ii) Describe primary storage (RAM, ROM, Cache).
   iii) Define bit, byte, code and the prefixes k.m. and g.
   iv) Describe secondary storage (diskettes and hard disks, CD ROMS, Zip Drives etc).
   v) Describe how to care for a computer and its accessories.

3. Describe microcomputer software
   i) Define software.
   ii) Describe types of operational and application software
   iii) Define file and give the rules for filenames and file extensions.

4. Describe windows software
   i) Start and quit a Program
   ii) Demonstrate how to use the help function
   iii) Locate a specific file using the **find** function
   iv) Identify system settings:wall paper, screen saver, screen resolution, background
   v) Start a program by using the Run Command
   vi) Shutting down your computer

5. Identify File Management commands
   i) Demonstrate how to view directory structure and folder content
   ii) Organize files and folders

iii) Copy, delete, and move files and folders
iv) Create folders
v) Maximize and minimize a window
vi) Describe windows task bar

6. Describe Keyboards
   i) Identify and locate alphabetic and numeric keys
   ii) Identify and locate function key & special keys

7. Describe Word Processing
   i) Describe Windows components
   ii) Menu bar
   iii) Menu indicators
   iv) Document window
   v) The Status bar
   vi) The Help feature
   vii) Insertion point movements

8. Describe the procedure used to development of a document
   i) Enter text
   ii) Change the display

9. Describe the procedure for opening, saving and exiting documents
   i) Saving a document
   ii) Closing a document.
   iii) Starting a new document Window
   iv) Opening a document
   v) Exiting word processor

10. Describe the procedure for editing a Document
    i) Adding new text
    ii) Deleting text
    iii) Using basic format enhancement (split and join paragraphs, insert text)

11. Describe the main Select Features
    i) Identify a selection
    ii) Moving a selection
    iii) Copying a selection
    iv) Deleting a selection
    v) Saving a selection

12. Explain how to change Layout Format
    i) Changing layout format: (margins, spacing, alignment, paragraph indent, tabs, line spacing, page numbering)

13. Explain how to change Text Attributes
    i) Changing text attributes: (bold, underline, font, etc.)

14. Describe the Auxiliary Tools
    i) Using Spell Check & Thesaurus

15. Describe Print features
    i) Selecting the Print Feature: (i.e; number of copies and current document)
    ii) Identifying various options in print screen dialogue box

16. Examine & Discuss Electronic Spreadsheet
    i) Spreadsheet Basics
    ii) The Worksheet Window

17. Describe Menus
    i) Menu Bar
    ii) Control menu
    iii) Shortcut menu
    iv) Save, Retrieve form menus

18. Describe the components of a worksheet
    i) Entering constant values and formulas
    ii) Using the Recalculation feature

19. Describe Use ranges
    i) Typing a range for a function
    ii) Pointing to a range for a function
    iii) Selecting a range for toolbar and menu commands

20. Describe how to print a worksheet
    i) Printing to the Screen
    ii) Printing to the Printer
    iii) Printing a selected Range

21. Describe how to edit a worksheet
    i) Replacing cell contents
    ii) Inserting & deleting rows and columns
    iii) Changing cell formats
    iv) Changing cell alignments
    v) Changing column width
    vi) Copying and moving cells

22. State major security issues in using computers
    i) Pass words
    ii) Accessing accounts
    iii) Viruses and how they can be avoided

iv) Identity theft and ways to protect personal information

23. Describe how to use Electronic Mail
    i) E-mail etiquette
    ii) E-mail accounts
    iii) E-mail messages
    iv) E-mail message with attachments
    v) E-mail attachments
    vi) Print e-mail messages
    vii) Deleting e-mail messages

24. Explain the Internet and its uses
    i) The World Wide Web(www)
    ii) Accessing Web sites
    iii) Internet Web Browsers
    iv) Internet Search Engines
    v) Searching Techniques
    vi) Posting documents on-line

Practical:

1. Create a document using Word Processing.

2. Complete word processing exercises to demonstrate proficiency in word processing

3. Prepare and send e-mails with attachments

4. Retrieve documents and e-mail attachments and print copies

5. Develop & print a spread sheet.

6. Post a document on-line

SD-1700 WORKPLACE SKILLS

Description:

This course involves participating in meetings, information on formal meetings, unions, workers' compensation, employment insurance regulations, workers' rights and human rights.

Course Outcomes:

Upon completion of this course, students will be able to:
- Participate in meetings
- Define and discuss basic concepts of:
  - unions
  - workers' compensation
  - employment insurance
  - workers' rights
  - human rights
  - workplace diversity
  - gender sensitivity

Objectives & Content:

1. Meetings
   - i) Identify & discuss meeting format and preparation required for a meeting.
   - ii) Explain the purpose of an agenda.
   - iii) Explain the roles and responsibilities of meeting participants.
   - iv) Explain the purpose of motions and amendments and withdrawals.
   - v) Explain the procedure to delay discussion of motions.
   - vi) Explain the voting process.

2. Unions
   - i) State why unions exist.
   - ii) Give a concise description of the history of Canadian labour.
   - iii) Explain how unions function.
   - iv) Explain labour's structure.
   - v) Describe labour's social objectives.
   - vi) Describe the relationship between Canadian labour and the workers.
   - vii) Describe the involvement of women in unions.

3. Worker's Compensation
   - i) Describe the aims, objectives, benefits and regulations of the Workplace Health, safety and Compensation Commission.
   - ii) Explain the internal review process.

4. Employment Insurance
   i) Explain employment insurance regulations
   ii) Describe how to apply for employment insurance.
   iii) Explain the appeal process.
   iv) Identify the components of a letter of appeal.

5. Worker's Rights
   I) Define labour standards.
   ii) Explain the purpose of the Labour Standards Act.
   iii) Identify regulations pertaining to:
      – Hours of work
      – Minimum wages
      – Employment of children
      – Vacation pay
   iv) Explain the purpose of the Occupational Health & Safety Act as it refers to workers' rights

6. Human Rights
   i) Describe what information cannot be included on an employment application.
   ii) Describe what information cannot be included in an interview.
   iii) Examine the Human Rights Code and explain the role of the Human Rights Commission.
   iv) Define harassment in various forms and identify strategies for prevention.

7. Workplace Diversity
   I) Define and explore basic concepts and terms related to workplace inclusively including age, race, culture, religion, socio-economic, sexual orientation with an emphasis on gender issues and gender stereotyping.

8. Gender Sensitivity
   I) Explore gender and stereotyping issues in the workplace by identifying strategies for eliminating gender bias.

Practical:

1. Prepare an agenda.

2. Participate in a meeting.

3. Analyze a documented case of a human rights complaint with special emphasis on the application, time frame, documentation needed, and legal advice available.

SD-1710 JOB SEARCH TECHNIQUES

Description:

This course is designed to give students an introduction to the critical elements of effective job search techniques.

Course Outcomes:

Upon completion of this course, students will be able to:

– Demonstrate effective use of Job Search Techniques

Objectives & Content:

1. Identify and examine employment trends and opportunities

2. Identify sources that can lead to employment

3. Access and review information on the Newfoundland and Labrador Apprenticeship and Certification Web site and the Apprenticeship Employment Gateway

4. Analyze job ads and discuss the importance of fitting qualifications to job requirements

5. Identify and discuss employability skills as outlined by the Conference Board of Canada.

6. Discuss the necessity of fully completing application forms**.**

7. Establish the aim/purpose of a resume

8. Explore characteristics of effective resumes, types of resumes, and principles of resume format .

9. Explore characteristics of an effective cover letter.

10. Identify commonly asked questions in an interview.

11. Explore other employment related correspondence.

12. Explore the job market to identify employability skills expected by an employer.

13. Conduct a self-analysis and compare with general employer expectations.

14. Discuss the value of establishing and maintaining a portfolio.

Practical:

1. Complete sample application forms.

2. Write a resume.

3. Write an effective cover letter.

4. Establish a portfolio.

5. Write out answers to commonly asked questions asked during interviews.

6. Identify three potential employers from the Apprenticeship Employment gateway, Apprenticeship & Certification web site.

SD-1720 ENTREPRENEURIAL AWARENESS

Description:

This course is designed to introduce the student to the field of entrepreneurship, including the characteristics of the entrepreneur, the pros and cons of self-employment, and some of the steps involved in starting your own business.

Course Outcomes:

Upon completion of this course, the student will be able to:

– Identify the various types of business ownership, the advantages and disadvantages of self-employment and identify the characteristics of an entrepreneur.
– State the purpose and identify the main elements of a business plan.

Objectives & Content:

1. Explore Self-Employment: An Alternative to Employment
   i) Identify the advantages and disadvantages of self-employment vs. regular employment
   ii) Differentiate between an entrepreneur and a small business owner
   iii) Evaluate present ideas about being in business

2. Identify and discuss various types of business ownership
   i) Explore the Characteristic of Entrepreneurs
   ii) Identify characteristics common to entrepreneurs
   iii) Compare one's own personal characteristics with those of entrepreneurs.
   iv) Examine one's present ideas about business people

3. Identify Business Opportunities
   i) Distinguish between an opportunity and an idea.
   ii) Examine existing traditional and innovative business ventures
   iii) Identify and summarize the role of various agencies that support business development.
   iv) Identify potential business opportunities.

4. Review the Entrepreneurial Process.
   i) Explain the entrepreneurial process
   ii) Describe the purpose of a business plan
   iii) Identify & discuss the main elements of a business plan

Practical:

1. From a list potential business opportunities prepare a list of elements that would have to be included in a business plan.