A PLAN OF TRAINING

FOR

AUTOMOTIVE SERVICE TECHNICIAN

OCCUPATION

Approved by
Provincial Apprenticeship Board
Newfoundland and Labrador Department of Education
June, 2000

Foreword

Apprenticeship training in the Province of Newfoundland and Labrador is undergoing considerable change. This change is prompted by the need to keep pace with technological changes in industry, the need to be competitive, and the desire to be efficient and effective in meeting the needs of the apprentice. We feel that this training plan will lay the groundwork to meet both the demands of industry and the needs of the apprentice.

The plan that follows is a comprehensive one. It recognizes that apprenticeship training begins when a student first registers at a training institution, or signs a Contract of Apprenticeship with an employer, and continues until such time as the apprentice has completed all of the required technical training and has received the required industry experiences necessary to write an interprovincial examination. Passing this examination will result in the apprentice receiving Red Seal Certification which gives the journeyperson national mobility of qualifications. This plan also recognizes the need to provide flexible access to training based on the needs of the employer and the apprentice while at the same time recognizing that the end goal is to complete the requirements for Red Seal Certification.

It is realized that change in all facets of education and industry is continuous and sometimes rapid. This change will necessitate the review of this document on a continuous basis to ensure that current needs of industry and apprentices are being satisfied. Through a process of accreditation, regular input from industry advisory committees, as well as input from those involved in the administration and delivery of the training, we are confident that residents of our province who elect to pursue an apprenticeable occupation as a career choice will receive high quality training and thus will be prepared to compete for jobs worldwide.

_____
Chair, Provincial Apprenticeship
and Certification Board

_____
Minister of Youth Services and
Post-Secondary Education

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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:

The completion of designated first year courses specific to the occupation

OR

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

OR

Enrolment in a program of studies that includes all entry and advanced level skills and required work experiences as approved by the Provincial Apprenticeship and Certification Board.

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	25% of Course Credit Hours, **Plus** relevant work experience totaling 1800 hours	Second Year
Second Year Apprentice	50% of Course Credit Hours, **Plus** relevant work experience totaling 3600 hours	Third Year
Third Year Apprentice	75% of Course Credit Hours**, Plus** relevant work experience totaling 5400 hours	Fourth Year
Fourth Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 7200 hours	Write Certification Examination
5400 Hour Programs	**Requirements for Progression**	**Progress To**
First Year Apprentice	33% of Course Credit Hours, **Plus** relevant work experience totaling 1800 hours	Second Year
Second Year Apprentice	66% of Course Credit Hours, **Plus** relevant work experience totaling 3600 hours	Third Year
Third Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 5400 hours	Write Certification Examination

4800 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	33% of Course Credit Hours, **Plus** relevant work experience totaling 1600 hours	Second Year
Second Year Apprentice	66% of Course Credit Hours, **Plus** relevant work experience totaling 3200 hours	Third Year
Third Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 4800 hours	Write Certification Examination

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:

<table>
<tr><th>Program Duration</th><th colspan="2">Wage Rates</th><th>Comments</th></tr>
<tr><td rowspan="4">7200 Hours</td><td>1st Year</td><td>55%</td><td rowspan="7">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.</td></tr>
<tr><td>2nd Year</td><td>65%</td></tr>
<tr><td>3rd Year</td><td>75%</td></tr>
<tr><td>4th Year</td><td>90%</td></tr>
<tr><td rowspan="3">5400 Hours
and
4800 Hours</td><td>1st Year</td><td>55%</td></tr>
<tr><td>2nd Year</td><td>70%</td></tr>
<tr><td>3rd Year</td><td>85%</td></tr>
<tr><td colspan="4">4000 (Hairstylist) - 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.</td></tr>
</table>

6.0 TOOLS

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

7.0 PERIODIC EXAMINATIONS

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.

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 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 Youth Services and Post-Secondary Education within 30 days of the decision.

REQUIREMENTS FOR RED SEAL CERTIFICATION IN THE AUTOMOTIVE SERVICE TECHNICIAN OCCUPATION

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. Normally, a combination of training from an accredited training program and suitable work experience totalling 7200 hours

   Or

   A total of 9000 hours of suitable work experience.

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

4. 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.

o accredit institutions to deliver apprenticeship training programs.

PREFACE

This document is intended to describe the curriculum content of the Automotive Service Technician Training Services in the Atlantic Provinces.

It describes the suggested content of each of the courses required for completion of **apprenticeship**.

It is intended to indicate the scope of the occupation by identifying the performance objectives (skills), the required information (knowledge), and suggested practical projects to reinforce the skills and knowledge attained.

This Curriculum Plan will be amended periodically and suggestions for improvement should be directed to the Apprenticeship and Occupational Certification Branch of each province.

ACKNOWLEDGMENTS

Valuable input to the development of this Curriculum document has been contributed by Advisory Committees, Instructional Staff and Support personnel. Without their dedication to quality training, this document would not have been produced. A sincere thank you!

This document has been validated by the Provincial Advisory Committee at their April, 1999 meeting.

INTRODUCTION

OVERVIEW

The training service is designed to provide trainees with skills and knowledge required for employment in the Automotive Service Technician field. Automotive Service Technicians diagnose problems and make repairs. They examine automobiles for defects, locate the cause of the malfunction, dismantle and overhaul components, repair defects or fit new parts, and reassemble and make final adjustments.

Technicians use many specialized tools, including hand tools, gauges, test meters, jacks and hoists, welding equipment, hydraulic equipment, and complex electronic diagnostic testing devices.

GENERAL OBJECTIVES

Following successful completion of this program, the trainee will be able to:

- Demonstrate good safety habits and the proper use and maintenance of various tools and equipment used in an automotive repair shop.

- Display an understanding of and skill in recognizing, servicing, removing, overhauling, and installing the various related parts and systems on automobiles.

PROGRAM INFORMATION

DURATION

Apprenticeship requires a combined total of 7200 hours of classroom and practical work experience.

PROGRAM INFORMATION

Evaluation

Theory

A pass mark of 70% is required for each course

Practical

A pass mark of 70% is required for each course.

Work experiences or competencies performed by the apprentice are recorded by the **employer** in the Progress Record Book.

GLOSSARY OF TERMS

The following is a brief explanation of the components of the courses found in this document.

Outcome is a statement that summarizes the intention or objectives of the unit of instruction.

Duration is the approximate length of time required for the apprentice to complete the course. This including both theory and practical. Durations may vary for each apprentice as their background and experience will affect the time required to meet the objectives.

Prerequisites are the courses that must be completed before the apprentice attempts the course at hand.

Objectives are statements of what the apprentices will learn and what they will be able to do, how well, and to what standards.

Content is a listing of the theoretical topics included in the courses material and required by the apprentice for the performance of the tasks/objectives.

Suggested Learning Activities are possible jobs (tasks) that the apprentice may be assigned in order to demonstrate his/her ability to perform the objectives. Any, or all of the suggested projects listed may be substituted by the instructor for other projects that will also enable the apprentice to perform the objectives of the course. Different learning activities could be used by different colleges, that will depend on their resources.

Suggested Resources includes any written or audio-visual material required by the trainee to complete that course of instruction. Written reference material may include text books, Manufacturer's Service Manuals, Learning Activity Package, or other appropriate publications of literature. Audio-visual reference material will usually be in the form of video tapes, but may also include slides, films, overhead transparencies, etc.

PROGRAM STRUCTURE

PROGRAM STRUCTURE

Code	*Course Name*	*Hours*	*Prerequisite(s)*	*Page #*
SV1100	Safety in the Shop	15	N/A	23
TS1510	Occupational Health and Safety	4	N/A	25
TS1520	WHMIS	6	N/A	28
SV1110	Ozone Depleting Substances	7	N/A	31
TS1530	First Aid	16	N/A	32
SV1120	Gasket, Seals and Sealers	8	SV1100 - TS1530	34
WD2330	MIG Welding	30	SV1100 - TS1530	36
WD1300	Oxy-Fuel Welding	30	SV1100 - TS1530	38
SV1130	Electrical and Electronic Basic Principles	90	SV1100 - SV1110 TS1510 - TS1520	40
SV2680	Basic Motive Power Computers	60	SV1130	43
SV1140	Hydraulic Basic Principles	30	N/A	47
SV1155	Service Information Systems for Automotive Equipment	30	N/A	49
SV1165	Hand Tools	30	SV1100 - SV1110 TS1510 - TS1520 TS1530	51
SV1175	Shop Tools and Equipment	30	SV1165	52
SV1185	Fasteners, Tubing and Fittings	30	SV1175	54
SV1195	Lubrication and Fluid Service	30	SV1185	56
SV1375	Batteries	15	TS1510 - TS1520 SV1100 - SV1110 SV1130 - SV1155 SV1165	58
SV1385	Starting Systems	30	SV1185 - SV1375	61
SV1395	Charging Systems	30	SV1185 - SV1375	63
SV1600	Ignition Systems	30	SV1185 - SV1375	66
SV1495	Lighting Systems	30	SV1185 - SV1375	69
SV2000	Instruments and Safety Devices	75	SV1185 - SV1375	71

Code	*Course Name*	*Hours*	*Prerequisite(s)*	*Page #*
SV2010	Onboard Diagnostic I	30	SV2680	73
SV2011	Onboard Diagnostic II	30	SV2010	75
SV1215	Wheels and Tires	15	TS1510 - TS1520 TS1530 - SV1100 SV1110 - SV1120 SV1155 - SV1195	77
SV1610	Steering Columns	15	SV1215	79
SV1255	Suspension	45	SV1610	81
SV1225	Manual Steering	15	SV1255	84
SV2020	Power Steering	30	SV1610 - SV1140	86
SV2030	Electronic Power Steering	15	SV1130 - SV2680 SV1215	88
SV2040	Wheel Alignment	45	SV1225 - SV2030	90
SV1285	Drive Lines	30	TS1510 - TS1520 TS1530 - SV1100 SV1110 - SV1120 SV1155 - SV1195	92
SV1620	Front Wheel Drives	30	SV1285	94
SV2050	Engine Clutches	45	SV1620	96
SV2060	Manual Transmissions and Transaxles	45	SV2050	98
SV2070	Automatic Transmissions and Transaxles Servicing	30	SV1140 - SV1620	100
SV2080	Automatic Transmissions and Transaxles Overhauling	60	SV2070	102
SV2090	Electronic Transmissions Control	30	SV1130 - SV2011 SV2080	104
SV2100	Transfer Cases and Hub Assemblies	45	SV2680 - SV1285	106
SV2110	Differential and Axle Assemblies	45	SV1285 - SV1620 SV2120	108

Code	*Course Name*	*Hours*	*Prerequisite(s)*	*Page #*
SV1630	Brake Systems	90	TS1510 - TS1520 TS1530 - SV1100 SV1110 - SV1120 WD1300 - SV1155 SV1195	110
SV1640	Power Brake Systems	15	SV1630	113
SV2120	ABS/Traction Control Systems	45	SV1130 - SV2680 SV1215 - SV1640	115
SV2130	Introduction to Air Brakes	15	SV1630	119
SV2140	HVAC Systems	45	SV1110 - SV1375 SV2200	121
SV2150	Power Actuated Accessories	60	SV1130 - SV2680 SV1140 -SV1375 SV1495	124
SV2160	Air Bag Systems	30	SV2010 - SV1610	126
SV1305	Engine Principles	60	TS1510 - TS1520 TS1530 - SV1100 SV1110 - SV1120 SV1155 - SV1195	128
SV1315	Engine Cooling Systems	30	SV1305	130
SV2170	Engine Diagnostic and Testing	45	SV1315	133
SV2180	Engine Removal and Installation	30	SV1375 - SV1285 SV1305 - SV1315 SV2170 - SV1650	135
SV2190	Cylinder Head and Valve Trains	30	SV2180	138
SV2200	Cylinder Block Assemblies	45	SV2180	140
SV2210	Diesel Fuel Systems	30	SV1305 - SV2170	143
SV2220	Emission Control Systems	45	TS1510 - TS1520 TS1530 - SV1110 SV1120 - SV1155 SV1195 - SV2011 SV1305 - SV2210	145
SV1650	Fuel Delivery	30	SV1305	147

Code	*Course Name*	*Hours*	*Prerequisite(s)*	*Page #*
SV1660	Air Intake Systems	30	SV1305	150
SV2230	Fuel Injection Systems (gasoline)	45	SV1375 - SV2011 SV1305	152
SV2240	Fuel Injection Diagnosis	15	SV1650 - SV1660 SV2230	154
SV2250	Alternative and Variable Fuels	15	SV1650 - SV2230	156
SV1670	Exhaust Systems	30	TS1510 - TS1520 TS1530	157
SV2260	Preventive Maintenance Inspection	15	AST Program	159
SV2270	Government Safety Inspection	7	SV1100 - SV1120 SV1155 - SV1195 SV1375 - SV2011 SV1215 - SV2040 SV1630 - SV2130	161
SV2280	Pre-Delivery Inspection	8	AST program	163

Required Related Courses **Page**

SUGGESTED COURSE LAYOUT FOR THE AUTOMOTIVE SERVICE TECHNICIAN

Program & Apprenticeship Registration

ENTRY LEVEL COURSES

SV1100 - Safety in the Shop . . . . . 15 hrs.
TS1510 - Occupational Health and Safety . . . . . 4 hrs.
TS1520 - WHMIS . . . . . 6 hrs.
SV1110 - Ozone Depleting Substances . . . . . 7 hrs.
TS1530 - First Aid . . . . . 16 hrs.
SV1120 - Gasket, Seals and Sealers . . . . . 8 hrs.
WD1300 - Oxy-Fuel Welding . . . . . 30 hrs.
SV1130 - Electrical & Electronic Basic Principles . . . . . 90 hrs.
SV1140 - Hydraulic Basic Principles . . . . . 30 hrs.
SV1155 - Service Information Sys for Automotive Equipment . . . . . 30 hrs.
SV1165 - Hand Tools . . . . . 30 hrs.
SV1175 - Shop Tools and Equipment . . . . . 30 hrs.
SV1185 - Fasteners, Tubing and Fittings . . . . . 30 hrs.
SV1195 - Lubrication and Fluid Service . . . . . 30 hrs.
SV1375 - Batteries . . . . . 15 hrs.
SV1385 - Starting Systems . . . . . 30 hrs.
SV1395 - Charging Systems . . . . . 30 hrs.
SV1600 - Ignition Systems . . . . . 30 hrs.
SV1495 - Lighting Systems . . . . . .30 hrs.
SV1215 - Wheels and Tires . . . . . 15 hrs.
SV1610 - Steering Columns . . . . . 15 hrs.
SV1255 - Suspension . . . . . 45 hrs.
SV1225 - Manual Steering . . . . . 15 hrs.
SV1285 - Drive Lines . . . . . .30 hrs.
SV1620 - Front Wheel Drives . . . . . 30 hrs.
SV1630 - Brake Systems . . . . . .90 hrs.
SV1640 - Power Brake Systems . . . . . .15 hrs.
SV1305 - Engine Principles . . . . . 60 hrs.
SV1315 - Engine Cooling Systems . . . . . 30 hrs.
SV1650 - Fuel Delivery . . . . . 30 hrs.
SV1660 - Air Intake Systems . . . . . .30 hrs.
SV1670 - Exhaust Systems . . . . . 30 hrs.
*CM2150 - Workplace Correspondence . . . . . 45 hrs.
*MR1210 - Customer Service . . . . . 30 hrs.
*SP2330 - QA/QC . . . . . 30 hrs.
*MC1050 - Introduction to Computers . . . . . 30 hrs.
*SD1700 - Workplace Skills . . . . . 30 hrs.
*SD1710 - Job Search . . . . . 15 hrs.
*SD1720 - Entrepreneurial Awareness . . . . . 15 hrs.

ADVANCED LEVEL COURSES

WD2330 - MIG Welding	30 hrs.
SV2680 - Basic Motive Power Computers	60 hrs.
SV2000 - Instruments and Safety Devices	75 hrs.
SV2010 - On Board Diagnostic I	30 hrs.
SV2011 - On Board Diagnostic II	30 hrs.
SV2020 - Power Steering	30 hrs.
SV2030 - Electronic Power Steering	15 hrs.
SV2040 - Wheel Alignment	45 hrs.
SV2050 - Engine Clutches	45 hrs.
SV2060 - Manual Transmissions and Transaxles	45 hrs.
SV2070 - Automatic Transmissions and Transaxles Servicing	30 hrs.
SV2080 - Automatic Transmissions and Transaxles Overhauling	60 hrs.
SV2090 - Electronic Transmissions Control	30 hrs.
SV2100 - Transfer Cases and Hub Assemblies	45 hrs.
SV2110 - Differential and Axle Assemblies	45 hrs.
SV2120 - ABS/Traction Control Systems	45 hrs.
SV2130 - Introduction to Air Brakes	15 hrs.
SV2140 - HVAC Systems	45 hrs.
SV2150 - Power Actuated Accessories	60 hrs.
SV2160 - Air Bag Systems	30 hrs.
SV2170 - Engine Diagnostic and Testing	45 hrs.
SV2180 - Engine Removal and Installation	30 hrs.
SV2190 - Cylinder Head and Valve Trains	30 hrs.
SV2200 - Cylinder Block Assemblies	45 hrs.
SV2210 - Diesel Fuel Systems	30 hrs.
SV2220 - Emission Control Systems	45 hrs.
SV2230 - Fuel Injection Systems	45 hrs.
SV2240 - Fuel Injection Diagnosis	15 hrs.
SV2250 - Alternative and Variable Fuels	15 hrs.
SV2260 - Preventative Maintenance Inspection	15 hrs.
SV2270 - Government Safety Inspection	7 hrs.
SV2280 - Pre-Delivery Inspection	8 hrs.

***Related Courses are to be interspersed throughout the Entry Level Program.**

PROGRAM CONTENT

NAME AND NUMBER: SV1100 - Safety in the Shop

SUGGESTED DURATION: 15 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able identify procedures for the maintenance of a safe and clean work environment and proper procedures to extinguish fires.

OVERVIEW OF OBJECTIVES:
1. Identify fire hazards.
2. Identify safe working habits.
3. Identify explosion hazards.

CONTENT:

1. Identify fire hazards

    - Fire hazards: classification of fires, types, purpose and use of fire extinguishers.
    - Explosion hazards: spontaneous combustion, storage and handling of fuels
    - Ventilation and hazardous gases: carbon monoxide, storage batteries

2. Identify safe working habits

    - Personal hazards
    - Good housekeeping practices
    - Reporting injuries

3. Identify explosion hazards

    - Recognize and prevent explosion hazards

SUGGESTED LEARNING ACTIVITIES:

1. Operate fire extinguishers.
2. Locate exits, fire alarms.
3. Locate shop ventilation systems.
4. Prepare a floor plan showing fire exit routes.

SUGGESTED RESOURCES:

NAME AND NUMBER: TS1510 - Occupational Health and Safety

SUGGESTED DURATION: 4 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

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

OVERVIEW OF OBJECTIVES:
1. Interpret the Occupational Health and Safety Act laws and regulations.
2. Designate responsibilities within the laws and regulations.
3. Establish joint health and safety committees/representatives within the laws and regulations.
4. Examine right to refuse dangerous work.
5. Describe discriminatory action.
6. Explain duties of commission officers.
7. Interpret appeals of others.
8. Emphasize reporting of accidents.

CONTENT:

1. Interpret the Occupational Health and Safety Act laws and regulations

   a. Expound 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

   b. Define definitions
      - Application of definitions
      - Defining terminology

2. Designate responsibilities within the laws and regulations

    - Duties of employer, owner, contractors, sub-contractors, employees, and suppliers

3. Establish joint health and safety committees/representatives within the laws and regulations

    - Establish committee
    - Functions of committee
    - Legislated rights
    - Deviation from policy standards
    - Performance of other duties
    - Establish health and safety representation
    - Reasonable grounds for refusal
    - Reporting endangerment to health
    - Appropriate remedial action
    - Committee recommendation
    - Investigation of endangerment
    - Employer to take appropriate remedial action

4. Examine right to refuse dangerous work

    - Reasonable grounds for refusal
    - Reporting endangerment to health
    - Appropriate remedial action
    - Committee recommendation
    - Investigation of endangerment
    - Employer to take appropriate remedial action
    - Action taken when employee does not have reasonable grounds for refusing dangerous work
    - Employee's rights
    - Assigning another employee to perform duties
    - Temporary reassignment of employee to perform other duties
    - Collective agreement influences
    - Wages and benefits

5. Describe discriminatory action

    - Definition
    - Filing a complaint procedure
    - Allocated period of time a complaint can be filed with the Commission
    - Duties of an arbitrator under the Industrial Relations Act
    - Order in writing inclusion
    - Report to commission Allocated period of time to request Arbitrator to deal with the matter of the request

- Notice of application
- Failure to comply with the terms of an order
- Order filed in the court

6. Explain duties of commission officers

- Powers and duties of officers
- Carry out examinations and inspections
- Officer's procedure for carrying out any inspection
- Orders given by officers orally or in writing
- Specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
- Service of an order
- Prohibition of persons towards an officer in the exercise of his/her power or duties
- Rescinding of an order
- Posting a copy of the order
- Illegal removal of an order

7. Interpret appeals of others

- Allocated period of time for appeal of an order
- Person who may appeal order
- Action taken by Commission when person involved does not comply with the order
- Enforcement of the order
- Notice of application
- Rules of court

8. Emphasize reporting of accidents

- Application of act
- Report procedure
- Reporting notification of injury
- Reporting accidental explosion or exposure
- Posting of act and regulations

SUGGESTED LEARNING ACTIVITIES:

1. Describe repairs or work situations around vehicles that one might want to refuse.
2. Interview someone in the motor vehicle repair trade - report results.

SUGGESTED RESOURCES:

1. Occupational, Health & Safety Act.

NAME AND NUMBER: TS1520 - WHMIS

SUGGESTED DURATION: 6 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to interpret and apply the Workplace Hazardous Materials Information System (WHMIS) Regulation.

OVERVIEW OF OBJECTIVES:
1. Define WHMIS.
2. Examine hazard identification and ingredient disclosure.
3. Explain labeling and other forms of warning.
4. Introduce material safety data sheets (MSDS).

CONTENT:

1. Define WHMIS safety

    - Rational and key elements
    - History and development of WHMIS
    - WHMIS legislation
    - WHMIS implementation program
    - Definitions of legal and technical terms

2. Examine hazard identification and ingredient disclosure

    - Prohibited, restricted and controlled products
    - Classification and the application of WHMIS information requirements
    - 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
- 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
- Comparison of classification systems - WHMIS and TDG
  - General comparison of classification categories
  - Detailed comparison of classified criteria

3. Explain labeling and other forms of warning

- Definition of a WHMIS label
  - supplier label
  - workplace label
  - other means of identification
- Responsibility for labels
  - supplier responsibility
  - employer responsibility
  - worker responsibility
- Introduce label content, design and location
  - supplier labels
  - workplace labels
  - other means of identification

4. Introduce material safety data sheets (MSDS)

- Definition of a material safety data sheet
- Purpose of the data sheet
- Responsibility for the production and availability of data sheets
  - supplier responsibility
  - employer responsibility

- workers responsibility

SUGGESTED LEARNING ACTIVITIES:

1. Lectures
2. Class Participation
3. Locate WHMIS labels - describe different sections

SUGGESTED RESOURCES:

1. WHMIS Regulation
2. Sample MSDS sheets

NAME AND NUMBER: SV1110 - Ozone Depleting Substances

SUGGESTED DURATION: 7 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to legally handle ozone depleting substances (refrigerants) used in motor vehicles.

OVERVIEW OF OBJECTIVES:
1. Handle ozone depleting substances (refrigerants) used in motor vehicles as per regulations.

CONTENT:

1. Handle ozone depleting substances (refrigerants) used in motor vehicles as per regulations.

    - Curriculum and certification supplied by HRAI to be delivered by instructors certified to teach ODS courses for Motive Power Occupations

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: TS1530 - First Aid

SUGGESTED DURATION: 16 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to recognize situations requiring emergency action and to make appropriate decisions concerning first aid.

OVERVIEW OF OBJECTIVES:
First Aid Safety Oriented course offered by the St John Ambulance or equivalent.

1. Identify the objectives of first aid and the general principles of safety.
2. Describe what is involved in the application of the Priority Action Approach.
3. Recognize the interdependence of all the systems of the body.
4. Assess emergency situations by doing a primary examination to detect life-threatening conditions.
5. Do a secondary examination when the victim's life is no longer in danger.
6. Describe how sorting is done when the victim has multiple injuries or when there are several casualties.
7. Recognize the signs and symptoms of different emergencies and describe how to treat them.
8. Demonstrate the appropriate general and specific care to be provided in different emergency situations where one or more body systems are failing because of an accident or secondary illness.
9. Select the rescue and transportation method that offers maximum protection for the victim and subjects the rescuer to a minimum of risks.
10. Know when to call on more qualified persons or ask for medical assistance.
11. Prevent accidents by adopting a safety-oriented lifestyle.

CONTENT:

1. As per St John Ambulance or equivalent curriculum.

SUGGESTED LEARNING ACTIVITIES:

1. As per St John Ambulance or equivalent curriculum

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1120 - Gaskets, Seals and Sealers

SUGGESTED DURATION: 8 hours

PREREQUISITES: SV1100 - TS1530

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the student will be able to use gaskets, seals and sealing compounds.

OVERVIEW OF OBJECTIVES:
1. Identify types of gaskets, o-rings, seals and sealing compounds and their purposes.

CONTENT:

1. Identify types of gaskets, o-rings, seals and sealing compounds and their purposes

   a. Gaskets
      - Type and construction
      - Purpose
      - Installation

   b. O-rings
      - Types
      - Limitations
      - Installations

   c. Seals
      - Types
      - Installation

   d. Sealing compound
      - Room temperature vulcanizing (RTV)
      - Anaerobic

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: WD2330 - Mig Welding

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1100 - TS1530

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to describe the basic MIG (GMAW) welding process and provide the trainee with the skills and knowledge needed to use MIG Welding equipment.

OVERVIEW OF OBJECTIVES:
1. Operate MIG welding equipment to industrial safety standards as needed for various motorized equipment.

CONTENT:

1. Operate MIG welding equipment to industrial safety standards as needed for various motorized equipment

    a. Equipment used in MIG welding

    b. Shielding gases used in MIG welding

    c. Filler wire used in MIG welding

    d. The basic MIG welding process

    e. Advantages of MIG welding

    f. Types of MIG welding

    g. Proper penetration

h. 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

i. Set up and shut down procedures

SUGGESTED LEARNING ACTIVITIES:

1. Identify the equipment used in MIG welding.
2. Describe the shielding gases used in MIG welding.
3. Describe the filler wire used in MIG welding.
4. Describe the basic MIG welding process.
5. List the advantages of MIG welding.
6. List the types of MIG welding.
7. Weld using MIG equipment.
8. Perform set up and shut down procedures.

SUGGESTED RESOURCES:

NAME AND NUMBER: 1330 - Oxy-Fuel Welding

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1100 - TS1530

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to identify procedures for the safe and effective set up and operation of oxy-fuel equipment for heating, cutting and braze welding.

OVERVIEW OF OBJECTIVES:
1. Operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts.
2. Perform braze welding using oxy-fuel equipment.
3. Perform flame cutting with oxy-fuel equipment.

CONTENT:

1. Operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts.

    a. Safety precautions
        - Safety apparel
        - Storage and handling of welding gases
        - Pre-operational inspection

    b. Setting up equipment
        - Cylinders
        - Gauges
        - Regulators
        - Valves-flame arrestor
        - Torches and tips
        - Hoses
        - Testing for leaks

- Operating the torch
  - Lighting procedures
  - Types of flame (adjustment)
  - Shutting down procedures

2. Perform braze welding using oxy-acetylene equipment

   - Braze welding

3. Perform flame cutting with oxy-acetylene equipment

   - Flame cutting
     - Cutting torch and tips
     - Use of cutting torch

SUGGESTED LEARNING ACTIVITIES:

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.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1130 - Electrical & Electronic Basic Principles

SUGGESTED DURATION: 90 hours

PREREQUISITES: SV1100 - SV1110 - TS1510 - TS1520

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to apply basic electrical and electronic principles.

OVERVIEW OF OBJECTIVES:
1. Demonstrate knowledge of electrical basic principles.
2. Apply electrical principles using ohms law to calculate volts, ohms and amperes.
3. Use instruments to test components of series, parallel and series parallel circuits to determine cause of malfunctions in an electrical circuit.
4. Identify electronic components.

CONTENT:

1. Demonstrate knowledge of electrical basic principles

    a. Safety practices and procedures working with electrical equipment

    b. Terminology - abbreviations and glossary of electrical terms

    c. Sources of Electricity
        - generation of electricity
        - use of chemical, magnetism, heat, light and DC power supply
        - theory and laws of electricity
        - theory and laws of magnetism and inductance

    d. Ohms Law - volts, ohms and amperes

    e. Symbols and schematics - common automotive symbols
        - read schematics/wiring diagrams

2. Apply electrical principles using ohms law to calculate volts, ohms and amperes

    - Application of Ohms Law to Electrical Circuits
        - Series circuit
        - Parallel circuit
        - Series and parallel circuit

3. Use instruments to test components of series, parallel and series parallel circuits to determine cause of malfunctions in an electrical circuit

    a. Circuit testing devices
        - Applications of volt, ohm and ammeters
        - Meter ranges
        - Correct hookup of meters
        - Test lights, circuit breakers

    b. Circuit problems and testing problems
        - Short, open and grounds
        - Diagnostic trouble shooting procedures
        - Testing procedures and equipment

4. Identify electronic components

    a. Wires and terminals
        - Types and sizes
        - Terminals and connectors
        - Conductors, semi conductors and insulators

    b. Fibre Optics
        - Basics

    c. Capacitors
        - Construction
        - Purpose
        - Uses

    d. Resistors
        - Identification
        - Purpose
        - Uses

    e. Transistors
        - Identification
        - Purpose
        - Uses

f. Diodes
- Identification
- Purpose
- Uses

SUGGESTED LEARNING ACTIVITIES:

1. Classroom Theory
2. Read schematics and wiring diagrams
3. Familiarize learner with circuit testing devices
4. Use circuit testing devices.
   - ampmeter
   - ohmmeter
   - voltmeter
   - test lights
5. Apply Ohms Law to Electrical Circuit
6. Identify wires and terminals
   - demonstrate back probing
7. Test electronic circuits

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2680 - Basic Motive Power Computers

SUGGESTED DURATION: 60 hours

PREREQUISITES: SV1130

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to diagnose and/or repair/reprogram motive power computers.

OVERVIEW OF OBJECTIVES:
1. Explain the basic operation of computers.
2. Explain how and why computers are used to control vehicle systems.
3. Demonstrate ability to follow safety precautions associated with computers and electronics components.
4. Demonstrate understanding of scan tools and their operation.

CONTENT:

1. Explain the basic operation of computers

    a. Rationale - reasons for using electronic controls
        - more accurate control
        - less change in emissions and performance with accumulated mileage

    b. Basic computer systems
        - computers - compared to brain
        - inputs - information to brain
        - outputs - commands from brain

    c. Computer operation
        - basic CPU
        - types of memory - RAM, ROM, PROM, EEPROM
        - input and output interfaces
        - clock speed
        - feeds (power) and grounds for computers

d. Input circuits
- discreet inputs
- analogue inputs
- 2-wire sensor systems
- 3-wire sensor systems

e. Output circuits
- high side and low side control of circuits
- pulse width modulation (PWM)
- current limiting protection in newer computers versus burn-out of older units with no self-protection

f. Sensing devices
- switches
- thermistors
- potentiometers
- pressure sensors
- permanent magnet (PM) generators
- hall effect switches
- LED operated
- knock sensors

g. Feedback systems
- open loop versus closed loop operation
- oxygen sensors

h. Adaptive learning
- purpose for adaptive strategies of computer systems
- short term versus long term memories
- ways of describing variation - counts or percentages
- conditions versus commands - what does 115 integrator counts or long-term fuel trim of 110% means

i. Output systems
- solenoids - on-off and PWM
- relays
- stepper motors
- lights
- trouble codes and diagnostic information

2. Explain how and why computers are used to control vehicle systems

- Electrical and electronic fundamentals

3. Demonstrate ability to follow safety precautions associated with computers and electronics components

   - Construction and programmability of computers
   - Use of original PROMS and knock sensor calibrators
   - Programming of reprogrammable type before use

4. Demonstrate understanding of scan tools and their operation

   a. Scan tools
      - Test circuitry for operation and defects
      - Clear codes
      - Road test with scanners and data recorders

   b. Understand J 1930 technology

   c. Test computer output sensors
      - Solenoids/on off and PWM
      - Relays
      - Stepper motors
      - Lights
      - Trouble codes and diagnostic information

   d. Sensing Devices

   e. Wiring Diagrams
      - Power and ground wiring and connectors
      - Proper procedure for testing

   f. Use of Logical Approach to Diagnosis
      - Verify complaint
      - Preliminary checks (visual, operational, and other systems)
      - Diagnostic systems check (check operational of MIL)
      - Check for service bulletins
      - Check for diagnostic trouble codes (DTC's)
      - Use symptoms diagnostic charts
      - Repair and verify operation

   g. Diagnostic Tools
      - Shop manuals and other printed or electronic service information
      - Digital VOM
      - Various test lights - 12 volt - noid
      - Pressure gauges
      - Injector testers
      - Test connector sets (for testing weatherproof terminal circuits)

h. Specific Tests
- Precautions with static electricity
- Diagnostic system check
- Computer feeds and grounds - voltage drops
- Use of scan tools to check inputs
- Use of VOM and oscilloscopes to check inputs
- Snap-shot functions in scan tools
- Fuel injector balance tests and current tests
- Fuel pump output tests

SUGGESTED LEARNING ACTIVITIES:

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.

SUGGESTED RESOURCES:

- Scanners
- Break out boxes
- Manufacturers specific scan tools
- Engine analyzers
- Lab-type oscilloscopes
- Portable scanners

NAME AND NUMBER: SV1140 - Hydraulic Basic Principles

SUGGESTED DURATION: 30 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon completion of this course, the apprentice will be able to apply basic hydraulic principles by using Pascal's Law to calculate force and fluid pressure as applied to Motive Powered Equipment.

OVERVIEW OF OBJECTIVES:
1. Apply basic hydraulic principles.
2. Identify basic hydraulic components and systems and their applications.
3. Interpret and use hydraulic symbols and diagrams.
4. Identify safety practices.

CONTENT:

1. Apply basic hydraulic principles

    - Definition of Pascal's Law
    - Multiplication of force
    - Using the formulas, calculate area, pressure, force
    - Bernoulli's principle
    - Advantages of hydraulic systems
    - Hydrodynamics
    - Hydrostatic
    - Types of properties of hydraulic fluid
        - viscosity
        - friction
        - flow
        - volume
        - velocity
        - laminar
    - Pressure

    - imperial
    - metric
- Force
- Energy
- Work
- Power
- Torque
- Pressure gauge
- Absolute pressure

2. Identify basic hydraulic components and systems and their applications

    - Basic hydraulic components
        - pump
        - hydraulic actuator
            - linear
            - rotary
        - pressure control valve
        - directional control valve
        - volume control valve
        - reservoir
        - hoses
    - Types of hydraulic systems
        - open-center
        - close-center
        - advantages and disadvantages of different systems

3. Interpret and use hydraulic symbols and diagrams

    - Recognize symbols commonly used in hydraulic diagrams
    - Interpretation of schematics and diagrams
        - pictorial drawing
        - cutaway drawing
        - symbol drawing
        - exploded views

4. Identify safety practices

    - Blocking prior to removal (procedures)
    - Releasing system pressure

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1155 - Service Information Systems for Automotive Equipment

SUGGESTED DURATION: 30 hours

PREREQUISITES: None

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit the apprentice will be able to identify types of Service Information Systems used and procedures to obtain data needed from it to make repairs and adjustments.

OVERVIEW OF OBJECTIVES:
1. Locate specifications as detailed in appropriate vehicle service manual.
2. Decode motor vehicle serial numbers for vehicle identification purposes through use of appropriate service manual.
3. Interpret motor vehicle components through manufacturer's identification numbers.
4. Use manufacturers identification systems to interpret vehicle components and equipment.
5. Locate diagnostic procedures in diagnostic charts and procedures to locate problem areas in vehicle and equipment in a logical sequence.
6. Use electronic service data retrieval systems.

CONTENT:

1. Locate specifications as detailed in appropriate vehicle service manual

    - Use of service manuals
        - locating sections
        - follow repairs procedures

2. Decode motor vehicle serial numbers for vehicle identification purposes through use of appropriate service manual.

    - Vehicle identifications
        - make
        - model

- year

3. Interpret motor vehicle components through manufacturer's identification numbers

   - Component identification
     - engine
     - transmissions
     - drive axle

4. Use manufacturers identification systems to interpret vehicle components and equipment

   - Component identification
     - engine
     - transmissions
     - drive axle

5. Locate diagnostic procedures in diagnostic charts and procedures to locate problem areas in vehicle and equipment in a logical sequence.

   a. Diagnostic procedures

   b. J1930 SAE Nomenclature for Electrical and Electronic Components

6. Use electronic service data retrieval systems

   - Electronic Service Data Retrieval System

SUGGESTED LEARNING ACTIVITIES:

1. Using manuals and several different vehicles, identify the model and year for 10 vehicles.
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.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1165 - Hand Tools

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1100 - SV1110 - TS1510 - TS1520 - TS1530

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the student will be able to demonstrate the skills and knowledge needed to properly select, use and maintain common hand held tools for the repair of motorized equipment.

OVERVIEW OF OBJECTIVES:
1. Identify hand tools used in the Automotive Service Industry.

CONTENT:

1. Identify hand tools used in the Automotive Service Industry

    a. Hand Tools: screwdrivers, pliers, hammers, wrenches, punches

    b. Cutting Tools: chisels, hack saws, files, drills, taps and dies, reamers, knives

    c. Measuring Tools: steel rules and squares, calipers, feeler gauges, dial indicators, micrometers, verniers, telescoping gauges, torque wrenches

    d. Other Tools: stud extractors

SUGGESTED LEARNING ACTIVITIES:
1. Use hand tools for motorized equipment while working on different bench work projects.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1175 - Shop Tools and Equipment

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1165

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to correctly and safely use shop tools and equipment.

OVERVIEW OF OBJECTIVES:
1. Identify shop tools and equipment used in the Automotive Service Industry.
2. Using a hoist raise a vehicle to working height, lower and remove the vehicle while following manufacturer's operating procedures.
3. Raise a vehicle using mechanical or hydraulic floor jacks and position vehicle floor stands under a raised vehicle in a location recommended by the vehicle manufacturer.
4. Demonstrate the ability to safely use electrical and pneumatic tools and shop equipment.

CONTENT:

1. Identify shop tools and equipment used in the Automotive Service Industry

    a. Shop Equipment: hoists, floor jacks, safety stands, hydraulic press, drill press, bench grinders, bench vices, pullers, high pressure washers-heated, parts cleaners, pneumatic equipment, air line, portable air tank, creepers-shop maintenance plan, mobile crane, extension lights

    b. Shop Tools: electric drills, power tools, air and electric

    c. Vehicle Protective Equipment: seat and fender covers

2. Using a hoist raise a vehicle to working height, lower and remove the vehicle while following manufacturer's operating procedures

    - Manufacturer's manual

- Safety

3. Raise a vehicle using mechanical or hydraulic floor jacks and position vehicle floor stands under a raised vehicle in a location recommended by the vehicle manufacturer

    - Safety
    - Manufacturer's manual
        - Location recommended

4. Demonstrate the ability to safely use electrical and pneumatic tools and shop equipment

    - Safety

SUGGESTED LEARNING ACTIVITIES:

1. Use hoist safely.
2. Raise vehicles by means of a floor jack and place on safety stands.
3. Use high pressure washer and parts cleaner to clean parts or components.
4. Prepare a shop maintenance plan.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1185 - Fasteners, Tubing and Fittings

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1175

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to properly use various hoses, fasteners, tubing and fittings in every aspect of the occupation.

OVERVIEW OF OBJECTIVES:
1. Identify fastening devices.
2. Select fastening devices.
3. Install fastening devices.
4. Identify ferrous and non ferrous tubing.

CONTENT:

1. Identify fastening devices

    - Types and functions: bolts, capscrews and studs, nuts, washers, pins, snap rings, locking wire, thread repairs, liquid locking compounds, anti-seize

2. Select fastening devices

    - Types and functions: bolts, capscrews and studs, nuts, washers, pins, snap rings, locking wire, thread repairs, liquid locking compounds, anti-seize

3. Install fastening devices

    - Types and functions: bolts, capscrews and studs, nuts, washers, pins, snap rings, locking wire, thread repairs, liquid locking compounds, anti-seize

    - Torquing Procedures and methods
        - Torque wrench
        - Measure stretch

- Torque and turn
- Torque-to-yield fasteners

4. Identify ferrous and non ferrous tubing

   - Types and uses: copper, steel, braided steel, rubber, plastic, low, medium, and high pressure hydraulic hoses
   - Cutting, bending and flaring procedures: ISO flare, single, double

SUGGESTED LEARNING ACTIVITIES:

1. Identify and describe characteristics and uses of common fasteners.
2. Install compression fittings.
3. Cut, flare, bend and connect tubing.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1195 - Lubrication and Fluids Service

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1185

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to perform vehicle lubrication services.

OVERVIEW OF OBJECTIVES:
1. Identify types of lubrication, their ratings and their classifications.
2. Change engine oil and filter.
3. Perform a complete vehicle lubrication.
4. Identify proper disposal of lubricant.

CONTENT:

1. Identify types of lubrication, their ratings and their classifications

    a. Lubricants
        - Engine oils
        - Gear lubricants
        - Chassis grease
        - SAE classification
        - API classification

2. Change engine oil and filter

    a. Lubricating Equipment

    b. Engine Oil Filters

3. Perform a complete vehicle lubrication

    a. Lubricating Charts

b. Lubrication Recovery Systems

c. Bulk Lubrication Systems

d. Service Internals

e. Maintenance during lubrication service
- Check fluid levels
- Lubricate hinges and locks

f. Care for all pressurized systems

4. Identify proper disposal of lubricant
- environment
- recycling

SUGGESTED LEARNING ACTIVITIES:

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

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1375 - Batteries

SUGGESTED DURATION: 15 hours

PREREQUISITES: TS1510 - TS1520 - SV1100 - SV1110 - SV1130 - SV1155 - SV1165

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and replace batteries.

OVERVIEW OF OBJECTIVES:
1. Identify service ratings of batteries to assure proper application and testing procedures.
2. Explain the construction of a battery.
3. Charge batteries.
4. Test battery to determine its service ability according to manufacturer's specification and procedures.
5. Diagnose battery problems and service batteries.

CONTENT:

1. Identify service ratings of batteries to assure proper application and testing procedures

    - Battery rating
        - Uses
        - Explain battery performance ratings

2. Explain the construction of a battery

    - Battery construction
        - Electrolyte
        - Cell construction
        - Types
        - Operation

3. Charge batteries

    - Charging
        - Slow charging
        - Fast charging
        - Low maintenance batteries
        - Filling batteries

4. Test battery to determine its service ability according to manufacturer's specification and procedures

    - Testing
        - Hydrometer
        - Load test
        - Open circuit voltage

5. Diagnose battery problems and service batteries

    a. Safety
        - Safety precautions

    b. Battery problems
        - Undercharges
        - Overcharges
        - Battery condition
        - Battery discharging/parasitic draw

    c. Removal and installation
        - Cable removal
        - Battery mounting
        - Cleaning and repairing terminals and cables
        - Proper polarity connections/multiple battery set up
        - Cleaning battery
        - Special tools

SUGGESTED LEARNING ACTIVITIES:

1. Classroom theory
2. Identify battery ratings
3. Familiarize learner with testing tools
4. Use battery for observation
5. Test batteries
    - load test
    - specific gravity
6. Boost procedures

7. Charge battery
   - Slow
   - Fast

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1385 - Starting Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1185 - SV1375

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and repair starting systems and components on motor vehicles.

OVERVIEW OF OBJECTIVES:
1. Identify components of starting system.
2. Diagnose starting problems.
3. Repair/replace starting systems on vehicle.

CONTENT:

1. Identify components of starting system

    a. Starting system
        - Components and operation

    b. Starter types
        - Direct drive
        - Gear reduction
        - Permanent magnet

    c. Starter switches

    d. Starter devices

2. Diagnose starting problems

    a. Safety procedures

    b. Test meters

- Amp meter
- Volt meter
- Ohm meter

c. Starting system diagnosis
- Battery
- Cables and grounds
- Ring gear and flywheel
- Starter damage
- Neutral and clutch safety switches
- Theft deterrents

d. Starter testing
- Current test
- Circuit voltage drop
- Load test
- Torque test

e. Starter test (Internal)
- Armature
- Commutator
- Field windings
- Solenoids
- Brushes
- Bushings

3. Repair/replace starting systems on vehicle

- Starter service
  - Components
  - Testing
  - Bushing replacement
  - Brush replacement

SUGGESTED LEARNING ACTIVITIES:

1. Classroom Theory
2. Familiarize learner with test equipment
3. Identify starting system components
4. Remove and replace starter.
5. Starter test (internal).
6. Starter test on vehicle.
7. Starter system diagnosis.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1395 - Charging Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1185 - SV1375

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to obtain a working knowledge of the information needed for diagnosing, servicing and repairing charging systems.

OVERVIEW OF OBJECTIVES:
1. Identify charging system components.
2. Explain operation of charging systems.
3. Perform charging system tests using equipment recommended by manufacturer.
4. Make adjustments and repairs to charging system components.
5. Diagnose charging system components.

CONTENT:

1. Identify charging system components

    a. Identification and purpose of alternative parts
        - Stator
        - Rotor
        - Diodes
        - Rectifier bridge
        - Diode trio
        - Brushes

    b. Types and Functions of Regulators
        - Mechanical regulator
        - Transistorized regulator
        - Remote mounted regulator
        - Integral type regulator

    c. Special types of alternators

- Brushless alternator
- 24 volt alternator
- 12/24 volt alternator
- Oil cooled alternator

2. Explain operation of charging systems

   a. Principles and Operation of Alternators
      - Alternator
      - Regulator
      - Battery

   b. Safety hazards working with charging systems

3. Perform charging system tests using equipment recommended by manufacturer

   a. Alternator output test (bench and on vehicle)
      - voltage
      - amperage

   b. Special tools
      - AVR tester
      - DVOM
      - Oscilloscope

4. Make adjustments and repairs to charging system components

   - Alternator Service
      - Disassembly
      - Stator test
      - Rotor test
      - Diodes test
      - Bearing condition
      - Slip ring condition
      - Re-assembly procedures
      - Cleaning procedures

5. Diagnose charging system components

   a. Charging system problems
      - No charge, discharge or overcharge
      - Erratic rate or charge
      - Excessive noise
      - Regulator malfunction
      - Parasitic draw

- Output test
- Regulator bypass test
- Voltage drop test

b. Charge Indicators

SUGGESTED LEARNING ACTIVITIES:

1. Classroom Theory
2. Familiarize learner with test equipment
3. Identify charging system components
4. Remove and replace alternator.
5. Alternator and regulator test (internal).
6. Charging system diagnosis.

SUGGESTED RESOURCES:

1. Alternator and regulator (on car).

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NAME AND NUMBER: SV1600 - Ignition Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1185 - SV1375

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to repair and service basic ignition systems.

OVERVIEW OF OBJECTIVES:
1. Identify ignition system components.
2. Understand the operating principles of an ignition system.
3. Diagnose and service ignition system problems.

CONTENT:

1. Identify ignition system components

    a. Ignition System Description
        - Types
        - Components
        - Function of each type

    b. Distributor Ignition
        - Operation
        - Components

    c. Distributor less Ignition

2. Understand the operating principles of an ignition system

    a. Ignition Timing
        - Distributor removal and installation

    b. Spark plugs

- Types
- Heat ranges
- Servicing
- Correct installation

c. High tension leads
- Types
- Testing

d. Ignition Switches
- Testing

e. Ignition Coils
- Operation
- Circuits
- Resistors
- Testing

3. Diagnose and service ignition system problems

a. Diagnose Ignition System malfunction
- No spark at plugs
- Weak or intermittent spark
- Engine misfire
- Coil failure
- Short plug life
- Pre-ignition
- Detonation
- Back firing

b. Visual Inspection
- Loose wires
- Corroded wires

c. Service manuals
- Trouble trees
- Electrical diagrams
- Firing orders

d. Special tools
- Tach-dwell meter
- Measuring tools
- Oscilloscope
- Engine analyzers

SUGGESTED LEARNING ACTIVITIES:

1. Classroom Theory
2. Service Manuals
   - Trouble trees
   - Electrical diagrams
3. Identify ignition system types
4. Familiarize learner with test equipment
5. Ignition timing
6. On Vehicle Testing
   - Coils
   - Plug
   - Wires
7. Ignition System Trouble Shooting
8. Use test equipment on vehicle testing

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1495 - Lighting Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1185 - SV1375

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service motor vehicle lighting system.

OVERVIEW OF OBJECTIVES:
1. Identify types of lighting systems associated with a vehicle.
2. Use test equipment to locate, opens, shorts and grounds in lighting systems.
3. Make repairs to lighting system; wiring harness, bulb replacement, fuses or circuit breakers using wiring diagrams to locate circuits and components of circuits.
4. Diagnose motor vehicle lighting systems.

CONTENT:

1. Identify types of lighting systems associated with a vehicle

Aim headlights according to manufacturers instruction and highway safety inspection regulations

a. Exterior lighting
- Bulb identification
- Headlights and circuits
- Park lights
- Brake lights
- Signal lights
- Emergency flasher
- Fuses and circuit breakers
- Fusible links

b. Interior lighting
- Dome lights
- Dash lights
- Glove compartment lights
- Courtesy lights
- Illuminated entry

c. Accessory Lighting
- Trailer lights
- Roof lights
- Fog lights

d. Daytime Running Lights

2. Use test equipment to locate, opens, shorts and grounds in lighting systems
- Headlight aiming
- Aiming equipment
- Aiming procedures
- Replacement procedures

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

a. Meters and test lights
b. Trim Component Removal
- Special tools

4. Diagnose motor vehicle lighting systems

- Diagnose Lighting System Problems
  - Wiring diagrams
  - Wire and terminal connection

SUGGESTED LEARNING ACTIVITIES:
1. Classroom Theory
2. Read Wiring Diagrams
3. Familiarize Learner with Test Equipment
4. Headlight aiming.
5. Diagnose electrical faults.
6. Repair electrical faults.

SUGGESTED RESOURCES:
1. Test instruments.

NAME AND NUMBER: SV2000 - Instruments, Safety Devices

SUGGESTED DURATION: 75 hours

PREREQUISITES: SV1185 - SV1375

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate a working knowledge of the procedure for diagnosis, repair and replacement of automotive instruments, safety devices and power accessories.

OVERVIEW OF OBJECTIVES:
1. Identify safety devices normally associated with a vehicle.
2. Service and repair electronic instruments, accessories and safety devices.

CONTENT:

1. Identify safety devices normally associated with a vehicle

    a. Indicators
        - Oil, temperature and fuel gauges
        - Indicator lights

    b. Safety devices
        - Security alarm
        - Seat belt warning
        - Headlight on warning
        - Key in switch warning
        - Keyless entry systems

    c. Windshield wiper and washers

2. Service and repair electronic instruments, accessories and safety devices

        - Difference between “electronic” and “electrical” when considering instruments

- Types of displays and advantages/disadvantages
  - LED
  - CRT (cathode ray tube)
  - Liquid crystal
  - Vacuum tube flourescent
  - Analogue (needle)
- Sources of information for displays
  - stand-alone computers or modules
  - PCM or VCM supplied
  - data buses and "computerized clusters"
- Odometers
  - motorized/mechanical
  - non-volatile memory
- Sensors
  - permanent magnet vehicle speed sensor
  - buffers, digital ratio adaptors
  - photo-electric
- Service reminders
  - Oil change notices
  - Emission system reminders
  - Reset methods

SUGGESTED LEARNING ACTIVITIES:

1. Classroom Theory
2. Familiarize learner with test equipment
3. Identify instrument, safety devices and power accessory components.
4. Identify differences between electrical and electronic dash boards.
5. Repair wiring harness.
6. Diagnose electrical problems.
7. Check and repair power accessories, safety devices and instruments.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2010 - On-Board Diagnostics I

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV2680

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to use on-board diagnostic systems to identify and diagnose problems in vehicle systems.

OVERVIEW OF OBJECTIVES:
1. Use on-board diagnostic systems to identify and diagnose problems in vehicle systems.

CONTENT:

1. Use on-board diagnostic systems to identify and diagnose problems in vehicle systems

    a. 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)
        - Means of checking these systems, bulb check position when turning ignition or run key to start, normal operation of light-key on-engine not running and with engine running
        - Circuit operation-means of operating light: pressure switches, temperature switches, voltage differences (charge indicator), solid state switches-modules or computers-driver circuits
        - Diagnosis of light systems, circuit checks-load power source-ground (what completes circuit?)
        - Checking computer circuits/or voltage drop

    b. Additional diagnostic help from on-board computers
        - Trouble codes, accessing codes-grounding connectors-key cycles-control button combinations-read-out devices-voltmeters, MIL, digital dashes
        - 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

c. Service procedures
   - Use of shop manuals, step charts or diagnostic routines, specifications, circuit operating modes
   - Repair verification

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2011 - On-Board Diagnostics II

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV2010

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to diagnose and repair OBD-Generation II systems.

OVERVIEW OF OBJECTIVES:
1. To diagnose and repair OBD II systems.

CONTENT:

1. To diagnose and repair OBD II systems

    a. Comparison between OBD I and OBD II

    b. Types of diagnostic self-testing: passive, active, intrusive, recording test results

    c. Test fail actions (what happens if a test fails)

    d. DTC: identification, types, pass/fail reporting, conditions to set and condition to clear DTC's

    e. Input monitoring

    f. HO2S (Heated Oxygen Sensor) and catalyst diagnostics

    g. Misfire detection: misfiring causing more than 1½ times acceptable emissions, catalyst damaging misfire, rough road detection (software approach, ABS approach)

    h. Output monitoring: idle speed, fuel trim, EGR

i. EVAP system diagnostics: non-enhanced systems, enhanced systems

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1215 - Wheels and Tires

SUGGESTED DURATION: 15 hours

PREREQUISITES: TS1510 - TS1520 - TS1530 - SV1100 - SV1110 - SV1120 - SV1155 - SV1195

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair wheel and tires.

OVERVIEW OF OBJECTIVES:
1. Demonstrate knowledge of tire construction.
2. Demonstrate knowledge of wheels.
3. Change and repair tires/tubes.
4. Balance wheels and tires.
5. Rotate wheels.
6. Identify causes and effects of tire wear.

CONTENT:

1. Demonstrate knowledge of tire construction

    - Tire construction
        - Types
        - Rating
        - Size
        - Unidirectional tires

2. Demonstrate knowledge of wheels

    - Types
    - Sizes
    - Run out
    - Unidirectional wheels
    - Wheel offset

- Back spacing
- Wheel nut torquing and tightening sequence
- Wheel stud replacement

3. Change and repair tires/tubes

   - Dismounting and mounting procedures
   - Tire pressures and balance

4. Balance wheels and tires

   - Describe static and dynamic balance
   - Balance method on and off the vehicle
   - Wheel weights and safety precautions

5. Rotate wheels

   - Purpose
   - Sequence

6. Identify causes and effects of tire wear

   - Causes and effects of tire wear

SUGGESTED LEARNING ACTIVITIES:

1. Classroom theoretical testing by instructor from test bank.
2. Lab practical skills evaluation done by instructor.
3. Balance wheels and tires.
4. Change tires.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1610 - Steering Columns

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1215

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to inspect and repair steering columns.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of steering columns.
2. Remove, disassemble and reassemble a steering column.

CONTENT:

1. Identify components and functions of steering columns

    - Steering columns and shafts
        - Air bag disarming, removal and reinstallation
        - Construction and operation of steering columns and sub components
        - Standard
        - Tilt
        - Telescopic
        - Turn signal
        - Cruise
        - Ignition switch
        - Horn
        - Dimmer
        - Lights
        - Radio

2. Remove, disassemble and reassemble a steering column

    a. Steering wheel removal and replacement

b. Shaft and coupling service

c. Energy absorbing steering columns

d. Identify problems

e. Steering locks
- Types and functions
- Removal and replacement procedure

SUGGESTED LEARNING ACTIVITIES:
1. Classroom theoretical testing by instructor from test bank.
2. Lab practical skills evaluation done by instructor.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1255 - Suspension

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1610

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair suspension components.

OVERVIEW OF OBJECTIVES:
1. Identify and inspect suspension components.
2. Remove and replace shock absorbers.
3. Remove and replace stabilizer bars.
4. Remove and replace ball joint.
5. Remove and replace struts.
6. Remove and replace coil springs and control arms.
7. Remove and replace leaf spring.
8. Remove, replace and adjust torsion bars.
9. Remove, replace and adjust air ride system.
10. Computer controlled active suspension systems.

CONTENT:

1. Identify and inspect suspension components

    a. Design of suspension

    b. Types of suspension systems (front and rear)
    - Independent
    - Solid axle
    - Twin beam
    - McPherson strut
    - Flex axles

    c. Frames

- Types
- Purpose
- Energy absorbing bumpers

d. Front and rear suspension components and systems
e. Describe operations of SLA, strut and wish-bone suspension
f. Explain spring terms
   - Sprung
   - Unsprung
   - Spring rate
g. Inspection procedures

2. Remove and replace shock absorbers

   - Types and purpose
   - Checking for serviceability
   - Removal and replacement procedures

3. Remove and replace stabilizer bars

   - Types and purpose
   - Inspection
   - Removal and replacement procedures

4. Remove and replace ball joint

   - Inspection
   - Types and purpose
   - Removal and replacement procedures
   - Service

5. Remove and replace struts

   - Inspection
   - Types and purpose
   - Removal and replacement procedures
   - Service

6. Remove and replace coil springs and control arms

   - Inspection
   - Types and purpose
   - Removal and replacement procedures
   - Service

7. Remove and replace leaf spring

- Inspection
- Types and purpose
- Removal and replacement procedures
- Service

8. Remove, replace and adjust torsion bars

    - Inspection
    - Types and purpose
    - Removal and replacement procedures
    - Service

9. Remove, replace and adjust air ride system

    - Inspection
    - Types and purpose
    - Removal and replacement procedures
    - Service
    - Active suspension
    - Air ride components
        - Height sensor
        - Control module
        - Air control solenoids
    - Computer controlled active suspension system

10. Computer controlled active suspension systems.

    - Diagnosis
    - Repair procedures

SUGGESTED LEARNING ACTIVITIES:

1. Classroom theoretical testing by instructor from test bank.
2. Lab practical skills evaluation done by instructor.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1225 - Manual Steering

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1255

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair manual steering components.

OVERVIEW OF OBJECTIVES:
1. Disassemble, assemble, test and adjust steering gear.
2. Disassemble, assemble, test and adjust steering linkage.

CONTENT:

1. Disassemble, assemble and adjust steering gear

    - Types
        - Cam and lever (identification)
        - Worm and roller (identification)
        - Recirculating ball
        - Rack and pinion
    - Operation
    - Ratio
    - Overhaul and adjustment procedures
    - Identify problems
    - Testing

2. Disassemble, assemble and adjust steering linkage

    - Components
    - Steering geometry
    - Toe setting
    - Steering wheel centering
    - Linkage adjustment procedure

- Testing

SUGGESTED LEARNING ACTIVITIES:

1. Classroom theoretical testing by instructor from test bank.
2. Lab practical skills evaluation done by instructor.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2020 - Power Steering

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1610 - SV1140

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair power steering components.

OVERVIEW OF OBJECTIVES:
1. Identify power steering components and their functions.
2. Disassemble, assemble and adjust a power steering gear box assembly.
3. Disassemble and assemble a power steering pump.
4. Diagnose power steering systems.

CONTENT:

1. Identify power steering components and their functions

    - Valving
    - Pumps
    - Steering boxes

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

    - Gear types integral
    - Linkage
    - Rack and pinion
    - Fluids and adjustments
    - Inspect, test and repair
    - Hydraulic principles
    - Control valve

3. Disassemble and assemble a power steering pump

- Types
- Drives
- Removal
- Repair
- Inspect, test and repair

4. Diagnose power steering systems

   - Leaks
   - Pressure flow test
   - Noise diagnose

SUGGESTED LEARNING ACTIVITIES:

1. Classroom theoretical testing by instructor from test bank.
2. Lab practical skills evaluation done by instructor.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2030 - Electronic Power Steering

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1130 - SV1215 - SV2680

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service electronic power steering systems.

OVERVIEW OF OBJECTIVES:
1. Identify electronic power steering components and their functions.
2. Service and replace components of electronic power steering systems.

CONTENT:

1. Identify electronic power steering components and their functions

    - Principles of operation
        - Computer
        - Sensor inputs
        - Outputs-control of hydraulics
        - Operating modes

2. Service and replace components of electronic power steering systems

    - Diagnostic strategy
    - Quick tests and visual inspection
    - Trouble codes
    - Test equipment

SUGGESTED LEARNING ACTIVITIES:
1. Use a scan tool to check trouble codes and retrieve data.
2. Use recommended equipment to do a system pressure test.
3. Check solenoids and computer outputs.

4. Remove and replace a control solenoid.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2040 - Wheel Alignment

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1225 - SV2030

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to perform wheel alignments.

OVERVIEW OF OBJECTIVES:
1. Identifying wheel alignment terminology.
2. Pre-inspect vehicle for wheel alignment.
3. Identify adjustment procedures.
4. Identify alignment problems.
5. Perform wheel alignment.

CONTENT:

1. Identifying wheel alignment terminology

    - Caster
    - Camber
    - Steering axis inclination
    - Included angle
    - Toe-in
    - Tracking
    - Positive and negative scrub radius
    - Setback

2. Pre-inspect vehicle for wheel alignment

    - Service manual procedures

3. Identify adjustment procedures

- Shim pack
- Eccentric
- Slotted adjustment
- Thread adjustment

4. Identify alignment problems

   - Tire's wear
   - Handling problems

5. Perform wheel alignment

   - Two wheel
   - Four wheel

SUGGESTED LEARNING ACTIVITIES:

1. Perform wheel alignments; two and four wheel.
2. Classroom theoretical testing by instructor from test bank.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1285 - Drive Lines

SUGGESTED DURATION: 30 hours

PREREQUISITES: TS1510 - TS1520 - TS1530 - SV1100 - SV1110 - SV1120 - SV1155 - SV1195

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to identify the procedures for the service and repair of drive line components on rear drive automobiles and light trucks.

OVERVIEW OF OBJECTIVES:
1. Identify drive line components and functions.
2. Perform service on drive shafts on rear drive vehicles.
3. Perform service on universal joints on rear drive vehicles.
4. Check drive line angles on rear drive vehicles.
5. Adjust drive line angles on rear drive vehicles.

CONTENT:

1. Identify drive line components and functions

    - Rear end torque
    - Balance
    - Cause of unbalance and effects
    - Types of drive line
        - hotchkiss
        - torque tube
        - insulated
        - two piece

2. Perform service on drive shafts on rear drive vehicles

    - Rear end torque
    - Balance
    - Cause of unbalance and effects

- Types of drive line
  - hotchkiss
  - torque tube
  - insulated
  - two piece
- Remove, phase and install

3. Perform service on universal joints on rear drive vehicles

   - Types
     - cross and roller
     - constant velocity
   - Inspection
   - Lubrication

4. Check drive line angles on rear drive vehicles

   - Purpose

5. Adjust drive line angles on rear drive vehicles

   - Transmission
   - Rear axle
   - Drive shaft

SUGGESTED LEARNING ACTIVITIES:

1. Remove, dismantle, inspect, lubricate and reassemble universal joints.
2. Balance drive shaft and check installation phase and angles of rear wheel drive shaft.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1620 - Front Wheel Drives

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1285

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to demonstrate the procedures for servicing and repairing front wheel drive components, including drive shafts, joints, bearings, seals and steering knuckles.

OVERVIEW OF OBJECTIVES:
1. List front wheel drive components.
2. Identify proper repair procedures for removing and installing front wheel drive components.
3. Identify ABS components.

CONTENT:

1. List front wheel drive components

    - Axle retainers and shafts
    - Support bearing
    - Steering knuckles
    - Constant velocity joints
    - Bearings and seals
    - Lubricants

2. Identify proper repair procedures for removing and installing front wheel drive components

    - Overhaul and replacement procedures
    - Diagnostic procedures

3. Identify ABS components

- Wheel speed sensor
- Sensor rings
- Wiring connections and harnesses

SUGGESTED LEARNING ACTIVITIES:

1. Disassemble, inspect, repair and assemble front wheel drive components.
2. Replace CV boot.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2050 - Engine Clutches

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1620

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service, repair and adjust clutch components for both front and rear drive automobiles and light trucks.

OVERVIEW OF OBJECTIVES:
1. Identify engine clutch components and their functions.
2. Diagnose and adjust a clutch for proper operation.
3. Remove and replace an automobile clutch assembly.

CONTENT:

1. Identify engine clutch components and their functions

    a. Principles of Operation and Safety
        - Pressure plate assembly
        - Flywheel
            - Pilot bearings and bushings
            - Face condition
            - Flywheel and ring gear
            - Refacing

    b. Clutch disc
        - Facings
        - Cushioning device
        - Torsional device

    c. Pressure plate assembly
        - Types
            - Coil spacing
            - Semi-centrifugal

- Diaphragm spacing

d. Clutch release bearing and fork
- Types
- Replacement procedures

e. Clutch housing and clutch shaft

f. Clutch linkage and pedal
- Types
  - Mechanical
  - Hydraulic
- Master and slave cylinders
- Adjustments

g. Transmission removal and replacement
- Procedure

h. Transmission mounts

2. Diagnose and adjust a clutch for proper operation

- Diagnose clutch faults
  - Chatter
  - slippage
  - Noises
  - Not engage/disengage

3. Remove and replace automobile clutch assembly

- Procedures

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

SUGGESTED LEARNING ACTIVITIES:

1. Remove, check, reinstall and adjust a clutch assembly in a rear wheel drive vehicle.
2. Remove, check, reinstall and adjust a clutch assembly in a front wheel drive vehicle.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2060 - Manual Transmissions and Transaxles

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV2050

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair manual transmissions and transaxles.

OVERVIEW OF OBJECTIVES:
1. Identify components of manual transmissions and transaxles.
2. Service manual transmissions and transaxles.

CONTENT:

1. Identify components of manual transmissions and transaxles

    - Basic operation of manual transmissions and transaxles
    - Gear terminology
    - Gear mounting
    - Types of transmissions and transaxles
    - Gears ratios
    - Synchromesh transmissions and transaxles
    - Synchronizers
    - Gear selection
    - Detent and interlock
    - Transaxle final drive
    - Shifting mechanisms
    - Lubricants

2. Service manual transmissions and transaxles

    a. Special tools

    b. Transmission/Transaxle Problem Diagnosis
        - Problems and causes

c. Transmission and Transaxle Service
- Overhaul procedures
- Transmission and transaxle disassembly and reassembly

SUGGESTED LEARNING ACTIVITIES:

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

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2070 - Automatic Transmissions and Transaxles Servicing

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1140 - SV1620

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service, remove and install automatic transmissions and transaxles.

OVERVIEW OF OBJECTIVES:
1. Apply hydraulic principles.
2. Identify components and functions.
3. Perform maintenance service on automatic transmissions and transaxles as it is recommended by the vehicle manufacturer.
4. Remove and install automatic transmission and transaxles and perform in vehicle service.

CONTENT:

1. Apply hydraulic principles

2. Identify components and functions

3. Perform maintenance service on automatic transmissions and transaxles as per manufacturer

    - Selection of fluid
    - Fluid level, cleanliness
    - Factors affecting life of fluids
    - Changing fluid and filters
    - External gasket and seal replacement
    - Band adjustment
    - Throttle and shift linkage

4. Remove and install automatic transmission and transaxles and perform in vehicle service

- Towing or pushing precautions
- Change modulators
- Remove and install automatic transmission and transaxles

SUGGESTED LEARNING ACTIVITIES:

1. Service automatic transmissions and transaxles
   - change fluid and filters
   - adjust bands
   - inspect for leaks

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2080 - Automatic Transmissions and Transaxles Overhauling

SUGGESTED DURATION: 60 hours

PREREQUISITES: SV2070

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to understand the procedures for problem diagnosis and repair of automatic transmissions and transaxles assemblies.

OVERVIEW OF OBJECTIVES:
1. Identify principles of operation of automatic transmissions and transaxles.
2. Diagnose problems in automatic transmissions and transaxles.
3. Repair automatic transmissions and transaxles.

CONTENT:

1. Identify principles of operation of automatic transmissions and transaxles

    a. Torque Converters
        - Types
        - Construction
        - Operating principles
        - Removal, checking and replacement

    b. Automatic Transmissions and Transaxles
        - Components (types, design and materials)
            - planetary gear sets
            - oil pumps
            - pressure regulator valves
            - servos
            - bands
            - clutches
            - spool valves

- balance valves
- manual control valves
- shifter valves
- governors
- throttle valves
- accumulators
- valve body
- upshift valves
- downshift valves

- Transmission cooling and lubrication
- Power flow
- Three speed
- Four speed
- Manual control mechanisms
- Final drive

2. Diagnose problems in automatic transmissions and transaxles

- Pressure test
- Problem diagnosis
- Road test

3. Repair automatic transmissions and transaxles

- Follow manufacturer's manual

SUGGESTED LEARNING ACTIVITIES:

1. Dismantle, inspect, repair and assemble automatic transmissions and transaxles.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2090 - Electronic Transmission Control

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1130 - SV2011 - SV2080

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to diagnose and repair transmissions with electronic control systems.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of electronic transmission control.
2. Diagnose and repair transmissions with electronic control systems.

CONTENT:

1. Identify components and functions of electronic transmission control

    - Operation of electronic transmission controls
        - Computer systems used with automatic transmissions
        - Components controlled by computer
        - Computers used-dedicated computer, PCM, VCM
        - Computer inputs
        - Computer outputs
        - On-off solenoids
        - PWM solenoids and force motors
    - Hydraulic components used with computer control
        - Hydraulic versus electronic gear selection
        - Shift valves
        - Converter control circuits
        - Pressure control circuits

2. Diagnose and repair transmissions with electronic control systems

    a. Diagnosis of problems

- Diagnostic procedures
  - Diagnostic strategy
  - Use of self-diagnostics
  - Scan tool use
  - Road testing and use of check charts
  - Failure modes
  - Pressure tests

b. Repairs and adjustments
- Replacement of transmission components
  - Wiring repairs
  - Clearing of trouble codes
  - Clearing or resetting of adaptive memory after repairs
  - Reprogramming

SUGGESTED LEARNING ACTIVITIES:

1. Use a scan tool to check for codes and access data.
2. Use a diagnostic chart to diagnose a trouble code.
3. Perform a procedure test.
4. Do a resistance test on transmission solenoids.
5. Remove and replace a shift solenoid.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2100 - Transfer Cases and Hub Assemblies

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV2680 - SV1285

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to identify and perform the procedures for the service and repair of transfer cases and hub assemblies on four wheel drive vehicles.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of transfer cases and hub assemblies.
2. Diagnose problems in a transfer case and service it or replace it.
3. Service front hub assemble on four wheel drive vehicles.

CONTENT:

1. Identify components and functions of transfer cases and hub assemblies

    - Type of transfer case
        - part time four wheel drive
        - full time four wheel drive
        - automatic

    - Operating precautions

2. Diagnose problems in a transfer case and service it or replace it

    - Lubricants
    - Transfer case problems diagnosis
    - Transfer case overhaul
    - All wheel drive

3. Service front hub assemble on four wheel drive vehicles

- Automatic locking type
- Manual locking type
- Service procedures

SUGGESTED LEARNING ACTIVITIES:

1. Remove, inspect, repair and assemble a transfer case assembly.
2. Disassemble, repack and assemble front locking hub assembly on four wheel drive vehicles.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2110 - Differentials and Axles Assemblies

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1285 - SV1620 - SV2120

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to identify procedures for axle shaft removal and replacement and the service of bearing and seals in rear wheel drive vehicles.

OVERVIEW OF OBJECTIVES:
1. Demonstrate knowledge of the operation of principles of differential assemblies.
2. Evaluate the condition of a differential to determine its serviceability.
3. Overhaul a differential assembly.
4. Service axle, bearings and seals.

CONTENT:

1. Demonstrate knowledge of the operation of principles of differential assemblies

    a. Differential (Standard)
        - Theory of operation-operation principles
        - Types (removable and integral carrier)
        - Components
        - Adjustments
        - Lubrication
        - Ratio

    b. Differential (limited slip)
        - Theory of operation-operation principles
        - Types
        - Adjustments
        - Lubrication

2. Evaluate the condition of a differential to determine its serviceability

    - Problem diagnosing
    - Removal and replacement
    - Overhaul procedures
    - Pinion seal replacement procedures

3. Overhaul a differential assembly

    - Procedures

4. Service axle, bearings and seals

    a. Types of axles
        - Semi floating
        - Three quarter floating
        - Full floating

    b. Attaching axle in the housing
        - C-locks
        - Axle retainer plate

    c. Types of rear axle bearings and retainers
        - Straight roller type
        - Tapered roller type
        - Ball bearing type

    d. Measurement and adjustment of end play

SUGGESTED LEARNING ACTIVITIES:

1. Disassemble, inspect, repair, assemble and adjust a differential.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1630 - Brake Systems

SUGGESTED DURATION: 90 hours

PREREQUISITES: TS1510 - TS1520 - TS1530 - SV1100 - SV1110 - SV1120 - SV1155 - SV1195 - WD1300

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair brake systems and components.

OVERVIEW OF OBJECTIVES:
1. Identify brake system components and purpose.
2. Bleed brake systems.
3. Machine brake drums and brake rotors to dimensional tolerances.
4. Inspect and overhaul wheel cylinders, brake calipers, and master cylinder.
5. Diagnose automotive brake system malfunctions.
6. Identify safety precautions when working with ABS brakes.

CONTENT:

1. Identify brake system components and purpose

    - Theory of operation (hydraulic and friction)
    - Brake fluid types, condition, and handling
    - Brake lines and fittings
    - Describe the purpose, construction, and operation of hydraulic braking systems
    - Coefficient of friction
    - Calipers
    - Cylinders
    - ABS brakes (introduction)

2. Bleed brake systems

    - Bleeding brakes (non-ABS)
        - Methods of bleeding

- Bleeding sequences
- Fluid control valves

3. Machine brake drums and brake rotors to dimensional tolerances

- Brake drum service
  - Identify components
  - Describe the operations and construction of the drum brake system
  - Brake drum removal and replacement
  - Inspect brake drum condition
  - Measure brake drum
  - Machine brake drum
  - Brake adjustment
- Brake lining service
  - Check lining condition (wear and contamination)
  - Brake shoe arc
  - Brake shoe replacement procedures
- Parking brake service
  - Check for proper operation
  - Cable replacement and adjustment
- Disc brake service
  - Caliper removal and replacement
  - Brake rotor removal and replacement
  - Inspect rotor condition
  - Measure rotor
  - Machine brake rotor
- Disc brakes (general)
  - Types
  - Components and their operation

4. Inspect and overhaul wheel cylinders, brake calipers, and master cylinder

- Wheel cylinders service
  - Inspect for leaks and proper operation
  - Removal of wheel cylinder
  - Dismantle and service of wheel cylinder
- Brake caliper service
  - Inspect for leaks and proper operation
  - Inspect brake pad condition
  - Dismantle and service caliper
- Master cylinder (general)
  - Types
  - Components and function
- Master cylinder service
  - Inspect condition and operation
  - Removal, reconditioning and installation

- Hydraulic control valves

5. Diagnose automotive brake system malfunctions

   - Theory of operation-basic
   - Identify components

6. Identify safety precautions when working with ABS brakes

   - Difference in service procedures between various types of anti-lock systems

SUGGESTED LEARNING ACTIVITIES:

1. Inspect, test and repair drum brakes.
2. Inspect, test and repair disc brakes.
3. Inspect, test and repair master cylinder and wheel cylinder.
4. Inspect, test and repair machine drums and disc rotors.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1640 - Power Brake Systems

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1630

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and diagnose problems of power brake systems.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of power brake system.
2. Diagnose problems in a power brake system and service them.

CONTENT:

1. Identify components and functions of power brake system

    a. General purpose of power brake system

    b. Types of power boosters and theory of operation
        - Vacuum operated
        - Power steering pressure operated (Hydroboost)
        - Electric pump operated

    c. Inspect power brake system
        - Troubleshoot problems
        - Make adjustments

    d. Vacuum pump

    e. Remote reservoir

2. Diagnose problems in a power brake system and service them

    - Replacement procedures

SUGGESTED LEARNING ACTIVITIES:

1. Inspect, remove and diagnose PBS.
2. Inspect anti-lock brake components.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2120 - ABS/Traction Control Systems

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1130 - SV1215 - SV1640 - SV2680

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to diagnose and repair anti-lock brake systems (ABS) and traction control systems (TCS) on light duty motor vehicles.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of ABS/Traction control systems.
2. Demonstrate knowledge of the principles of operation of an ABS system.
3. Diagnose and repair anti-lock brake systems (ABS) on light duty motor vehicles.
4. Diagnose and repair traction control systems (TCS) on light duty motor vehicles.

CONTENT:

1. Identify components and functions of ABS/Traction control systems

    - Computer
    - Hydraulic modulator
    - Wheel speed input
    - Sensor circuit
    - Hydraulic channels

2. Demonstrate knowledge of the principles of operation of an ABS system

    - Benefits and limitations of ABS
        - Coefficient of friction-tire to road
        - Maximum braking versus maximum steering
        - Stopping ability with ABS on 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

- System variations
  - Types of wheel speed calculation-wheel speed averaging-select low
  - Hydraulic outputs-front/rear split, diagonal split, individual control

- System construction-computers and sensors
  - Computer (EBCM-electronic brake control module) feeds and grounds
  - Computer inputs-wheel speeds (or vehicle speed)
    - brake switch
    - 4 wheel drive position
    - modulator inputs to EBCM
    - diagnostic request
  - Computer output-hydraulic modulator
    - ABS warning lights
    - diagnostic output
  - Wheel speed sensor construction
    - Operates on frequency
    - Mounting methods and air gaps
- Hydraulic modulator construction
  - Kelsey Hayes Rear Wheel Anti-Lock
    - isolation valve
    - dump valve
    - low pressure accumulate
    - reset switch
  - Integral system modulator
    - pumps
    - accumulators
    - control valves
    - rear wheel operation
  - Teves and Bosch add-on systems
  - Delco 6 construction and operation
  - Bendix systems
- System self-diagnostics
  - Self checks on start up
  - Continuous monitoring
  - Failure modes and actions
  - Trouble codes
  - Wheel speed sensor diagnostics
    - vehicle moving
    - vehicle not moving

3. Diagnose and repair anti-lock brake systems (ABS) on light duty motor vehicles

   a. Problem Diagnosis
   - Diagnostic procedures-logical approach to problem solving
   - Separating what is normal (from what is not normal)
     - Mechanical condition of brake system

- System cut-out speeds (no ABS below a pre-determined speed)
- Causes of brake grabbing or lock-up at low speed (a non-ABS problem)
- Retrieving trouble codes and code charts
- Pressure gauges
- Break-out and pin-out boxes
- Speed sensor circuit problems

b. System Service
- Hydraulic service
  - Check brake fluid levels
  - Bleeding brakes
  - Acceptable brake fluid type (DOT 3)
- Precautions when doing non-ABS service
  - Replacing wheel studs
  - Use of top quality parts
  - Electric welding precautions
  - Tire replacement and air pressures

c. System repairs
- Speed sensor circuits
  - Sensor replacement or adjustment
  - Wiring repairs and locations
  - Changes to accommodate different size tires on trucks-reprogramming and speed sensor buffer (DRAC) changes
  - Replacement of speed sensor components on non-serviceable type wheel bearings

4. Diagnose and repair traction control systems (TCS) on light duty motor vehicles

- Methods of achieving traction control (reduction of positive wheel slip)
  - Selective application of brakes on spinning drive wheels
  - Throttle control
  - Torque reduction-timing retard-fuel cutback or cut-off
  - Operating speeds
- Components used with traction controls
  - Manual controls
  - Indicator lights
  - Separate hydraulic actuators

SUGGESTED LEARNING ACTIVITIES:

1. Locate the components used with an ABS system.
2. Describe basic operation of an ABS system.
3. Check wheel speed sensor diagnostic capability of system.
4. Connect a scan tool and check system for codes and read data.
5. Perform resistance checks on system components.

6. Describe bleeding procedures for a 4-wheel ABS system.
7. Replace ABS components.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2130 - Introduction to Air Brake Systems

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1630

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate a working knowledge of the construction, operating principles, testing and servicing of air brake assemblies.

OVERVIEW OF OBJECTIVES:
1. Identify components and functions of air brake systems.
2. Test and service air brake systems.

CONTENT:

1. Identify components and functions of air brake systems

    a. Components
    - compressor
    - types
        - classifications
        - operating principles
    - reservoir
        - types (dry, wet)
        - purpose
        - classification
        - safety valves
    - valves
        - operating principles
            - foot valves
            - quick release valves
            - relay valves
            - hand valves
            - limiting valves
            - automatic reservoir drain valves
            - check valves (single and double)

    - brake chamber

- types and design
- functions
- inter-relationship of components
- operating principles
- adjustments

- brake shoe and drums
  - types
    - cams
    - wedge
  - lubrication
- indicator and warning devices

b. Removal and installation procedures of components
c. Repair procedures of components
d. Maintenance of components
e. Adjustment of some components

2. Test and service air brake systems

a. Procedures
b. Reservoir leaking or water accumulation
c. Low or high air pressure
d. Frozen air lines
e. Camshaft and bushing wear
f. Braking performance

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2140 - HVAC Systems

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1110 - SV1375 - SV2200

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to diagnose and correct problems with HVAC Systems.

OVERVIEW OF OBJECTIVES:
1. Identify automotive HVAC systems components and purpose.
2. Diagnose and correct problems with automotive heating and ventilating systems.
3. Diagnose and correct problems with automotive air conditioning systems.
4. Convert A/C systems from R-12 refrigerant to R-134 or other accepted refrigerants.

CONTENT:

1. Identify automotive HVAC systems components and purpose

    - Components
    - Operating Principles
    - Methods of temperature control
        - water valve
        - control door

    a. Basic air conditioning factors
        - benefits
        - forms of heat transfer
        - states of matter
        - heat measurement

    b. The basic refrigeration circuit
        - the basic circuit
        - evaporator
        - compressor

- condenser
- metering devices
  - orifice tubes
  - expansion valves
- receiver/dryer
- accumulator/dryer

c. Types of Compressors
- fixed displacement compressors
- variable displacement compressors

2. Diagnose and correct problems with automotive heating and ventilating systems

- Servicing heating and ventilation systems
  - controls
  - hoses
  - heater cores
- Diagnosing heating and ventilation system problems
  - coolant leaks
  - lack of heat
  - excessive heat

3. Diagnose and correct problems with automotive air conditioning systems

a. Refrigerant
- handling safety
- R-12, R-134 and blends
- temperature/pressure relationship
- environmental concerns

b. A/C system types
- Cycling Clutch/Orifice Tube
- Variable Displacement/Orifice Tube
- Cycling Clutch/Thermostatic Expansion Valve
- Variable Displacement/Thermostatic Expansion Valve

c. A/C controls
- manual control systems
- components of manual control systems
- automatic temperature control systems
- components of auto temp A/C systems

d. Diagnosis of HVAC system problems
- function test
- performance test
- gauge and manifold sets

e. Refrigerant system service
- refrigerant recovery and recycling
- system evacuation and leak testing
- recharging
- component replacement

f. Compressor service-without discharge
- clutch repairs
- pulley bearing replacement

g. Compressor service-system discharged
- shaft seal replacement
- switch replacements
- control valve and pressure relief valve replacement

h. Installation of filters in contaminated refrigerant systems

i. Objectionable odors from A/C systems
- Cause of odor
- Removal of biological cause
- After-blow systems for HVAC fan

j. Servicing of ventilation air intake filter.

4. Convert A/C systems from R-12 refrigerant to R-134 or other accepted refrigerants
- Factors affecting type of conversion needed
- Basic conversion using minimum parts

SUGGESTED LEARNING ACTIVITIES:

1. Check operation of heater and vent controls.
2. Flush a heater core and check water flow.
3. Locate all parts of a basic A/C system.
4. Discharge an orifice tube A/C system; remove and inspect the orifice (if serviceable). Reinstall orifice and charge system.
5. Remove and replace a compressor clutch assembly and shaft seal.
6. Identify changes to be made to convert an A/C system to use an alternate refrigerant gas.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2150 - Power Actuated Accessories

SUGGESTED DURATION: 60 hours

PREREQUISITES: SV1130 - SV1140 - SV1375 - SV1495 - SV2680

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service power actuated accessories.

OVERVIEW OF OBJECTIVES:
1. Identify power actuated accessories.
2. Service power actuated accessories.

CONTENT:

1. Identify power actuated accessories

    - Power Antenna
    - Convertible Top
    - Cruise Control
        - Vacuum operated
        - Stepper motor operated
    - Power Windows
    - Power Seats
    - Sun Roof
    - Trailer Brake Hook-Up
    - Power Door Locks
    - Power Trunk Opener and Closer
    - Power Mirrors
    - Heated Mirrors
    - RAP (Retained Accessory Power) Systems
    - Remote Control for locks, etc.
    - Battery Protection Systems-timer disconnects
    - Comfort and convenience items
        - Radio and antennas
        - Cigarette lighter
        - Power windows

- Power seats
- Power door locks
- Trunk releases and locks
- Sunroofs

- Cruise control
  - Vacuum operated
  - Stepper motor type

- Anti-theft systems
  - types
  - operation

2. Service power actuated accessories

   a. Review of diagnostic strategy
      - Verify customer concern
      - Preliminary checks
      - Use published diagnostic systems checks
      - Check for service bulletins
      - Use trouble code diagnostics if codes are present
      - Use system diagnosis
      - Use diagnostics suitable for intermittent problems
      - Call an expert
      - Verify repair

   b. Actuator Circuits
      - Solenoids
      - Series-wound motors
      - Permanent magnet (PM) motors
      - Hydraulic circuits

SUGGESTED LEARNING ACTIVITIES:

1. List and describe the steps in a diagnostic strategy.
2. Locate feeds and grounds, and all components used in a power window or power door lock system.
3. Perform diagnostic tests on a power door lock or power window system.
4. Describe a trailer hook-up, including all lights, auxiliary power and electric brakes.
5. Describe the operation of a battery protection timer disconnect system.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2160 - Air Bag Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1610 - SV2010

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service SIR (Supplemental Inflatable Restraint) systems. To service these systems the technician will also need current service information and tools.

OVERVIEW OF OBJECTIVES:
1. Demonstrate knowledge of SIR system design, operation and components.
2. Demonstrate knowledge of service procedures for SIR systems.
3. Diagnostic of SIR systems.

CONTENT:

1. Demonstrate knowledge of SIR system design, operation and components

    a. System design and operation
        - System design
        - Occupant protection in a crash

    b. System components
        - Inflator module
        - SIR coil (in steering wheel)
        - Warning lamp
        - Arming sensors
        - Discriminating sensors
        - DERM (diagnostic energy reserve module)
        - Wiring harness
        - Shorting devices
        - Side impact

2. Demonstrate knowledge of service procedures for SIR systems
    a. System service precautions
        - SIR diagnostic check
        - Disabling the SIR

- Enabling (connecting) the SIR
- Precautions when windshields are replaced
- Component handling precautions
- ESD (electro-static discharge - static electricity) precautions
- Special tools for SIR service
- Wiring repairs

b. Diagnostic procedures
- Trouble codes
- Scan tool use
- Crash event recording

c. Inflator module (air bag) disposal procedures and vehicle scrapping procedures

d. SDM (sensing and diagnostic module) systems
- Difference between DERM and SDM systems

e. Inspection of components after a crash
- Steering column dimension check
- Replacement of sensors

3. Diagnostic of SIR systems

SUGGESTED LEARNING ACTIVITIES:

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1305 - Engine Principles

SUGGESTED DURATION: 60 hours

PREREQUISITES: TS1510 - TS1520 - TS1530 - SV1100 - SV1110 - SV1120 - SV1155 - SV1195

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate the knowledge and skills necessary for the understanding of the operation principles of an internal combustion engine.

OVERVIEW OF OBJECTIVES:
1. Identify and describe all the components of an internal combustion engine.
2. Describe the operating principles of an internal combustion engine.

CONTENT:

1. Identify and describe all the components of an internal combustion engine

    a. Engine design and classification

    b. Engine components
        - cylinder block: types and design
        - cylinder liners
        - crankshaft and main bearing
        - balance shaft
        - connecting rod and bearing
        - piston
        - ring
        - flywheel
        - drive plate
        - vibration damper
        - cylinder head
        - camshaft and bearing
        - valve train components
        - gears and sprockets
        - timing chain and belt
        - gasket and seals

- intake manifold
- exhaust manifold

2. Describe the operating principles of an internal combustion engine

   a. Engine principles
      - operation with spark ignition
      - operation with compression ignition
      - four stroke cycle
      - two stroke cycle
      - piston displacement: top dead center, bottom dead center, bore, stoke
      - valve timing: fixed, variable, valve lead, valve lag, valve overlap
      - firing order
      - compression ratio
      - volumetric efficiency
      - engine horsepower: indicated, friction, brake, rated
      - engine torque

   b. Combustion chamber design
      - open
      - swirl

   c. Need for engine cooling

   d. Lubrication system components

SUGGESTED LEARNING ACTIVITIES:

1. Disassemble an engine and identify all components.
2. Describe the operation of an engine and the purpose and function of all components.
3. Reassemble the engine.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1315 - Engine Cooling System

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1305

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate the knowledge and skills necessary to inspect, test and service the cooling systems.

OVERVIEW OF OBJECTIVES:
1. Identify components of an engine cooling system.
2. Diagnose problems with cooling system.
3. Mix, install and recycle antifreeze.
4. Drain and clean coolant system.

CONTENT:

1. Identify components of an engine cooling system

    a. Cooling systems
        - Function
        - Types: air, liquid with open recovery system, liquid with pressurized recovery system

    b. Radiator
        - Types: crossflow, downflow
        - Construction: metal, plastic, aluminum
        - Testing
        - Replacement

    c. Radiator cap
        - Function
        - Testing

    d. Radiator and heater hoses
        - Types
        - Inspection

- Replacement

e. Hose Clamp

f. Thermostat
- Purpose
- Testing
- Replacement

g. Water pump
- Testing
- Replacement
- Drives

h. Fan assembly
- Type of drive: clutch type, electric, hydraulic
- Shroud
- Controls
- Testing
- Replacement

i. Coolant
- Types: gasoline, diesel
- Mixing
- Testing
- Additives

j. Block heater
- Type: in block, in line, metal heating element

2. Diagnose problems with cooling system

- Overheating
- Overcooling

3. Mix, install and recycle antifreeze

4. Drain and clean coolant system

SUGGESTED LEARNING ACTIVITIES:

1. Pressure tests and flush a cooling system.
2. Remove and install a thermostat.
3. Remove and install a water pump.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2170 - Engine Diagnostic and Testing

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1315

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to diagnose problems when gasoline and diesel engines fail to perform properly.

OVERVIEW OF OBJECTIVES:
1. Diagnose problems and replace components when gasoline and diesel engines fail to perform properly.

CONTENT:

1. Diagnose problems and replace components when gasoline and diesel engines fail to perform properly.

    a. Problems
        - oil consumption
        - antifreeze consumption
        - oil contamination
        - antifreeze contamination
        - oil pressure
            - low
            - high
        - cooling problems
        - engine noises
        - valve timing
        - vacuum leaks

    b. Testing equipment
        - compressor gauge
        - vacuum gauge
        - leak down tests

- stethoscope

c. Symptoms
- Engine will not crank
- Cranks slowly, will not start
- Cranks normally, will not start
- Starts, but will not continue to run at idle
- Engine starts, idles rough, without abnormal smoke or noise
- Starts, idles rough with abnormal noise and smoke
- Misfires above idle but idles correctly
- Engine will not return to idle
- Fuel leaks on ground, engine runs normally
- Noticeable loss of power
- Noise or rap from one or more cylinders
- Above normal combustion noise with excessive black smoke
- Engine noise
- Engine overheats
- Instrument panel oil warning light on at idle
- Engine will not shut off with key

SUGGESTED LEARNING ACTIVITIES:

1. Check cylinder compression.
2. Check crankcase pressure.
3. Check engine oil pressure.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2180 - Engine Removal and Installation

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1285 - SV1305 - SV1315 - SV1375 - SV1650 - SV2170

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate the knowledge and skills necessary to remove and install engines.

OVERVIEW OF OBJECTIVES:
1. Identify components and purpose.
2. Remove engines from a vehicle, following manufacturers recommended procedures.
3. Install engines in vehicles using manufacturers recommended procedures.
4. Start and run engine.

CONTENT:

1. Identify components and purpose

    a. Cooling system
        - Draining and filling

    b. Engine oil
        - Draining and filling

    c. Hood
        - Removal and installation

    d. Lifting devices

    e. Electrical components
        - Removal and installation

    f. Fuel system components
        - Removal and installation

g. Emission control system components
- Removal and installation

h. Power steering components
- Removal and installation

i. Air conditioning components
- Removal and installation

j. Exhaust system components
- Removal and installation

k. Lifting procedures

l. Engine mounts
- Removal, installation and inspection

m. Engine (without transmission)
- Removal and installation

n. Engine (with transmission)
- Removal and installation

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

- Removal procedures

3. Install engines in vehicles using manufacturers recommended procedures

- Installation procedures

4. Start and run engine

a. Electrical system
- battery
- starter
- ignition
- base timing
- firing order

b. Fuel system
- fuel supply
- fuel delivery

c. Engine starting
- oil pressure monitoring

- coolant temperature monitoring

d. Engine running
   - check and adjust ignition timing
   - check and adjust idle speed

SUGGESTED LEARNING ACTIVITIES:

1. Remove and install an engine.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2190 - Cylinder Heads and Valve Trains

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV2180

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to inspect and repair automotive engine cylinder heads and valve trains.

OVERVIEW OF OBJECTIVES:
1. Remove and disassemble cylinder head.
2. Inspect and service cylinder heads for defects and wear.
3. Reassemble cylinder heads.
4. Install cylinder head.
5. Make final adjustment to cylinder heads according to manufacturer's specifications.

CONTENT:

1. Remove and disassemble cylinder head

    - Removal procedures
    - Disassembling procedures

2. Inspect and service cylinder heads for defects and wear

    a. Cylinder head inspection and service
        - Measurements: wear and warpage
        - Crack detection
        - Valve seats: regrinding and replacing
        - Valve guides: replacing
        - Expansion plugs
        - Overhead cam

    b. Valve service
        - Inspection

- Regrinding

c. Valve train inspection, service and replacement
   - Pushrods
   - Rockers
   - Springs
   - Rotators
   - Spring seats
   - Camshaft and bearings
   - Lifters
   - Sprockets and gear
   - Timing chain and belt

3. Reassemble cylinder heads

   - Valve seating
   - Valve height
   - Valve adjustment
   - Valve timing

4. Install cylinder head

   - Installation procedures to Mfg specifications
   - Surface preparation
   - Torque (manufacturers specifications)

5. Make final adjustment to cylinder heads according to manufacturer's specifications

   - Valve adjustment (set)
   - Manufacturer's manual

SUGGESTED LEARNING ACTIVITIES:

1. Remove, inspect, repair or replace cylinder head and valve train components.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2190 - Cylinder Block Assemblies

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV2180

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to inspect and overhaul cylinder block assemblies and components.

OVERVIEW OF OBJECTIVES:
1. Disassemble cylinder block.
2. Inspect and service cylinder block using manufacturer's specifications.
3. Recondition and assemble cylinder block assemblies to manufacturer's specifications.

CONTENT:

1. Disassemble cylinder block

    - markings
    - ridge removal
    - clean cylinder block

2. Inspect and service cylinder block using manufacturer's specifications

    a. Cylinder block inspection and measurements
        - wear
        - taper
        - out of round
        - warpage
        - crack detection

    b. Cylinder block service
        - deglazing
        - expansion plug
        - lubricating system inspection

- cooling system inspection
- cylinder liners: removal, installation

c. Crankshaft and bearings
- bearing and clearance
- crankshaft inspection and measurement: detect, wear, taper, out of round
- bearings replacement
- crankshaft end play
- vibration damper: removal, inspection

d. Camshaft and bearing
- inspection
- bearing replacement
- lifter
- pushrods

e. Rings
- Removal
- Installation
- Ring gap phasing
- Ring gap and side clearance

f. Pistons
- Inspection
- Measurements
- Clearance
- Replacement

g. Connecting rods and bearings
- Inspection
- Bearing clearance
- Connecting rod replacement
- Bearing replacement

h. Crankshaft gear and sprocket
- Inspection
- Replacement

3. Recondition and assemble cylinder block assemblies to manufacturer's specifications

- Crankshaft installing procedures
- Camshaft installing procedures
- Pistons installing procedures - ring compressor
- Oil pump: priming, installation
- Oil pan
- Vibration damper installation

SUGGESTED LEARNING ACTIVITIES:

1. Disassemble, inspect, overhaul and reassemble a cylinder block assembly.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2210 - Diesel Fuel System

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1305 - SV2170

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to service and repair mechanical diesel fuel system components.

OVERVIEW OF OBJECTIVES:
1. Identification, components and purpose.
2. Test and replace diesel engine fuel supply pumps and filters.
3. Test and replace diesel engine fuel injectors.
4. Diagnose and replace diesel engine injection pumps.
5. Diagnose problems that can occur in a diesel engine fuel system.
6. Service and repair starting aids.

CONTENT:

1. Identification, components and purpose

    - Injection pumps
        - distributor type
        - inline type
        - electronic
    - Injector type
        - single
        - multi

2. Test and replace diesel engine fuel supply pumps and filters

    a. Properties of diesel fuel

    b. Fuel classification
        - types
        - grades
        - rating

- additives and conditions

c. Tank
- safety
- location and arrangements
- removal and replacement procedures
- repair procedures
- inspection for leaks
- design and material

d. Fuel lines
- types
- fitting
- removal and installation procedures
- repair procedures

e. Filters
- types
- functions
  - restriction indicators
  - water indicators
- water separators
- limitations
- location
- service procedures
- filling and bleeding procedures

f. Fuel heaters and filters
- removal procedures

g. Fuel pump
- testing procedures
  - pressure
  - vacuum
  - volume/delivery

3. Test and replace diesel engine fuel injectors

- Types and applications
- Nozzle protection
- Nozzle test
- Inspection procedures

4. Diagnose and replace diesel engine injection pumps

- Explain pump and injection system operation

- Pressure checking procedure
- Removal and installation
- Fuel solenoid
- Fuel valve
- Fuel lines
- Acceleration controls

5. Diagnose problems that can occur in a diesel engine fuel system

   - Adjustments
   - Manual controls

6. Service and repair starting aids

   - Glow plugs
   - Intake manifold heater
   - Fluid starting aids
   - Block heaters
   - Battery warmers
   - Booster batteries

SUGGESTED LEARNING ACTIVITIES:

1. Inspect and replace diesel fuel system components.
2. Test injector pump operation.
3. Remove, inspect, replace injection nozzle.
4. Adjust governor.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2220 - Emission Control Systems

SUGGESTED DURATION: 45 hours

PREREQUISITES: TS1510 - TS1520 - TS1530 - SV1110 - SV1120 - SV1155 - SV1195 - SV2011 - SV1305 - SV2210

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and repair vehicle emission control systems while maintaining industry and provincial standards.

OVERVIEW OF OBJECTIVES:
1. Identify the components of an emission control system.
2. Follow procedures recommended under provincial guidelines and vehicle manufacturers specifications.
3. Using testing equipment to inspect, test and repair emission control systems.

CONTENT:

1. Identify the components of an emission control system

    a. Crankcase Ventilation
        - Positive
        - Opened and closed

    b. Air Injection
        - Secondary
        - Pulsed secondary

    c. Catalytic Converters (types and functions)
        - Pellet Type
        - Monolithic Type
        - 2 Way
        - 3 Way

    d. Evaporation Controls
        - Tank venting
        - Purging (types)

    e. Spark Timing Controls
        - Thermal Valves

- Knock Sensors

f. EGR Systems
- Positive Back Pressure Valve
- Negative Back Pressure Valve
- Port Gas Recirculation Valve
- Digital
- Linear
- Testing of systems

2. Follow procedures recommended under provincial guidelines and vehicle manufacturers specifications.

- Manufacturer's specifications

3. Using testing equipment to inspect, test and repair emission control systems

- Scope
- Gas analysis
- Scan tools

SUGGESTED LEARNING ACTIVITIES:

1. Ability to diagnose and repair emission systems while maintaining industry standards.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1650 - Fuel Delivery

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1305

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and repair gasoline fuel delivery systems.

OVERVIEW OF OBJECTIVES:
1. Identify types of materials used in fuel tank construction.
2. Identify the major characteristics and properties of fuels.
3. Explain the operation of fuel delivery components.
4. Pressure test and repair fuel systems.

CONTENT:

1. Identify types of materials used in fuel tank construction

    a. Safety Precautions

    b. Tanks
        - Steel
        - Plastic
        - Aluminum
        - Design

    c. Filler tubes
        - Vent pipes
        - Flow back

    d. Filler Caps
        - Pressure Vacuum Type

    e. Pickup Tubes
        - Screen
        - Return

    f. Sending units
        - Types

g. Fuel gauges
- Types
- Low fuel level sensor

h. Filtering
- Single Stage
- Dual Stage

i. Fuel lines and fittings
- Rigid
- Flexible

j. Fuel supply designs
- Return type
- Returnless

2. Identify the major characteristics and properties of fuels

a. Fuels
- Gasoline: Volatility
  - Additives (Ethanol, Methanol)
  - Ratings
  - Combustion
  - Contamination

b. Carburation
- Principles
  - Atomization
  - Vaporization
  - Venturi Principle
  - A/F Ratios
  - Volumetric Efficiency
  - Venturi
  - Computer Controlled
  - Remove and replace
  - Adjustments

3. Explain the operation of fuel delivery components

- Mechanical
- Electrical: Control Circuits
- Reciprocating
- Rotary
- Positive Displacement
- Replacement

4. Pressure test and repair fuel systems

   - Procedures
   - Injector cleaning

SUGGESTED LEARNING ACTIVITIES:

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

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1660 - Air Intake Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: SV1305

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to demonstrate a thorough working knowledge of the design and working application of air intake systems.

OVERVIEW OF OBJECTIVES:
1. Identify air filters.
2. Explain the operating principles of intake manifolds.
3. Explain the operation of turbochargers and superchargers.
4. Inspect, test and repair intake system components.

CONTENT:

1. Identify air filters

    - Principles
    - Types: oil bath, paper or dry type, polyurethane

2. Explain the operating principles of intake manifolds

    - Cold air
    - Hot air
    - Control
    - Distribution
    - Tuning
    - Variable induction

3. Explain the operation of turbochargers and superchargers

    - Construction
    - Principles
    - Induction systems
        - turbochargers
        - superchargers

4. Inspect, test and repair intake system components

    - Principles
    - Control

- Design
- Intercoolers
- Volumetric efficiency

SUGGESTED LEARNING ACTIVITIES:

1. Ability to explain the theory of an intake system, and also be able to inspect, test and repair related components.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2230 - Fuel Injection Systems (gasoline)

SUGGESTED DURATION: 45 hours

PREREQUISITES: SV1305 - SV1375 - SV2011

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to service and repair electronic fuel injection systems.

OVERVIEW OF OBJECTIVES:
1. Identify various types of fuel injection systems.
2. Define the fuel injection system components and their functions.
3. Explain the design and function of major EFI components.
4. Inspect, test and repair/replace fuel injection systems.

CONTENT:

1. Identify various types of fuel injection systems

    - Principles
    - Operation
    - Benefits

2. Define the fuel injection system components and their functions

    - Single
    - Multiple

3. Explain the design and function of major EFI components

    a. Port fuel injection systems
        - Multi-port
        - Sequential
        - Continuous

b. Control modules (microprocessor, PCM)
- Principles
- Speed Density
- Main air flow
- Signals
- Converters
- Memory

c. Injectors
- Construction
- Cold start

d. Pressure regulators
- TBI
- Port

e. Sensors
- Oxygen
- Temperature
- Other related

f. Analog and digital sensors
g. Actuators
h. Fuel Management Strategy
i. OBD Systems

4. Inspect, test and repair/replace fuel injection systems

- Testing

SUGGESTED LEARNING ACTIVITIES:

1. Repair components of the fuel injection system.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2240 - Fuel Injection Diagnosis

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1650 - SV1660 - SV2230

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to inspect, test, service and maintain diesel fuel systems.

OVERVIEW OF OBJECTIVES:
1. Explain carburetted fuel system operation.
2. Explain operation of electronic carburetted fuel system.
3. Identify types of EFI Systems.
4. Identify types of Control Systems.
5. Identify componenets of EFI Systems.
6. Explain the concept of closed Loop and duty cycle.
7. Describe Air/Fuel ratio requirements.
8. Describe the function of components.
9. Explain computer inputs and outputs.

CONTENT:

1. Explain carburetted fuel system operation.

2. Explain operation of electronic carburetted fuel system.

3. Identify types of EFI Systems.

4. Identify types of Control Systems.

5. Identify componenets of EFI Systems.

6. Explain the concept of closed Loop and duty cycle.

7. Describe Air/Fuel ratio requirements.

8. Describe the function of components.

9. Explain computer inputs and outputs.

SUGGESTED LEARNING ACTIVITIES:

- View Videos
- Complete applicable chapter in CEMEQ Module 15 & 16
- On a shop vehicle practice diagnosing fuel delivery system faults
- On a customer's vehicle with a Fuel Delivery System Fault, diagnose problem and recommend repairs
- Prepare and take test which will be administered by your instructor

SUGGESTED RESOURCES:

Performance test procedures for:

- Carburetted Fuel Systems
- EFI Systems
- Feedback Carburetted Systems
- On-board Diagnostic Procedures

NAME AND NUMBER: SV2250 - Alternative and Variable Fuels

SUGGESTED DURATION: 15 hours

PREREQUISITES: SV1650 - SV2230

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this unit, the apprentice will be able to have a working knowledge of other types of fuels that can be used in a combustion engine.

OVERVIEW OF OBJECTIVES:
1. Identify alternative fuels and explain their advantages and disadvantages.

CONTENT:
1. Identify alternative fuels and explain their advantages and disadvantages

    a. Alternate Fuels
        - LPG
        - Hydrogen
        - Methane
        - Licensing
        - Legal aspect
        - Inspect, test and repair

    b. Variable Fuel
        - Principles
        - Components

    c. Hybrids

SUGGESTED LEARNING ACTIVITIES:
1. Explain the composites of alternative and variable fuels and identify the proper applications of each.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV1670 - Exhaust Systems

SUGGESTED DURATION: 30 hours

PREREQUISITES: TS1510 - TS1520 - TS1530

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to identify the procedures used to service and replace automotive exhaust systems and related components.

OVERVIEW OF OBJECTIVES:
1. Components of exhaust systems.
2. Service components of exhaust systems.

CONTENT:

1. Components of exhaust systems

    a. Manifolds
        - Types and designs (combined, separate)

    b. Mufflers and Resonators
        - Types
        - Purpose

    c. Catalytic Converters

    d. Pipes, supports, clamps

    e. Oxygen sensors

    f. Induction systems
        - Turbochargers
        - Superchargers

2. Service components of exhaust systems

    a. Tools
    b. Alignment
    c. Sealers
    d. Removal and replacement procedures
    e. Checking system for leaks and/or restrictions
    f. Safety precautions (carbon monoxide)

SUGGESTED LEARNING ACTIVITIES:

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

SUGGESTED RESOURCES:

1. Lectures
2. Video

NAME AND NUMBER: SV2260 - Preventive Maintenance Inspection

SUGGESTED DURATION: 15 hours

PREREQUISITES: AST Program

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to be familiar with the procedures involved in preventive maintenance inspection.

OVERVIEW OF OBJECTIVES:
1. Describe how to design a preventive maintenance schedule.
2. Perform a preventive maintenance inspection.

CONTENT:

1. Describe how to design a preventive maintenance schedule

    a. Background on Preventive Maintenance Inspections
        - 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
        - Methods used to arrive at PM schedules and forms
        - Example of PM inspection form

    b. Levels of PM Inspection e.g. Minor Inspection vs. Major Inspection

2. Perform a preventive maintenance inspection

    a. 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

b. 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
- Constant velocity boots (visual inspection)
- Exhaust system (visual inspection)
- Shock absorbers and struts (visual inspection)
- Tires (visual inspection)
- Gas tanks (visual inspection)

SUGGESTED LEARNING ACTIVITIES:

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

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2270 - Government Safety Inspection

SUGGESTED DURATION: 7 hours

PREREQUISITES: SV1100 - SV1120 - SV1155 - SV1195 - SV1215 - SV1375 - SV1630 - SV2011 - SV2040 - SV2130

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to perform provincial motor vehicle safety inspections.

OVERVIEW OF OBJECTIVES:
1. Identify the purpose of a provincial government safety inspection and its history.
2. Identify provincial government safety inspection procedures.
3. Perform a government safety inspection.

CONTENT:

1. Identify the purpose of a provincial government safety inspection and its history.

    - Purpose for inspection
    - People or authorities involved in inspection
    - Responsibilities of those involve

2. Identify provincial government safety inspection procedures.

    - Inspection instructions
    - Specifications and tolerances
    - Documentation of inspections
        - inspection forms
        - reject stickers
        - stickers used when vehicle passes inspection
        - responsibilities re unsafe vehicles

3. Perform a government safety inspection.

SUGGESTED LEARNING ACTIVITIES:

1. Perform government motor vehicle safety inspection.

SUGGESTED RESOURCES:

NAME AND NUMBER: SV2280 - Pre-Delivery Inspection

SUGGESTED DURATION: 8 hours

PREREQUISITES: AST program

EVALUATIONS: Theory and practical applications require a minimum Pass mark of 70%

OUTCOME:
Upon successful completion of this course, the apprentice will be able to perform pre-delivery inspection on light duty motor vehicle.

OVERVIEW OF OBJECTIVES:
1. Identify the background and rational of pre-delivery inspection.
2. Identify the procedure to follow of pre-delivery inspection.
3. Perform a pre-delivery inspection.

CONTENT:

1. Identify the background and rational of pre-delivery inspection

    - Reasons why inspection is necessary
    - Manufacturer's inspection forms

2. Identify the procedure to follow of pre-delivery inspection

    - Use of a system or routine for doing any inspection
    - Procedure to follow if problems are identified

3. Perform a pre-delivery inspection

SUGGESTED LEARNING ACTIVITIES:
1. Perform a pre-delivery inspection on a light duty motor vehicle.
2. Locate specifications for door adjustments, etc.

SUGGESTED RESOURCES:

REQUIRED RELATED COURSES

COURSE NAME & NUMBER: Workplace Correspondence CM2150

DESCRIPTIVE TITLE: Workplace Correspondence

CALENDAR TITLE:

1.0 Type and Purpose Communications 2150 gives students the opportunity to study the principles of effective writing. Applications include letters, memos, and short report writing.

2.0 Major Topics Review of Sentence and Paragraph Construction; Business Correspondence; Informal Report; Job Search Techniques.

PREREQUISITES: Nil

CO-REQUISITES: Nil

COURSE DURATION 45hrs

SUGGESTED TEXT/ LEARNING RESOURCES:

Textbooks: Business English and Communications, Fourth Canadian Edition, Clark, Zimmer, et al., McGraw-Hill Ryerson, 1990

Student Projects and Activities for Business English and Communications,

Fourth Canadian Edition, Clark, et al., McGraw-Hill, 1990

Effective Business Writing, Jennifer MacLennon

Simon and Shuster Handbook for Writers, Second Edition, Troyka Lynn Quitman, Prentice Hall

Zimmer, et al., McGraw-Hill Ryerson Limited, 1989

Business and Administrative Communication, Second Edition, Kitty O. Locker. IRWIN, 1991

References: Pittman Office Handbook, Smith/Hay-Ellis

The Gregg Reference Manual, Fourth Canadian Edition, Sabin/O'Neill

McGraw Hill Handbook

Other Resources: Business Letter Business (Video), Video Arts

Guest Speakers

Sell Yourself (Video)

COURSE AIMS:

1. To help students understand the importance of well-developed writing skills in business and in career development.
2. To help students understand the purpose of the various types of business correspondence.
3. To examine the principles of effective business writing.
4. To examine the standard formats for letters and memos.
5. To provide opportunities for students to practice writing effective letters and memos.
6. To examine the fundamentals of informal reports and the report writing procedure.
7. To provide an opportunity for students to produce and informal report.

MAJOR TOPICS/TASKS:

1.0 Review of Sentence and Paragraph Construction
2.0 Business Correspondence
3.0 Informal Report/Present Orally

COURSE OUTLINE:

1.0 Review of Sentence and Paragraph Construction

- 1.1 Examining and applying principles of sentence construction
- 1.2 Examining and applying principles of paragraph construction

2.0 Business Correspondence

- 2.1 Examining the value of well-developed business writing skills
- 2.2 Examining principles of effective business writing
- 2.3 Examining business letters and memos

3.0 Informal Report

- 3.1 Examining the fundamentals of informal business reports
- 3.2 Applying informal report writing skills

LEARNING OBJECTIVES:

1.0 Review of Sentences and Paragraph Construction

1.1.1 Define a sentence and review the four types.
1.1.2 Identify the essential parts of a sentence, particularly subject and predicate, direct and indirect object.
1.1.3 Differentiate among phrases, clauses, and sentences.
1.1.4 Explore the major concepts related to subject-verb agreement.

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

1.2 Examine and Apply Principles of paragraph Construction

1.2.1 Discuss the basic purposes for writing.
1.2.2 Define a paragraph and describe the major characteristics of an effective paragraph.
1.2.3 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.

2.0 Business Correspondence

2.1 Examine the Value of Business Writing Skills

2.1.1 Discuss the importance of effective writing skills in business
2.1.2 Discuss the value of well-developed writing skills to career success

2.2 Examine Principles of Effective Business Writing

2.2.1 Discuss the rationale and techniques for fostering goodwill in business communication, regardless of the circumstances
2.2.2 Review the importance of revising and proofreading writing

2.3 Examine Business Letters and Memos

2.3.1 Differentiate between letter and memo applications in the workplace
2.3.2 Identify the parts of a business letter and memo
2.3.3 Explore the standard formats for business letters and memos
2.3.4 Examine guidelines for writing an acceptable letter and memo which convey: acknowledgment, routine request, routine response, complaint, refusal, and persuasive request, for three of the six types listed
2.3.5 Examine samples of well-written and poorly written letters and memos

3.0 Informal Report

3.1 Examine the Fundamentals of Informal Business Reports

3.1.1 Identify the purpose of the informal report
3.1.2 Identify the parts and formats of an informal report
3.1.3 Identify methods of information gathering

3.2 Apply Informal Report Writing Skills and Oral Reporting Skills

3.2.1 Gather pertinent information
3.2.2 Organize information into an appropriate outline
3.2.3 Draft a five minute informal report
3.2.4 Edit, proofread, and revise the draft to create an effective informal report and present orally using visual aids.

RECOMMENDED EVALUATION:

Required Pass Mark 70%

DEVELOPMENT HISTORY:

Date Developed:

Date Revised: 1999 05 03

Name and Number: Customer Service MR1210

Descriptive Title: Customer Service

Summary 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.

Prerequisites: None

Co-requisites: None

Suggested Duration: 30 hrs

Evaluation: Theory and Practical Applications Require a Pass Mark of 70%.

Course Aims:

1. To know and understand quality customer service

2. To know why quality service is important

3. To know and understand the relationship between "service" and "sales"

4. To understand the importance of and to demonstrate a positive attitude

5. To recognize and demonstrate handling of customer complaints

Course Objectives (Knowledge):

1. Providing Quality Service

    - Define quality service
    - List the types of quality service
    - Define Service vs. Sales or Selling
    - Explain why quality service is important
    - Identify the various types of customers
    - Define customer loyalty

2. Determining Customers Wants and Needs

- List four levels of customer needs
- Identify important customer wants and needs
- Identify ways to ensure repeat business

3. Demonstrating a Positive Attitude

- List the characteristics of a positive attitude
- Explain why it is important to have a positive attitude
- List ways that a positive attitude can improve a customer's satisfaction
- Define perception
- Explain how perception can alter us and customers
- Understand how to deal with perception

4. Effectively Communicating with customers

- Describe the main elements in the communication process
- Identify some barriers to effective communication
- Define body language
- Explain how body language would affect customers
- Determine why body language is important
- Define active listening and state why it is important
- Describe the four components of active living
- Contrast good and bad listeners
- List and discuss the steps of the listening process

5. Effectively using Questioning Techniques

- List questioning techniques
- Write two example of an open question
- Perform a questioning and listening role play

6. Using the Telephone Effectively

- List the qualities of a professional telephone voice
- Explain why telephone skills are important
- Demonstrate effective telephone skills

7. Asserting Oneself: Handling Complaints and Resolving Conflict

- Define assertiveness
- Define communication behaviors
- Relate assertions to effective communication
- Practice being assertive

- Understand the process of assertive guidelines for action
- Practice giving an assertive greeting
- Acknowledge multiple customers

8. Dealing with Difficult Customers

- Describe how you would deal with anger
- Complete a guide to controlling feelings
- Determine how you would feel dealing with an upset customer
- Suggest some techniques that might control your own feelings
- Understand leadership styles and the nature of organizations
- List ways to dealing with conflict / customer criticism
- Be aware of certain guidelines when confronting customers
- List ways of preventing unnecessary conflict with customers
- Review current skills and knowledge of customer service
- Develop a customer satisfaction improvement plan

Name and Number: QA/QC SP2330

Descriptive Title: Quality Assurance / Quality Control

Description:

This general studies course requires the use of basic tools and equipment and materials and supplies. It requires controlling drawings and specifications and/or calibrating measuring devices in applicable occupations.It involves 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.

Prerequisites: None

Co-requisites: None

Suggested Duration: 30 Hrs

Course Aims:

1. To develop the skills and knowledge required to apply quality assurance/quality control procedures

2. To develop an awareness of quality management principles and processes

Course Objectives (Knowledge):

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 engineering drawings 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 quality management.

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.

10. Explain the concepts of quality

    a. cost of quality
    b. measurement of quality
    c. quality control and quality assurance
    d. elements of quality
    e. elements of the quality audit
    f. quality standards
    g. role expectations and responsibilities

11. Explain the structure of quality assurance and quality control

    a. Define quality assurance, quality control and documentation terminology
    b. Describe organizational charts
    c. List the elements of a quality assurance system
    d. Explain the purpose of the quality assurance manual
    e. Describe quality assurance procedures
    f. Explain the key functions and responsibilities of personnel

12. Complete quality assurance/quality control documentation

    a. Describe methods of recording reports in industry
    b. Describe procedures of traceability (manual and computer-based recording)
    c. Identify needs for quality control procedures

Major Tasks / Subtasks (Skills):

1. Apply quality control to projects

    a. Follow QA/QC procedures for drawings, plans and specifications in applicable occupations.
    b. Calibrate measuring instruments and devices in applicable occupations.
    c. Interpret required standards
    d. Follow QA/QC procedures for accepting raw materials

e. Carry out the project
f. Control the quality elements (variables)
g. Complete QA/QC reports

Evaluation:

Pass Mark Required 70%

Development History:

Date Developed: February 1994
Date Revised: April, 1999

COURSE NAME & NUMBER: Introduction to Computers MC1050

DESCRIPTIVE TITLE: Introduction to Computers

CALENDAR ENTRY:

Type and Purpose 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.

Major Topics Microcomputer System Hardware and Software Components; Word Processing; Electronic Spreadsheets; Electronic Mail and the Internet.

PRE-REQUISITES: Nil

CO-REQUISITES: Nil

SUGGESTED DURATION: 30 hours

SUGGESTED TEXT/

LEARNING RESOURCES:

Textbook(s):

References:

Other Resources:

COURSE AIMS:

1. To provide students with a introduction to computer systems and their operation.

2. To introduce students to popular software packages, their applications and future trends in computer applications.

MAJOR TOPICS:

1. Microcomputer System Hardware and Software Components
2. Word Processing
3. Spreadsheet
4. E-Mail and the Internet

COURSE OUTLINE:

1.0 Microcomputer System Hardware and Software Components

1.1 Microcomputer Hardware

1.1.1 System Components
1.1.2 Function of each Component

1.2 Microcomputer Software

1.2.1 Software Definition and Types

1.2.2 System Software (Windows 95)

1.2.3 File Management Commands (Windows 95)

2. Word Processing

2.1 Keyboarding Techniques
2.2 Word Processing

2.2.1 Understanding Word Processing
2.2.2 Create a Document
2.2.3 Save, Open and Edit a Document
2.2.4 Edit a Document: Cut and Paste
2.2.5 Understand Hidden codes.
2.2.6 The Select Feature (Block)
2.2.7 Change Layout Format
2.2.8 Change Text Attributes
2.2.9 Use Auxiliary Tools
2.2.10 Select the Print Feature (number of copies and current document)

3. Electronic Spreadsheet

3.1 Spreadsheet Basics
3.2 Operate Menus
3.3 Create a Worksheet
3.4 Use Ranges
3.5 Print a Worksheet
3.6 Edit a worksheet

4. Electronic Mail and the Internet

4.1 Electronic Mail
4.2 The Internet

Learning Objectives:

1. Microcomputer System Hardware and Software Components

1.1 Microcomputer Hardware

1.1.1 System Components

1.1.1.1 Identify major components of a computer system.

1.1.2 Function of each Component

1.1.2.1 Describe the function of the microprocessor.
1.1.2.2 Describe and give examples of I/O DEVICES.
1.1.2.3 Describe primary storage (RAM, ROM, Cache).
1.1.2.4 Define bit, byte, code and the prefixes k.m. and g.
1.1.2.5 Describe secondary storage (diskettes and hard disks, CD ROMS, Zip Drives etc).
1.1.2.6 Describe how to care for a computer and its accessories.

1.2 Microcomputer Software

1.2.1 Software Definition and Types

1.2.1.1 Define software.
1.2.1.2 Describe, operational and application software used in this course.
1.2.1.3 Define file and give the rules for filenames and file extensions..

1.2.2 System Software (Windows 95)

1.2.2.1 Getting Started with Windows
1.2.2.2 Start and quit a Program
1.2.2.3 Get Help
1.2.2.4 Locate a specific file using the **find** function of Win95
1.2.2.5 Changing system settings:wall paper, screen saver, screen resolution, background.
1.2.2.6 Starting a program by using the Run Command
1.2.2.7 Shutting down your computer

1.2.3 File Management Commands (Windows 95)

1.2.3.1 View directory structure and folder content
1.2.3.2 Organizing files and folders
1.2.3.3 Copy, delete, and move files and folders
1.2.3.4 Create folders
1.2.3.5 Maximize and minimize a window
1.2.3.6 Print directory/folder content
1.2.3.7 Describe the Windows 95 taskbar

2. Word Processing

2.1 Keyboarding Techniques

2.1.1 Identify and locate alphabetic and numeric keys
2.1.2 Identify and locate function keys: special keys, home keys, page up key, page down key, numeric key pad, shift keys, punctuation keys, tab key

2.2 Word Processing

2.2.1 Understanding word processing

2.2.1.1 The Windows Component
2.2.1.2 The Menu Bar
2.2.1.3 Menu Indicators
2.2.1.4 The Document Window
2.2.1.5 The Status Bar
2.2.1.6 The Help Feature
2.2.1.7 Insertion Point Movements

2.2.2 Create a document

2.2.2.1 Change the Display
2.2.2.2 The Enter Key
2.2.2.3 Enter Text

2.2.3 Save, Open and Exit a document.

2.2.3.1 Save a document
2.2.3.2 Close a document.
2.2.3.3 Start a new document Window
2.2.3.4 Open a document
2.2.3.5 Exit Word Processor

2.2.4 Edit a Document

2.2.4.1 Add New Text
2.2.4.2 Delete text
2.2.4.3 Basic Format Enhancement (split and join paragraphs, insert text)

2.2.5 Understand Hidden Codes
2.2.5.1 Display Hidden Codes
2.2.5.2 Delete Text Enhancements

2.2.6 The Select Feature

2.2.6.1 Identify a Selection
2.2.6.2 Move a Selection
2.2.6.3 Copy a Selection
2.2.6.4 Delete a Selection
2.2.6.5 Select Enhancements
2.2.6.6 Save a Selection
2.2.6.7 Retrieve a Selection

2.2.7 Change Layout Format

2.2.7.1 Change layout format: (margins, spacing, alignment, paragraph indent, tabs, line spacing, page numbering)

2.2.8 Change Text Attributes

2.2.8.1 Change text attributes: (bold, underline, font, etc.)

2.2.9 Use Auxiliary Tools

2.2.9.1 Spell Check

2.2.10 Select the Print Feature

2.2.10.1 Select the Print Feature: (i.e; number of copies and current document)
2.2.10.2 Identify various options in print screen dialogue box

3. Electronic Spreadsheet

3.1 Spreadsheet Basics

3.1.1 The Worksheet Window

3.2 Operates Menus

3.2.1 Use a Menu Bar
3.2.2 Use a Control Menu
3.2.3 Use a Shortcut Menu
3.2.4 Save, Retrieve form Menus

3.3 Create a Worksheet
3.3.1 Enter Constant Values and Formulas
3.3.2 Use the Recalculation Feature
3.3.3 Use Cell References (relative and absolute references)

3.4 Use Ranges

3.4.1 Type a Range for a Function
3.4.2 Point to a Range for a Function
3.4.3 Select a Range for Toolbar and Menu Commands

3.5 Print a Worksheet
3.5.1 Print to the Screen
3.5.2 Print to the Printer
3.5.3 Print a Selected Range

3.6 Edit a Worksheet
3.6.1 Replace Cell Contents
3.6.2 Insert and Delete Rows and Columns
3.6.3 Change Cell Formats
3.6.4 Change Cell Alignments
3.6.5 Change Column Width
3.6.6 Copy and Move Cells

4. Electronic Mail and the Internet

4.1 Electronic Mail

4.1.1 Compose and send an e-mail message
4.1.2 Retrieve an e-mail attachments
4.1.3 Send an e-mail message with attachments
4.1.4 Retrieve and save e-mail attachments
4.1.3 Print an e-mail message
4.1.4 Delete an e-mail message

4.2 The Internet

4.2.1 Overview of the World Wide Web
4.2.2 Accessing Web sites
4.2.3 Internet Web Browsers
4.2.4 Internet Search Engines
4.2.5 Searching Techniques

STUDENT EVALUATION:

Required Pass Mark 70%

DEVELOPMENT HISTORY:

Date Designed 1998
Date Revised 1999

Name and Number: Workplace Skills SD 1700

Descriptive Title: Workplace Skills

Description:

This course involves participating in meetings, doing safety inspections, completing employment insurance forms, writing letters of employment insurance appeal, and filing a human rights complaint. Includes information on formal meetings, unions, worker's compensation, employment insurance regulations, worker's rights and human rights.

Prerequisites: None

Co-requisites: None

Suggested Duration: 30 Hrs

Course Aims:

1. Participate in meetings (conduct meetings).
2. Be aware of union procedures.
3. Be aware of workers' compensation regulations.
4. Be aware of occupational health and safety regulations.
5. Be aware of employment insurance regulations
6. Be aware of workers' rights.
7. Be aware of human rights

Course Objectives (Knowledge):

1. Meetings
    a. Explain preparation requirements prior to conducting a meeting
    b. Explain the procedures for conducting a meeting.
    c. Explain participation in meetings.
    d. Explain the purpose of motions.
    e. Explain the procedure to delay discussion of motions.
    f. Explain how to amend and vote upon a motion.
2. Unions

a. Why do unions exist?
b. Give a concise description of the history of Canadian labour.
c. How do unions work?
d. Explain labour's structure.
e. Describe labour's social objectives.
f. Describe the relationship between Canadian labour and the workers.
g. Describe the involvement of women in unions.

3. Worker's Compensation
   a. Describe the aims, objectives, benefits and regulations of the Workers Compensation Board.
   b. Explain the internal review process.

4. Occupational Health and Safety
   a. Describe the rules and regulations directly related to your occupation.

5. Employment Insurance Regulations
   a. Explain employment insurance regulations
   b. Describe how to apply for employment insurance.
   c. Explain the appeal process.

6. Worker's Rights
   a. Define labour standards.
   b. Explain the purpose of the Labour Standards Act.
   c. List regulations pertaining to:
      i. Hours of work.
      ii. Minimum wage.
      iii. Employment of children.
      iv. Vacation pay

7. Human Rights
   a. Describe what information cannot be included on an application.
   b. Describe what information cannot be included in an interview
   c. Why is there a Human Rights Code?
   d. Define sexual harassment.

Major Tasks / Subtasks (Skills):

1. Participate in meetings.
   a. Follow the form of getting a motion on the floor
   b. Discuss a motion
   c. Amend a motion
   d. Vote on a motion.

2. Complete a safety inspection of your shop.

3. Complete an employment insurance application form.

4. Write a letter of appeal.

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

Evaluation:

Required Pass Mark 70%

Development History:

Date Developed:
Date Revised: April, 1999

Name and Number: Job Search Techniques SD 1710

Descriptive Title: Job Search Techniques

Prerequisites: None

Co-requisites: None

Suggested Duration: 15 hrs.

Evaluation: Theory and Practical Applications Require a Pass Mark of 70%.

Course Objectives (Knowledge):

1. Examine and Demonstrate Elements of Effective Job Search Techniques

- Identify and examine employment trends and opportunities
- Identify sources that can lead to employment
- Discuss the importance of fitting qualifications to job requirements
- Discuss and demonstrate consideration in completing job application forms
- Establish the aim/purpose of a resume
- Explore characteristics of effective resumes, types of resumes, and principles of resume format
- Explore characteristics of and write an effective cover letter
- Explore, and participate in a role play of a typical job interview with commonly asked questions and demonstrate proper conduct
- Explore other employment related correspondence
- Explore the job market to identify employability skills expected by employer
- Conduct a self-analysis and compare with general employer expectations

DEVELOPMENT HISTORY:

Date Developed:

Date Revised: 1999 05 03

Name and Number: Entrepreneurial Awareness SD 1720

Descriptive Title: Entrepreneurial Awareness

Prerequisites: None

Co-requisites: None

Suggested Duration: 15 hrs

Evaluation: Theory and Practical Applications Require a Pass Mark of 70%.

Course Objectives (Knowledge):

1. Explore Self-Employment: An Alternative to Employment

- Identify the advantages and disadvantages of self-employment vs. regular employment
- Differentiate between an entrepreneur and a small business owner
- Evaluate present ideas about being in business

2. Explore the Characteristic of Entrepreneurs

- Identify characteristics common to entrepreneurs
- Relate their own personal characteristics with those of entrepreneurs.
- Evaluate their present ideas about business people

3. Identifying Business Opportunities

- Distinguish between an opportunity and an idea.
- List existing traditional and innovative business ventures in the region.
- Explain the general parameters between which business ventures should fit.
- Summarize the role of such agencies Regional Economic Development Boards, Business Development Corporations, etc.
- Identify potential business opportunities within the region.

4. Demystifying the Entrepreneurial Process.

- Explain the entrepreneurial process
- Describe the purpose of a business plan
- Identify the main ingredients of a business plan
- Summarize the role of such agencies as BDC's, ACOA, Women's Enterprise Bureau etc.
- List other agencies where assistance - financial and otherwise - is available to those interested in starting a business venture.

REQUIRED WORK EXPERIENCES

National Red Seal Certification requires that all Apprentices obtain appropriate industry based work experiences. The required work experiences identified in this section are written in the broadest terms so as to ensure the apprentices receive experiences in each of the required areas and to ensure that employers have a degree of flexibility in applying the terms and conditions implicit in a Contract of Apprenticeship. What is important is that both the apprentice and the employer understand the obligations laid out in this plan of training which is designed to ensure that at the completion of both the technical training and the required hours of work experience the apprentice has both the knowledge and the skills necessary to successfully complete the Red Seal Examination.

REQUIRED WORK EXPERIENCES:
Inspect, test, repair, replace and service various types of:

- medium duty steering and suspensions
- light and medium duty starting and charging systems
- medium duty hydraulic brakes
- light and medium engines and component parts
- light and medium duty cooling systems and component parts
- gasoline air and fuel delivery systems and component parts
- lubrication systems and component parts
- gasoline injection systems and component parts
- body electrical circuits and component parts
- medium duty drivelines, differentials and component parts
- medium duty automatic and standard transmissions and component parts
- air conditioning and component parts
- emission systems and component parts