

AUTOMOTIVE SERVICE TECHNICIAN 1

Program Guide 2010

TABLE OF CONTENTS

INTRODUCTION	5
RATIONALE.....	5
GOALS FOR ACE IT CERTIFICATE OF QUALIFICATION TECHNICAL TRAINING.....	5
INTRODUCTION TO THE PROGRAM GUIDE	6
CLASSROOM ASSESSMENT.....	6
SAFETY CONSIDERATIONS	7
WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM	7
EMPLOYABILITY SKILLS	8
CONSIDERATIONS FOR ACE IT PROGRAM DELIVERY	8
ADDRESSING LOCAL LABOUR MARKET INFORMATION AND NEEDS	8
FACILITIES, EQUIPMENT, AND RESOURCES	9
ACE IT PROGRAM DELIVERY	9
<i>Partnership Delivery Model</i>	9
<i>ITA Designated Training Status Provider</i>	9
<i>Teacher/Instructor Qualifications</i>	9
<i>ITA Assessment</i>	10
MINISTRY COURSES AND CODES FOR AUTOMOTIVE SERVICE TECHNICIAN 1	10
WORK-BASED TRAINING	10
SECTION 1: CHARTS.....	11
AUTOMOTIVE SERVICE TECHNICIAN 1 OCCUPATIONAL ANALYSIS CHART.....	12
AUTOMOTIVE SERVICE TECHNICIAN CERTIFICATION FLOWCHART	15
AUTOMOTIVE SERVICE TECHNICIAN 1 PROGRAM OUTLINE.....	16
SUGGESTED SCHEDULE OF TIME ALLOTMENT FOR AUTOMOTIVE SERVICE TECHNICIAN 1.....	16
SECTION 2: STUDENT LEARNING	18
LINE A: WORKPLACE SAFETY	19
<i>Competency: A1 Describe WorkSafe BC Regulations</i>	19
<i>Competency: A2 Describe Workplace Hazardous Materials Information System (WHMIS) Regulations</i>	21
<i>Competency: A3 Demonstrate Safe Vehicle Operation</i>	23
<i>Competency: A4 Demonstrate Safe Work Practices</i>	24
LINE B: EMPLOYABILITY SKILLS	26
<i>Competency: B1 Describe Business Practices</i>	26
<i>Competency: B2 Demonstrate Communication Skills</i>	27
LINE C: TOOLS AND EQUIPMENT	28
<i>Competency: C1 Use Hand Tools</i>	28
<i>Competency: C2 Use Measuring Instruments</i>	30
<i>Competency: C3 Use Power Tools</i>	31
<i>Competency: C4 Use Fasteners</i>	33
<i>Competency: C5 Use Shop Tools and Equipment</i>	36
<i>Competency: C6 Use Reference Resources</i>	38
LINE D: GENERAL AUTOMOTIVE MAINTENANCE.....	39
<i>Competency: D1 Select Lubricants and Fluids</i>	39
<i>Competency: D2 Describe Belts and Hoses</i>	40
<i>Competency: D3 Describe Exterior Lamps</i>	41
<i>Competency: D4 Describe Body Trim and Hardware</i>	42
<i>Competency: D5 Service Tires and Wheels</i>	43
<i>Competency: D6 Service Non Friction Bearings</i>	45
<i>Competency: D7 Service Spindles and Hubs</i>	46
LINE E: GENERAL AUTOMOTIVE PRACTICES	47
<i>Competency: E1 Describe Diagnostic Procedures</i>	47

<i>Competency: E2 Demonstrate Welding Safety</i>	48
LINE F: BASIC ELECTRICAL SYSTEMS	49
<i>Competency: F1 Describe Principles of Electricity</i>	49
<i>Competency: F2 Use Electrical Test Equipment</i>	51
<i>Competency: F3 Describe Principles of Electronics</i>	52
<i>Competency: F4 Service Wiring Systems</i>	53
<i>Competency: F5 Service 12 Volt Batteries</i>	54
<i>Competency: F6 Use Scan Tools</i>	56
LINE G: BRAKE SYSTEMS	57
<i>Competency: G1 Service Brake Tubing and Fittings</i>	57
<i>Competency: G2 Service Brake Hydraulic Systems</i>	58
<i>Competency: G3 Service Drum Brake Systems</i>	60
<i>Competency: G4 Service Disc Brake Systems</i>	62
<i>Competency: G5 Inspect Power Assist Systems</i>	64
<i>Competency: G6 Service Anti-Lock Brake Systems</i>	65
LINE H: STEERING SYSTEMS	67
<i>Competency: H1 Service Steering Gears</i>	67
<i>Competency: H2 Disarm and Rearm Passenger Restraint Systems</i>	69
<i>Competency: H3 Inspect Steering Columns</i>	70
<i>Competency: H4 Service Steering Linkage</i>	71
<i>Competency: H5 Service Power Steering Systems</i>	72
<i>Competency: H6 Perform Wheel Alignment</i>	74
LINE I: SUSPENSION SYSTEMS	75
<i>Competency: I1 Describe Frame Types</i>	75
<i>Competency: I2 Describe Suspension Geometry</i>	76
<i>Competency: I3 Describe Suspension Components</i>	77
<i>Competency: I4 Service Suspension Systems</i>	79
<i>Competency: I5 Describe Electronic Suspension Systems</i>	80
SECTION 3: TRAINING PROVIDER STANDARDS	81
AUTOMOTIVE SERVICE TECHNICIAN 1: TOOL LIST	82
FACILITY REQUIREMENTS	86
SECTION 4: LEARNING RESOURCES	87
ALBERTA LEARNING GUIDES	88
ADDITIONAL REFERENCES	88

INTRODUCTION

Rationale

In the Graduation Program 2004, Trades and Technology is one of the eight Focus Areas that students explore in Planning 10. (For more information about the Graduation Program 2004, Focus Areas, and Planning 10, see www.bced.gov.bc.ca/graduation/grad2004.htm)

Accelerated Credit Enrolment in Industry Training (ACE IT) is an industry training certification program for BC secondary school students. (See www.itabc.ca) The program enables students to earn both graduation credit and credit for technical training associated with an Industry Training Program. ACE IT complements these existing career programs:

- Secondary School Apprenticeship (SSA), which provides opportunities to start the work-based component of an apprenticeship
- Career Preparation

ACE IT involves industry recognized technical training that provides a standardized skill and knowledge set for a particular trade, so that post-secondary training providers and employers know what to expect from ACE IT graduates. The ACE IT program helps graduates make a smooth transition to either the workplace or an appropriate post-secondary program. Industry Training Authority records the technical training, which is recognized by post-secondary institutions in BC that offer further technical training in the related trade.

Industry training increases the relevance and practical application of the secondary school curriculum by linking directly with the world of work. This Program Guide contains the same learning competencies and content tasks found in a college Automotive Service Technician 1 technical training program. ACE IT students write the same ITA Automotive Service Technician 1 Certificate of Qualification exam as all other apprentices in the trade, and must achieve a minimum mark of 70 percent to pass.

Goals for ACE IT Certificate of Qualification Technical Training

The goals of ACE IT are to:

- provide students with a smooth transition from school to work
- enhance students' existing trade-specific job-readiness skills, or provide opportunities for the development of new skills
- provide students with the opportunity to obtain a Level 1 technical training certification or equivalent in a given trade
- help prepare students to enter the world of work with the skills, attitudes, and sense of responsibility necessary to be successful

Introduction to the Program Guide

All ACE IT Program Guides cover the knowledge, skills, and attitudes that provide students with a solid foundation in a trades subject area. The Program Guides set out what students are expected to know and be able to do, and contain the legally required content standards for students in BC secondary schools. Competencies discussed in this Program Guide are equivalent to Prescribed Learning Outcomes (PLO's) found in other Ministry curriculum documents. Schools have the responsibility to ensure that students achieve all Competencies in this Guide. However, schools have flexibility in determining how the delivery of content can best take place.

This Guide uses the following terms in discussing student learning: Lines, Competencies, Learning Objectives, and Learning Tasks.

1. Lines
 - Lines can be described as the overall sections or units required for a Level 1 program in this trade area.
2. Competencies
 - Lines are then divided into Competencies that are equivalent to Prescribed Learning Outcomes and have specific learning tasks associated with them.
3. Learning Objectives
 - Learning Objectives are a concise summary of the learning to be achieved for that Subject.
4. Learning Tasks
 - In each Learning Objective, the Learning Tasks constitute the theoretical and practical study and/or tasks to be completed.

Classroom Assessment

Teachers are encouraged to develop assessment methods that best capture student performance as they progress and complete the program. For the effective assessment of Level 1 or equivalent Competencies, methods of classroom criterion-referenced assessment and evaluation area needed to track progress and measure student achievement. Methods range from the very broad to very specific achievement specifications that indicate student progress against the standard.

Assessment evidence can be collected using a wide variety of methods, including:

- observation and comment (written, oral, practical)
- student self-assessments and peer assessments
- quizzes and tests (written, oral, practical)
- samples of student work
- projects

Student evaluation is generated from information collected through school-level assessment activities. Teachers use their experience, insight, knowledge about learning, and experience with students, along with the specific criteria they establish, to make judgments about student performance in relation to the Competency.

Some of the Competencies require a specific demonstration of the learning tasks, while others may require a demonstration of cognitive knowledge. Some of the learning resources available include written competency tests that teachers may wish to use.

Safety Considerations

One of the fundamental requirements of the workplace is an understanding of safe work practices and procedures. This understanding is not limited to cognitive knowledge. Rather, it must be translated into actions and behaviours that students apply on a daily basis. This knowledge and experience should endure after students' time in the classroom.

As students begin to experience a more complex environment with tools and equipment in which operational dangers are inherent, essential safety procedures must become second nature and be reinforced throughout students' time in a workshop, or on a job site.

Teachers need to be highly aware of safety issues while students are involved in maintenance, repair, replacement, servicing, or production activities. Safe work practices and procedures include:

- modelling correct procedures at all times
- teaching specific instructions on safe and correct use and handling of equipment and tools
- teaching clear and specific instruction on how to use, handle, and dispose of waste or hazardous materials, and modelling these procedures in daily practice
- verifying that all equipment, tools, and utensils are in good repair and suitably arranged for effective and safe student use
- supervising students at all times and in a correct manner
- verifying that facilities provide adequate lighting for detailed work
- verifying that ventilation and air circulation are appropriate to the task
- clearly defining and teaching hazard and accident awareness and avoidance techniques in the work area
- teaching industry-specific safety standards and procedures (in accordance with [WHMIS](#), the Workplace Hazardous Materials Information System)
- verifying that students can demonstrate knowledge and operational behaviours that indicate their understanding of the information in appropriate school-based activities
- establishing a safe learning environment by ensuring that working practices have safety as a priority while students complete their personal projects. This would include:
 - establishing rules and routines
 - ensuring that students wear appropriate clothing and safety equipment
 - referencing [WorkSafeBC](#); Workers' Compensation Board (WCB) standards, regulations, and procedures; and Occupational Health and Safety Regulation content
 - selecting pertinent tasks that reflect Level 1 Learning Objectives appropriate for the skills and abilities of the students
 - modelling safe work practices and attitudes

Workplace Hazardous Materials Information System

WHMIS is implemented through coordinated and interlocking federal, provincial, and territorial legislation. The [Hazardous Products Act](#) (HPA) and the [Controlled Products Regulations](#) (CPR) require Canadian suppliers (including importers and distributors) to provide supplier labels and material safety data sheets (MSDSs) for controlled products that are sold or imported for use in Canadian workplaces.

Current industry WHMIS standards and practice must be embedded in instruction.

Employability Skills

Employability skills are generic skills that all students need to make a successful transition to the workplace. These skills complement technical workplace skills. The [Conference Board of Canada](#) organizes these skills into three categories: fundamental skills, personal management skills, and teamwork skills.

Fundamental skills form the basis for further skills development. They include communication skills such as reading and understanding information, as well as listening to others and sharing information. Information management, the application or use of numbers, and problem solving are other fundamental skills.

Personal management skills comprise positive attitudes and behaviours that determine student potential for growth. They include demonstration of responsibility, adaptability, continuous learning, and working safely in all situations.

Teamwork skills are required for students to contribute productively in any environment. Teamwork skills include working with others on projects and tasks.

Employability skills are introduced in [Planning 10](#) to all students. The Competencies in this Program Guide provide students with the opportunity to observe, develop, or demonstrate a variety of the skills that are essential for employment in today's economy. Further information about employability skills can be found at www.conferenceboard.ca/topics/education/default.aspx.

It is important that teachers embed employability skills within their curriculum delivery.

CONSIDERATIONS FOR ACE IT PROGRAM DELIVERY

This section of the Program Guide contains additional information to help educators develop their school practices and plan their program delivery to meet the needs of the students and the requirements of the ITA.

Addressing Local Labour Market Information and Needs

There are more than 140 recognized trades and industry career choices in BC. [Labour Market Information](#) (LMI) gives clear details about specific occupations. This includes the nature of work, main duties, working conditions and wages, employment prospects, and education and training requirements. Usually this information addresses local, regional, and national work opportunities and trends.

For teachers, schools, and districts developing ACE IT programs, it is important to know the demand for specific occupations before training students. A trade that is in demand in one region may not be in demand in another part of the province. Local industry associations are a good source for obtaining information at the local or regional level. Program planners can research BC labour market information on the following government website:
<http://www.aved.gov.bc.ca/labourmarketinfo/welcome.htm>.

Facilities, Equipment, and Resources

To deliver ACE IT programs in BC schools, training sites must provide the required facilities, equipment, and resources.

The requirements include:

- safe facility and healthy working environment
- appropriate quality and quantity of tools, equipment, supplies, materials, and safety equipment for effective instruction
- appropriately selected learning resources (Note: If a school partners with a post-secondary training provider, consultation is advised to ensure continuity or sequential use of learning resources.)

Additional information about tool and equipment requirements for program delivery is provided in the ITA Program Outlines and the National Occupation Analysis (NOA) available on the Red Seal website: <http://www.red-seal.ca>.

Program-specific information can be found on the appropriate NOA lists, such as:

- www.red-seal.ca/carpenter
- www.red-seal.ca/automotiveservicetech
- www.red-seal.ca/cook

ACE IT PROGRAM DELIVERY

For districts to offer ACE IT programs, and be funded by the ITA, they must submit an ACE IT application to ITA and receive approval. The ACE IT application process is described in the ACE IT Program Guide on the Educator webpage: www.itabc.ca. School authorities should develop and maintain active partnerships with both industry and post-secondary institutions that have experience in delivering the relevant industry training program.

Partnership Delivery Model

In many cases, program development and delivery takes place through a cooperative partnership between school authorities and a post-secondary institution. In the partnership delivery model, classes can be taught at the school and/or the post-secondary institute in a delivery ratio on which the partners agree.

ITA Designated Training Status Provider

Schools can deliver ACE IT programs by applying to become an ITA designated training provider. In this model, a school would deliver the ACE IT program without the support of a post-secondary partner. Such a school, however, must become an ITA designated training provider by meeting the standards for overall program design, facilities, tools and equipment, supplies and materials, assessment, and teacher/instructor qualifications. This designated status is established by an ITA team that reports its findings and makes a recommendation to the ITA.

Teacher/Instructor Qualifications

Under the partnership model, the school authority and post-secondary institution jointly determine teacher qualifications. Under the ITA designated training provider model, instructor qualifications and experience must be suitable for the program and level of technical training.

ITA Assessment

Assessment involves both practice and theory. Schools delivering ACE IT programs will be provided a school report, to complete for each student, to submit the ITA. The classroom instructor determines the practical assessment methods, which may consist of student demonstrations of the appropriate Competencies.

MINISTRY COURSES AND CODES FOR AUTOMOTIVE SERVICE TECHNICIAN 1

The Ministry has designated the following four courses for schools to deliver the Level 1 Automotive Service Technician Training program:

- Auto Service Technician Level One 12A
- Auto Service Technician Level One 12B
- Auto Service Technician Level One 12C
- Auto Service Technician Level One 12D

The course codes to be used are AST 12A, AST 12B, AST 12C, and AST 12D. Each of these is a 4-credit course.

WORK-BASED TRAINING

Work-based training is an integral part of an industry training program. Under the ACE IT delivery model, it is recommended that students engage in either SSA or Work Experience 12. School authorities offering ACE IT programs become the sponsor for the ACE IT student.

SECTION 1: CHARTS

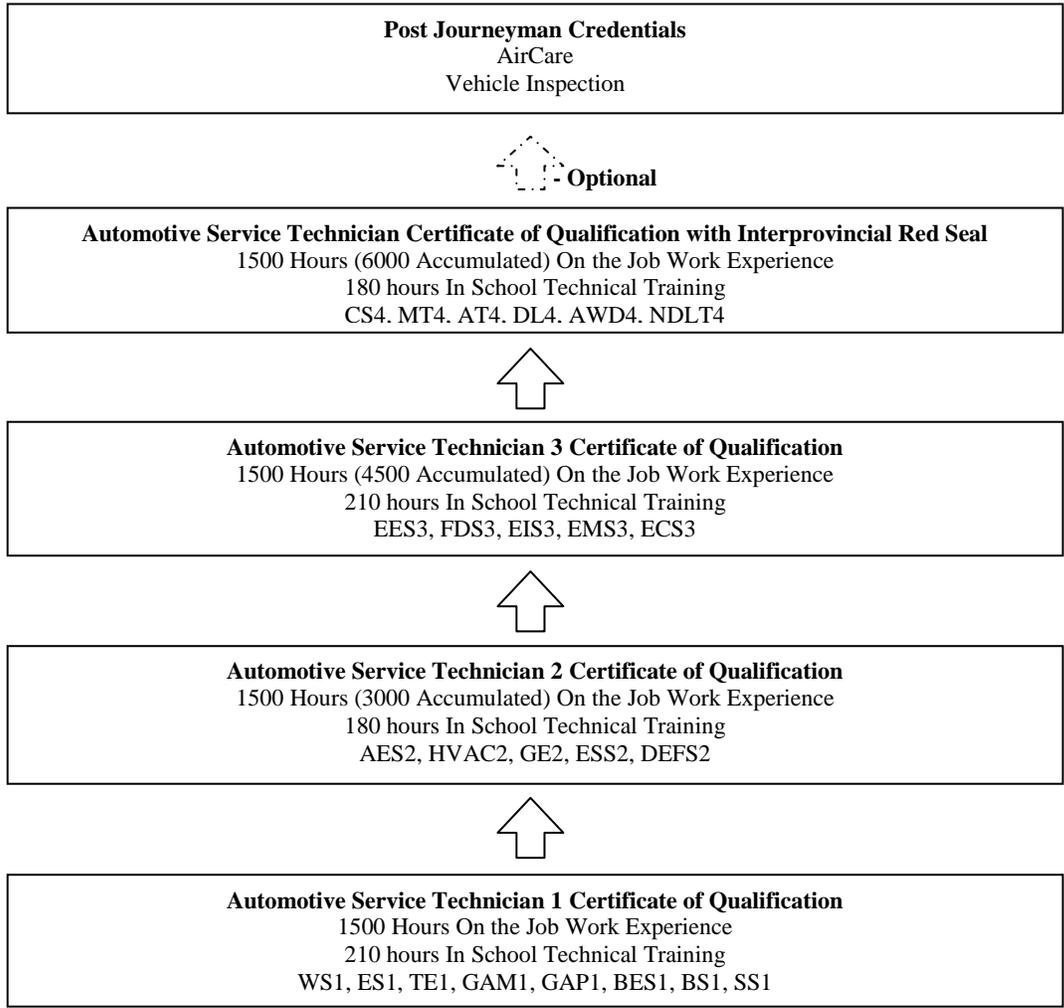
Automotive Service Technician 1 Occupational Analysis Chart

Workplace Safety Line A	Describe WorkSafe BC Regulations A1	Describe WHMIS Regulations A2	Demonstrate Safe Vehicle Operation A3	Demonstrate Safe Work Practices A4						
Employability Skills Line B	Describe Business Practices B1	Demonstrate Communication skills B2								
Tools and Equipment Line C	Use Hand Tools C1	Use Measuring Instruments C2	Use Power Tools C3	Use Fasteners C4	Use Shop Tools and Equipment C5	Use Reference Resources C6				
General Automotive Maintenance Line D	Select Lubricants and Fluids D1	Describe Belts and Hoses D2	Describe Exterior Lamps D3	Describe Body Trim and Hardware D4	Service Tires and Wheels D5	Service Non Friction Bearings D6				

Automotive Service Technician 1 Occupational Analysis Chart

Steering Systems Line H	Service Steering Gears H1	Disarm and Rearm Passenger Restraint Systems H2	Inspect Steering Columns H3	Service Steering Linkage H4	Service Power Steering Systems H5	Perform Wheel Alignment H6
Suspension Systems Line I	Describe Frame Types I1	Describe Suspension Geometry I2	Describe Suspension Components I3	Service Suspension Systems I4	Describe Electronic Suspension Systems I5	

Automotive Service Technician Certification Flowchart



COMPETENCY DESCRIPTIONS

Automotive Service Technician 1 <ul style="list-style-type: none"> • Workplace Safety (WS1) • Employability Skills (ES1) • Tools and Equipment (TE1) • General Automotive Maintenance (GAM1) • General Automotive Practices (GAP1) • Basic Electrical Systems (BES1) • Brake Systems (BS1) • Steering Systems (SS1) 	Automotive Service Technician 2 <ul style="list-style-type: none"> • Advanced Electrical Systems (AES2) • Heating Ventilation and Air Conditioning Systems (HVAC2) • Gasoline Engines (GE2) • Engine Support Systems (ESS2) • Diesel Engine and Fuel Systems (DEFS2)
Automotive Service Technician 3 <ul style="list-style-type: none"> • Electrical and Electronic Systems (EES3) • Fuel Delivery Systems (FDS3) • Electronic Ignition Systems (EIS3) • Engine Management Systems (EMS3) • Emission Control Systems (ECS3) 	Automotive Service Technician 4 <ul style="list-style-type: none"> • Clutch Systems (CS4) • Manual Transmissions (MT4) • Automatic Transmissions (AT4) • Drive Lines (DL4) • All Wheel and Four Wheel Drive Systems (AWD4) • New Drive Line Technology (NDLT4)

Automotive Service Technician 1 Program Outline

Suggested Schedule of Time Allotment for Automotive Service Technician 1

			Theory (Hours)	Practical (Hours)	Page
Line A	Workplace Safety	4 % of Time			
A1	Describe WorkSafe BC Regulations		2	0	19
A2	Describe W.H.M.I.S. Regulations		2	0	21
A3	Demonstrate Safe Vehicle Operation		1	0	23
A4	Demonstrate Safe Work Practices		2	2	24
Line B	Employability Skills	1 % of Time			
B1	Describe Business Practices		1	0	26
B2	Demonstrate Communication Skills		1	0	27
Line C	Tools and Equipment	8 % of Time			
C1	Use Hand Tools		1	1	28
C2	Use Measuring Instruments		2	3	30
C3	Use Power Tools		0	1	31
C4	Use Fasteners		2	4	33
C5	Use Shop Tools and Equipment		0	2	36
C6	Use Reference Resources		1	0	38
Line D	General Automotive Maintenance	11 % of Time			
D1	Select Lubricants and Fluids		1	0	39
D2	Describe Belts, and Hoses		2	0	40
D3	Describe Exterior Lamps		1	0	41
D4	Describe Body Trim and Hardware		1	0	42
D5	Service Tires and Wheels		3	8	43
D6	Service Non Friction Bearings		2	2	45
D7	Service Spindles and Hubs		1	2	46
Line E	General Automotive Practices	6 % of Time			
E1	Describe Diagnostic Procedures		1	0	47
E2	Demonstrate Welding Safety		2	10	48

			Theory (Hours)	Practical (Hours)	Page
Line F	Basic Electrical Systems	19 % of Time			
F1	Describe Principles of Electricity		4	9	49
F2	Use Electrical Test Equipment		1	1	51
F3	Describe Principles of Electronics		2	2	52
F4	Service Wiring Systems		3	4	53
F5	Service 12 Volt Batteries		4	5	54
F6	Use Scan Tools		2	3	56
Line G	Brake Systems	21 % of Time			
G1	Service Brake Tubing and Fittings		1	3	57
G2	Service Brake Hydraulic Systems		3	4	58
G3	Service Drum Brake Systems		3	8	60
G4	Service Disc Brake Systems		3	8	62
G5	Inspect Power Assist Systems		2	1	64
G6	Service Anti-lock Brake Systems		4	4	65
Line H	Steering Systems	20 % of Time			
H1	Service Steering Gears		3	6	67
H2	Disarm and Rearm Passenger Restraint Systems		2	3	69
H3	Inspect Steering Columns		1	1	70
H4	Service Steering Linkage		2	4	71
H5	Service Power Steering Systems		4	4	72
H6	Perform Wheel Alignment		3	8	74
Line I	Suspension Systems	10 % of Time			
I1	Describe Frame Types		1	0	75
I2	Describe Suspension Geometry		3	0	76
I3	Describe Suspension Components		2	0	77
I4	Service Suspension Systems		1	12	79
I5	Describe Electronic Suspension Systems		2	0	80

SECTION 2: STUDENT LEARNING

Line A: Workplace Safety

Competency: A1 Describe WorkSafe BC Regulations

Learning Objectives:

1. The learner will be able to describe the application and parts of the Worker's Compensation Act outlined in the Occupational Health and Safety Regulations.
2. The learner will be able to describe the application of the Occupational Health and Safety Regulations and how to find requirements applicable to the automotive service technician's workplace.

LEARNING TASKS	CONTENT
1. Define terms used in the Worker's Compensation Act	<ul style="list-style-type: none">• Definitions, section 1 of the act
2. Describe the conditions under which compensation will be paid	<ul style="list-style-type: none">• Part 1, division 2 of the act
3. State the general duties of employers, employees and others	<ul style="list-style-type: none">• Part 2, division 3, sections 115-124 of the act
4. State the Workers Compensation Act requirements for the reporting of accidents	<ul style="list-style-type: none">• Part 1, division 5 sections 53 and 54 of the act
5. State the "Core Requirements" of the Occupational Health and Safety Regulation	<ul style="list-style-type: none">• Definitions• Application• Rights and Responsibilities<ul style="list-style-type: none">– Health and safety programs– Investigations and reports– Workplace inspections– Right to refuse work• General conditions<ul style="list-style-type: none">– Building and equipment safety– Emergency preparedness– Preventing violence– Working alone– Ergonomics– Illumination– Indoor air quality– Smoking and lunchrooms
6. State the "General Hazard Requirements" of the Occupational Health and Safety Regulation	<ul style="list-style-type: none">• Chemical and biological substances• Substance specific requirements• Noise, vibration, radiation and temperature• Personal protective clothing and equipment• De-energize and lockout• Tools, machinery and equipment• Cranes and hoists• Electrical safety

Achievement Criteria:

Given a 10 question quiz on the Worker Compensation Act the Learner will be able to demonstrate knowledge of the trade by correctly answering 7 or more questions.

Line A: Workplace Safety

Competency: A2 Describe Workplace Hazardous Materials Information System (WHMIS) Regulations

Learning Objectives:

1. The learner will be able to describe the purpose of the Workplace Hazardous Materials Information System (WHMIS) Regulations.
2. The learner will be able to explain the contents of material safety data sheets (MSDS).
3. The learner will be able to explain the contents of a WHMIS label

LEARNING TASKS	CONTENT
1. State the legislation that requires suppliers of hazardous materials to provide MSDS and label products as a condition of sale and importation	<ul style="list-style-type: none">• Hazardous product act• Controlled products regulations• Ingredient disclosure list• Hazardous materials information review act• Hazardous materials information review regulations
2. State the purpose of the Workplace Hazardous Materials Information System (WHMIS)	<ul style="list-style-type: none">• Protection of Canadian workers from the adverse effects of hazardous materials through the provision of relevant information while minimizing the economic impact on industry and the discretion of trade<ul style="list-style-type: none">– Recognition of rights– Workers– Employers– Suppliers– Regulators
3. Describe the key elements of WHMIS	<ul style="list-style-type: none">• Material Safety Data Sheets (MSDS)• Labelling of containers of hazardous materials• Worker education programs
4. Describe the responsibilities of suppliers under WHMIS	<ul style="list-style-type: none">• Provide<ul style="list-style-type: none">– MSDS– Labels
5. Describe the responsibilities of employers under WHMIS	<ul style="list-style-type: none">• Provide<ul style="list-style-type: none">– MSDS– Labels

- Work education programs in the workplace
6. State the “General Hazard Requirements” of the Occupational Health and Safety Regulation
 - Hazardous ingredients
 - Preparation information
 - Product information
 - Physical data
 - Fire or explosion
 - Reactivity data
 - Toxicological properties
 - Preventive measures
 - First-aid measures

 7. Identify symbols found on WHMIS labels and their meaning
 - Compressed gases
 - Flammable and combustible materials
 - Oxidizing materials
 - Poisonous and infection materials
 - Acute toxic effects
 - Other toxic effects
 - Bio-hazardous infections materials
 - Corrosive materials
 - Dangerously reactive materials

 8. Demonstrate how WHMIS applies to hazardous materials used in the shop
 - Use, storage and disposal of;
 - Solvents
 - Caustic cleaners
 - Cleaning solutions
 - Gasoline
 - Diesel fuel
 - L.P.G.
 - C.N.G.
 - Asbestos
 - Battery acid
 - Refrigerants
 - Brake fluid
 - Antifreeze
 - Lubricants
 - Tracer dyes

Achievement Criteria:

Given a 10 question quiz on the WHMIS and MSDS the Learner will be able to demonstrate knowledge of the trade by correctly answering 7 or more questions.

Line A: Workplace Safety

Competency: A3 Demonstrate Safe Vehicle Operation

Learning Objectives:

1. The learner will be able to perform a walk around inspection prior to operating a vehicle.
2. The learner will be able to safely operate a vehicle.

LEARNING TASKS	CONTENT
1. Describe licensing pre-requirements	<ul style="list-style-type: none">• Drivers license requirements• Use of repair plates
2. Perform vehicle safety inspection requirements	<ul style="list-style-type: none">• Walk around<ul style="list-style-type: none">– Tires and wheels– Area clear– Tools put away• Brakes• Steering• Final check on work completed
3. Describe shop driving safety rules	<ul style="list-style-type: none">• Right of ways• Etiquette
4. Operate a vehicle in a shop	<ul style="list-style-type: none">• Speed limit• Safety considerations• Parking on hoist• Road tests

Achievement Criteria:

Given a written and/or a practical assessment on Workplace Safety the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line A: Workplace Safety

Competency: A4 Demonstrate Safe Work Practices

Learning Objectives:

1. The learner will be able to apply personal safety measures.
2. The learner will be able to identify and use shop emergency equipment
3. The learner will be able to prevent, identify and extinguish various classes of fires.

LEARNING TASKS	CONTENT
1. Apply personal safety precautions and procedures	<ul style="list-style-type: none">• Personal apparel<ul style="list-style-type: none">– Clothing– Hair and beards– Jewellery• Personal protection<ul style="list-style-type: none">– Head– Hands– Lungs– Eyes– Ears– Feet• Housekeeping• Ventilation systems• Clear head• Horseplay• Respect for others safety• Constant awareness of surroundings• Lifting
2. Locate shop emergency equipment and means of exit	<ul style="list-style-type: none">• Emergency shutoffs• Fire control systems• Eye wash facilities• Emergency exits• First aid facilities• Emergency contact / phone numbers• Outside meeting place• Disaster meeting place
3. Describe the conditions and classifications of fires	<ul style="list-style-type: none">• Conditions to support fire<ul style="list-style-type: none">– Air– Fuel– Heat• Classes of fires<ul style="list-style-type: none">– A - combustibles– B - liquids– C - electrical

Learning Tasks Continued

- 4. Describe fire safety precautions when working near, handling or storing flammables
 - D – metals
 - Symbols and colours
 - Fuels
 - Diesel
 - Gasoline
 - Propane
 - Natural gas
 - Lubricants
 - Oily rags
 - Combustible metals
 - Aerosols
- 5. Describe the considerations and procedures to extinguishing a fire
 - Warning others and fire department
 - Evacuation of others
 - Fire contained and not spreading
 - Method of exit
 - Training
 - P.A.S.S.
 - Point
 - Aim
 - Squeeze
 - Sweep

Achievement Criteria:

Given a written and/or a practical assessment on safe work practices the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line B: Employability Skills

Competency: B1 Describe Business Practices

Learning Objectives:

1. The learner will be able to describe effective methods of shop management and recycling programs.
2. The learner will be able to describe the career path of an automotive technician.

LEARNING TASKS	CONTENT
1. Describe the hierarchy of control within an automotive repair shop	<ul style="list-style-type: none">• Owner• Service manager• Foreman• Journey person• Apprentice• Lube person• Detailer
2. Describe shop efficiency and shop management methods	<ul style="list-style-type: none">• Flat rate• Hourly• Salary• Personal productivity• Incentive programs
3. Describe recycling programs	<ul style="list-style-type: none">• Material costs• Minimizing waste• Most cost effective method• Disposal of hazardous materials

Achievement Criteria:

Given a written assessment on basic work practices the Learner will be able to demonstrate knowledge of the trade by correctly answering 70% or more questions.

Line B: Employability Skills

Competency: B2 Demonstrate Communication Skills

Learning Objectives:

1. The learner will be able to clearly demonstrate both oral and written communication using trade terminology.

LEARNING TASKS	CONTENT
1. Explain the importance of learning and using correct trade terminology	<ul style="list-style-type: none">• Taking instructions• Giving instructions• Ordering parts• Explaining concepts
2. Use and maintain record keeping	<ul style="list-style-type: none">• Service / work order• Parts requisition• Purchase order• Technical reports• Time card• Vehicle maintenance log• Maintenance schedule
3. Use written reports	<ul style="list-style-type: none">• Service• Instructional• Technical

Achievement Criteria:

Given a written and/or a practical assessment on communication skills the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C1 Use Hand Tools

Learning Objectives:

1. The learner will be able to select the appropriate tool for a task.
2. The learner will be able to demonstrate the safe use of technician's hand tools.

LEARNING TASKS	CONTENT
1. Describe various general hand tools	<ul style="list-style-type: none">• General<ul style="list-style-type: none">– Purchase quality– Insurance– Orderly storage– Cleaning and maintenance– Used for intended purpose– Proximity to other people– Personal protective equipment– Ventilation• Wrenches• Socket wrenches• Screwdrivers• Pliers• Hammers
2. Describe special application hand tools	<ul style="list-style-type: none">• Punches• Chisels• Pry bars• Files• Saws• Vices and clamps• Scrapers and brushes• Pickup tools and mirrors• Pullers and slide hammers• Fender / seat covers
3. Use various general hand tools	<ul style="list-style-type: none">• Wrenches• Socket wrenches• Screwdrivers• Pliers• Hammers

Achievement Criteria:

Given a written and/or a practical assessment on hand tools the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C2 Use Measuring Instruments

Learning Objectives:

1. The learner will be able to select appropriate measuring instruments.
2. The learner will be able to use measuring instruments with required speed and accuracy.

LEARNING TASKS	CONTENT
1. Describe measuring tools	<ul style="list-style-type: none">• Steel rules• Tapes• Calipers and dividers<ul style="list-style-type: none">– Inside– Outside– Dividers– Vernier• Micrometers<ul style="list-style-type: none">– Inside– Outside– Depth• Telescoping gauges• Ball gauges• Feeler gauges• Dial indicator• Torque wrenches and torque sticks
2. Use Measuring Tools	<ul style="list-style-type: none">• Micrometer• Vernier• Torque wrench• Dial indicator• Feeler gauge

Achievement Criteria:

Given a written and/or a practical assessment on measuring instruments the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C3 Use Power Tools

Learning Objectives:

1. The learner will be able to select and demonstrate the safe use of power tools.

LEARNING TASKS	CONTENT
1. Describe power tools	<ul style="list-style-type: none">• General<ul style="list-style-type: none">– Purchase quality– Insurance– Orderly storage– Cleaning and maintenance– Used for intended purpose– Proximity to other people– Personal protective equipment– Ventilation• Air tools<ul style="list-style-type: none">– Maintenance and safety– Water filters– Lubricators– Pressure regulators– Air hose– Impact wrenches– Ratchets– Impact sockets and extensions– Air hammers– Blow guns– Drills– Rotary brushes– Grinders• Electric tools<ul style="list-style-type: none">– Grounded or double insulated– Maintenance and safety– Portable drills– Impact wrenches– Saws– Grinders– Work lights– Soldering irons and guns– Battery chargers
2. Use air powered tools	<ul style="list-style-type: none">• Ratchet• Gun• Butterfly• Air grinder

- Blow nozzle
 - Drill
 - Lubrication and care
3. Use electric powered tools
- Hand drill
 - Angle grinder
 - Heat gun
 - Work light

Achievement Criteria:

Given a written and/or a practical assessment on power tools the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C4 Use Fasteners

Learning Objectives:

1. The learner will be able to select threaded and non threaded fasteners.
2. The learner will be able to remove and replace fasteners.
3. The learner will be able to identify causes of fasteners failure.
4. The learner will be able to remove broken fasteners and repair threads.

LEARNING TASKS	CONTENT
1. Describe threaded fastener terminology	<ul style="list-style-type: none">• Nominal sizes• Major and minor diameter• Head markings and tensile strength• Pitch and thread angle• Thread series<ul style="list-style-type: none">– UNC– UNF– NPT– Metric• Right and left hand threads• Classes or fits
2. Select and use threaded fasteners	<ul style="list-style-type: none">• Fastener materials• Bolts• Studs• Nuts<ul style="list-style-type: none">– Hex– Castle– Slotted hex– Self locking– Wing– Speed• Self tapping screws• Sheet metal screws• Set screws
3. Torque fasteners to specifications	<ul style="list-style-type: none">• Torque definition• Tension• Elastic limit• Distortion• Tensile strength

- Torque wrenches
 - Extensions
 - Torque to yield
 - Torque sequence
 - Torquing in steps
4. Repair damaged threads
- Taps and wrenches
 - Taper
 - Plug
 - Bottoming
 - Drill and tap size charts
 - Tapping internal threads
 - Broken tap removal
 - Dies and stocks
 - Cutting external threads
 - Thread chasers
 - Helicoils
5. Select and use non threaded fasteners
- Washers
 - Flat
 - Bevel
 - Lock
 - Pins
 - Cotter clevis
 - Spring or roll
 - Shear
 - Taper
 - Dowel
 - Keys
 - Woodruff
 - Tapered
 - Spines
 - Locking plates
 - Safety wire
 - Snap rings
 - Pop rivets
6. Remove damaged nuts, bolts or studs
- Shaping a protruding end for grip
 - Broken stud extractors
 - Use of nut splitters
 - Use of chisels or punches
 - Use of hacksaws
 - Use of penetrating oil
 - Use of heat

Achievement Criteria:

Given a written and/or a practical assessment on fasteners the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C5 Use Shop Tools and Equipment

Learning Objectives:

1. The learner will be able to select, use and maintain shop tools and equipment.

LEARNING TASKS	CONTENT
1. Select and use lifting and jacking equipment	<ul style="list-style-type: none">• Mechanical jacks• Hydraulic jacks• Transmission jacks• Hoists• Stands• Portable cranes• Care and inspection of lifting and blocking equipment• Creepers
2. Select and use presses and pullers	<ul style="list-style-type: none">• Hydraulic presses and pullers• Arbor press• Slide hammers• Pullers<ul style="list-style-type: none">– Bearing– Steering component
3. Maintain air compressors	<ul style="list-style-type: none">• Construction• Tank• Compressor• Motor / engine• Drives, belts, couplings• Water filter / traps• Lubricators• Pressure regulators• Piping and hoses
4. Select and use cleaning equipment	<ul style="list-style-type: none">• Solvent and chemical cleaning facilities• Pressure washers• Steam cleaners• Abrasive blast machines• Brake cleaning equipment

Achievement Criteria:

Given a written and/or a practical assessment on shop tools and equipment the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line C: Tools and Equipment

Competency: C6 Use Reference Resources

Learning Objectives:

1. The learner will be able to locate information from a variety of sources necessary to maintain, troubleshoot and service vehicles.

LEARNING TASKS	CONTENT
1. Use service manuals to locate information	<ul style="list-style-type: none">• Maintenance• Repair procedures• Torque requirements• Technical service bulletins• Vacuum diagrams• Wiring diagrams
2. Use parts manuals to locate information	<ul style="list-style-type: none">• Exploded diagrams• Part number• Part quantity• Superseding of parts• Labour estimating guides
3. Use computers to locate information	<ul style="list-style-type: none">• Vehicle Identification Number (VIN)• Vehicle identification information<ul style="list-style-type: none">– Paint codes– Gross vehicle weight– options• Maintenance• Repair procedures• Torque requirements• Technical service bulletins• Vacuum diagrams• Wiring diagrams

Achievement Criteria:

Given a written and/or a practical assessment on reference resources the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D1 Select Lubricants and Fluids

Learning Objectives:

1. The learner will be able to select the correct lubricants and fluids necessary to maintain and service automobiles.

LEARNING TASKS	CONTENT
1. Describe and identify lubricants	<ul style="list-style-type: none">• Synthetic or mineral• Additives• Greases and other lubricants• Aerosols
2. Describe and identify fluids	<ul style="list-style-type: none">• Replacement intervals• Antifreeze<ul style="list-style-type: none">– Ethylene glycol– Propylene glycol based– Additives• Brake fluid• Power steering fluid• Windshield washer fluid
3. Describe and identify shop fluids	<ul style="list-style-type: none">• Engine shampoo• Floor cleaner• General cleaners• Solvent• Wheel acid• Car wash
4. Select lubricants and fluids for specific purposes	<ul style="list-style-type: none">• Greases• Antifreeze• Brake fluid• Power steering fluid• Windshield washer fluid• Shop fluids

Achievement Criteria:

Given a written and/or a practical assessment on lubricants and fluids the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D2 Describe Belts and Hoses

Learning Objectives:

1. The learner will be able to select the correct belts and hoses necessary to maintain and service automobiles.
2. The learner will be able to describe how to inspect belts and hoses.

LEARNING TASKS	CONTENT
1. Describe and identify drive belts	<ul style="list-style-type: none">• Non metallic<ul style="list-style-type: none">– V– Serpentine– Gilmer (toothed)
2. Describe drive belt inspection and replacement	<ul style="list-style-type: none">• Diagnose wear and defects• Replacement• Tension adjustment• Pulley alignment• Bearings• Manufacturer's specifications
3. Describe and identify hoses and clamps	<ul style="list-style-type: none">• Construction<ul style="list-style-type: none">– Pressure– Vacuum– Reinforced– Material compatibility<ul style="list-style-type: none">▪ Fuel▪ Oil▪ Coolant▪ Air / vacuum▪ Turbo▪ Brake– Flexibility– Moulded

Achievement Criteria:

Given a written and/or a practical assessment on belts and hoses the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D3 Describe Exterior Lamps

Learning Objectives:

1. The learner will be able to describe the types of exterior lamps.

LEARNING TASKS	CONTENT
1. Describe exterior lamps	<ul style="list-style-type: none">• Headlamps<ul style="list-style-type: none">– Xenon– Halogen– Sealed beam• Driving lights• Tail lights• Brake lights• Marker lights• Turn signals• License plate lights• Reverse lights• Government regulations

Achievement Criteria:

Given a written and/or a practical assessment on exterior lights the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D4 Describe Body Trim and Hardware

Learning Objectives:

1. The learner will be able to describe how to identify body trim and hardware.
2. The learner will be able to describe the design and operation of body trim and hardware.

LEARNING TASKS	CONTENT
1. Describe components of body trim and hardware	<ul style="list-style-type: none">• Windows• Mirrors• Bumpers• Mouldings and trim• Door hardware• Body panels• Windshield wiper systems<ul style="list-style-type: none">– Blades– Linkage• Interior components<ul style="list-style-type: none">– Seats– Carpet– Dashboard– headliners
2. Describe the design and operation of body trim and hardware	<ul style="list-style-type: none">• Wind noise<ul style="list-style-type: none">– Basic aerodynamics• Water leaks• Sealants• Noise vibration and harshness (NVH)

Achievement Criteria:

Given a written and/or a practical assessment on body trim and hardware the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D5 Service Tires and Wheels

Learning Objectives:

1. The learner will be able to select and install tires and wheels.
2. The learner will be able to inspect tires and wheels for defects or damage.
3. The learner will be able to repair tires.

LEARNING TASKS	CONTENT
1. Describe radial tire construction	<ul style="list-style-type: none">• Materials• Belts• Side walls• Sizing• Department of Transportation (DOT) number• Ratings<ul style="list-style-type: none">– UTQG– Load– pressure• Tread design<ul style="list-style-type: none">– Directional– Asymmetric– Conventional• Space saver spare
2. Service Tires	<ul style="list-style-type: none">• Inspection<ul style="list-style-type: none">– Wear patterns– Damage• Rotation• Mounting• Balance• Road force
3. Repair tires	<ul style="list-style-type: none">• Rubber Manufacturer's Association guidelines<ul style="list-style-type: none">– Plug patches– Plugs– Patches• Sealing tires
4. Describe wheel construction	<ul style="list-style-type: none">• Alloy• Steel• Directional• Offset

5. Inspect wheels

- Sizing
- Bolt pattern
- Curb damage
- Run out
- Fatigue damage
- Lug nut torque

Achievement Criteria:

Given a written and/or a practical assessment on service tires and wheels the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D6 Service Non Friction Bearings

Learning Objectives:

1. The learner will be able to identify and select non friction bearings.
2. The learner will be able to remove, replace and adjust non friction bearings.
3. The learner will be able to identify causes of non friction bearing failure.

LEARNING TASKS	CONTENT
1. Describe non friction bearings	<ul style="list-style-type: none">• Conrad (ball)• Tapered roller• Needle• Ball thrust• Dimensions• Load capacity
2. Service non friction bearings	<ul style="list-style-type: none">• Causes of failure• Removal and installation techniques• Lubrication / repacking<ul style="list-style-type: none">– Cleaning• Adjustment• Selection• Axial and radial play

Achievement Criteria:

Given a written and/or a practical assessment on servicing of non friction bearings the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line D: General Automotive Maintenance

Competency: D7 Service Spindles and Hubs

Learning Objectives:

1. The learner will be able to identify spindles, hubs and related components.
2. The learner will be able to remove, replace and adjust spindles, hubs and related components.
3. The learner will be able to diagnose spindle and hub problems.

LEARNING TASKS	CONTENT
1. Describe spindle and hub design and construction	<ul style="list-style-type: none">• Front wheel drive• Rear wheel drive• Construction materials• Bearing types• Disc or drum brake system
2. Inspect and service spindles and hubs	<ul style="list-style-type: none">• Lubrication• Inspection<ul style="list-style-type: none">– Visual– Audible– Measurements• Bearing adjustment• Alignment• Removal and installation• Axial and radial play

Achievement Criteria:

Given a written and/or a practical assessment on spines and hubs the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line E: General Automotive Practices

Competency: E1 Describe Diagnostic Procedures

Learning Objectives:

1. The learner will be able to describe the importance of following a diagnostic process.
2. The learner will be able to describe diagnostic procedures used for troubleshooting.

LEARNING TASKS	CONTENT
1. Describe the importance of following a diagnostic process	<ul style="list-style-type: none">• Cost of improper diagnosis• Unhappy customers• Lost business• Time management• Efficiency• Damage to components
2. Describe general diagnostic procedures	<ul style="list-style-type: none">• Understand system• Understand complaint<ul style="list-style-type: none">– Communicate with operator– Operational test– Visual inspection• Form all possible conclusions• Test conclusions• System component isolation
3. Describe the importance of following manufacturer's diagnostic procedures where available	<ul style="list-style-type: none">• Time saving• Warranty requirement• Diagnosis may not be possible any other way
4. Describe the importance of failure analysis	<ul style="list-style-type: none">• Repeat failure• Extended life• Cost• Customer satisfaction

Achievement Criteria:

Given a written and/or a practical assessment on diagnose procedures the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line E: General Automotive Practices

Competency: E2 Demonstrate Welding Safety

Learning Objectives:

1. The learner will be able to demonstrate welding safety procedures.
2. The learner will be able to demonstrate basic welding and cutting.

LEARNING TASKS	CONTENT
1. Describe oxy-acetylene components	<ul style="list-style-type: none">• Safety• Gases• Tanks, regulators and hoses• Torches
2. Demonstrate oxy-acetylene procedures	<ul style="list-style-type: none">• Set up• Lighting• Welding and cutting• Shut down• Storage• Maintenance• Inspection
3. Describe MIG (GMAW) welding components and methods	<ul style="list-style-type: none">• Gas Metal Arc Welding (GMAW)• Safety• Gas• Tank, regulator and hose• Ground terminal
4. Demonstrate MIG (GMAW) welding procedures	<ul style="list-style-type: none">• Set up• Weld• Shut down• Storage• Maintenance• Inspection

Achievement Criteria:

Given a written and/or a practical assessment on welding procedures the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F1 Describe Principles of Electricity

Learning Objectives:

1. The learner will be able to describe the principles of electricity and magnetism.
2. The learner will be able to describe circuit components and their operation.
3. The learner will be able to describe the use of electrical test equipment

LEARNING TASKS	CONTENT
1. Define electrical terminology	<ul style="list-style-type: none">• Electrical quantities and their<ul style="list-style-type: none">– units and prefixes– Voltage– Current– Resistance– Power• Types of circuits<ul style="list-style-type: none">– Series circuit– Parallel circuit– Series parallel circuit• Circuit terminology• Open circuit• Closed circuit• Short circuit• Continuity• Ground• Ground fault
2. Explain basic circuit concepts	<ul style="list-style-type: none">• Electron theory• Conventional theory• Basic circuit construction<ul style="list-style-type: none">– Power source– Load– control– Complete path• Electrical relationships• Ohm's law• Watts law• Series circuits• Parallel circuits• Series parallel circuits
3. Describe electrical components and their purpose	<ul style="list-style-type: none">• Wire• Devices

- Protective devices
- Actuators
- Resistors
- Switches
- Conductors
- Insulators

4. Describe magnetic theory

- Properties of magnetic lines of force
- Terminology
 - Flux
 - Flux density
 - Reluctance
 - Permeability
- Relationship to electrical current
 - Left hand rule for conductors
 - Left hand rule for coils
 - Electromagnetic induction
 - Relative motion
 - Speed
 - Angle
- Effect of magnetic core on coils
- Signal interference

Achievement Criteria:

Given a written and/or a practical assessment on principles of electricity the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F2 Use Electrical Test Equipment

Learning Objectives:

1. The learner will be able to describe the types of electrical test equipment.
2. The learner will be able to select and use electrical test equipment to measure electrical signals.

LEARNING TASKS	CONTENT
1. Describe the different types of electrical test equipment	<ul style="list-style-type: none">• Digital Volt Ohm Meter (DVOM)• Test light• Logic probe• High impedance test light
2. Use DVOM to test electrical circuits	<ul style="list-style-type: none">• Measure electrical signals<ul style="list-style-type: none">– Voltage– Amperage– Resistance– Frequency• Auto range feature• Units of measurement• Sample rate• Internal fuse

Achievement Criteria:

Given a written and/or a practical assessment on electrical test equipment the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F3 Describe Principles of Electronics

Learning Objectives:

1. The learner will be able to describe the principles of electronics.
2. The learner will be able to describe electronic circuit components and their operation.
3. The learner will be able to describe the use of test equipment.

LEARNING TASKS	CONTENT
1. Describe semiconductor theory	<ul style="list-style-type: none">• Semiconductor doping• PN junction
2. Describe electronic components	<ul style="list-style-type: none">• Diodes• Zener diodes• Light emitting diodes• Capacitors
3. Describe microprocessor systems	<ul style="list-style-type: none">• Microprocessor• Inputs / outputs• Programs

Achievement Criteria:

Given a written and/or a practical assessment on principles of electronics the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F4 Service Wiring Systems

Learning Objectives:

1. The learner will be able to interpret wiring diagrams and symbols.
2. The learner will be able to diagnose wiring harness problems.
3. The learner will be able to repair or remove and replace wiring harnesses.

LEARNING TASKS	CONTENT
1. Describe wiring harnesses	<ul style="list-style-type: none">• Purpose• Shielding• Routing• Support• Wire<ul style="list-style-type: none">– Gauge– Identification– Composition– Connectors– Twisted pairs
2. Interpret electrical wiring diagrams	<ul style="list-style-type: none">• Symbols• Conventions• Abbreviations• Power flow• Connectors
3. Inspect and repair wiring harnesses	<ul style="list-style-type: none">• Visual• Connectors• Soldering• Crimping• Insulation• Supports• Removal and installation• Testing

Achievement Criteria:

Given a written and/or a practical assessment on wiring systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F5 Service 12 Volt Batteries

Learning Objectives:

1. The learner will be able to describe battery design and operation.
2. The learner will be able to select. Test and maintain batteries.
3. The learner will be able to diagnose causes of battery failure.
4. The learner will be able to remove and replace batteries.

LEARNING TASKS	CONTENT
1. Describe safety considerations when working with automotive batteries	<ul style="list-style-type: none">• Hydrogen gassing• Acid• Personal protective equipment• Frozen batteries• Short circuit capacity• Environmental considerations
2. Describe the design and construction of a lead acid battery	<ul style="list-style-type: none">• Plates• Plate straps• Separators• Electrolyte• Case• Terminals
3. Describe the chemical action that takes place in a lead acid battery during charging and discharging	<ul style="list-style-type: none">• Charging cycle• Discharging cycle
4. Describe the various types of automotive batteries	<ul style="list-style-type: none">• Low maintenance• Maintenance free• Deep cycle• Recombination• Gel cell
5. Select automotive batteries	<ul style="list-style-type: none">• Battery rating methods• Physical dimensions

Achievement Criteria:

Given a written and/or a practical assessment on 12 volt batteries the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line F: Basic Electrical Systems

Competency: F6 Use Scan Tools

Learning Objectives:

1. The learner will be able to use a scan tool to retrieve diagnostic fault codes from a vehicle computer.
2. The learner will be able to use a scan tool to access vehicle data stream information from a vehicle computer.
3. The learner will be able to use a scan tool to clear diagnostic fault codes from a vehicle computer.

LEARNING TASKS	CONTENT
1. Describe scan tool types	<ul style="list-style-type: none">• Generic• Manufacturer specific• Types of fault codes<ul style="list-style-type: none">– Hard– Soft– Pending– Intermittent
2. Describe On Board Diagnostics (OBD)	<ul style="list-style-type: none">• Generic• Manufacturer specific• OBD I• OBD II• OBD III
3. Describe data stream information	<ul style="list-style-type: none">• Purpose• Fault tracing application• Sample rate• Frozen values• Movies• Snap shots
4. Use scan tool to access computer data	<ul style="list-style-type: none">• Code retrieval• Access data stream information• Clear fault codes

Achievement Criteria:

Given a written and/or a practical assessment on scan tools the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G1 Service Brake Tubing and Fittings

Learning Objectives:

1. The learner will be able to select tubing and fittings.
2. The learner will be able to cut, bend and flare brake tubing.

LEARNING TASKS	CONTENT
1. Select and use tubing and fittings	<ul style="list-style-type: none">• Tubing<ul style="list-style-type: none">– Sizing– Material– Application• Fittings• Flare• 45 degree• ISO• Cutting• Flaring<ul style="list-style-type: none">– Double lap<ul style="list-style-type: none">▪ SAE = 45 degree▪ ISO = bubble• Bending

Achievement Criteria:

Given a written and/or a practical assessment on brake tubing and fitting the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G2 Service Brake Hydraulic Systems

Learning Objectives:

1. The learner will be able to identify brake hydraulic system components.
2. The learner will be able to remove and replace brake hydraulic system components.
3. The learner will be able to diagnose causes of brake hydraulic system failure.

LEARNING TASKS	CONTENT
1. Describe hydraulic principles	<ul style="list-style-type: none">• Pascal's law<ul style="list-style-type: none">– Force– Pressure– Area
2. Describe components of the brake hydraulic system	<ul style="list-style-type: none">• Master cylinder• Wheel cylinder• Calipers• Valves• Residual pressure<ul style="list-style-type: none">– Metering– Proportioning– Pressure differential– Combination• Hoses• Hardware• Fluid
3. Service the brake hydraulic system	<ul style="list-style-type: none">• Inspect• Diagnose• Repair / replace<ul style="list-style-type: none">– Master cylinder– Wheel cylinder– Calipers– Valves– Hoses– Tubing• Flush• Bleed<ul style="list-style-type: none">– Pressure– Manual– Gravity

Achievement Criteria:

Given a written and/or a practical assessment on brake hydraulic systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G3 Service Drum Brake Systems

Learning Objectives:

1. The learner will be able to identify drum brake system components.
2. The learner will be able to remove and replace and adjust drum brake system components.
3. The learner will be able to diagnose causes of drum brake system failure.

LEARNING TASKS	CONTENT
1. Describe friction principle	<ul style="list-style-type: none">• Coefficient of friction• Factors affecting friction<ul style="list-style-type: none">– Material composition– Surface area– Heat– Applied pressure
2. Describe drum brake components	<ul style="list-style-type: none">• Drum• Shoes• Springs• Attaching hardware• Backing plate• Adjusters• parking brake mechanism• wheel cylinder
3. Describe drum brake design and operation	<ul style="list-style-type: none">• Non energizing and self energizing• Parking• Full floating axles
4. Inspect and overhaul drum brakes	<ul style="list-style-type: none">• Inspection<ul style="list-style-type: none">– Measurement– Fluid leakage– Wheel seals– Hardware condition– Parking brake cable and mechanism• Shoe replacement / adjustment• Drum service<ul style="list-style-type: none">– Machining<ul style="list-style-type: none">▪ On car▪ Off car• Parking brake adjustment• Road test

Achievement Criteria:

Given a written and/or a practical assessment on drum brake systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G4 Service Disc Brake Systems

Learning Objectives:

1. The learner will be able to identify disc brake system components.
2. The learner will be able to remove and replace and adjust disc brake system components.
3. The learner will be able to diagnose causes of disc brake system failure.

LEARNING TASKS	CONTENT
1. Describe friction principle	<ul style="list-style-type: none">• Coefficient of friction• Factors affecting friction<ul style="list-style-type: none">– Material composition– Surface area– Heat– Applied pressure
2. Describe disc brake components	<ul style="list-style-type: none">• Rotor• Caliper• Pistons• Pads• Parking brake mechanism
3. Describe disc brake design and operation	<ul style="list-style-type: none">• Rotor<ul style="list-style-type: none">– Solid– Vented– Cross drilled– Grooved• Caliper<ul style="list-style-type: none">– Fixed– Floating• Parking brake<ul style="list-style-type: none">– Drum in hat– Caliper style• Pads
4. Inspect and overhaul disc brakes	<ul style="list-style-type: none">• Inspection<ul style="list-style-type: none">– Measurement– Fluid leakage– Wheel seals– Hardware condition– Parking brake cable and mechanism

- Pad replacement
- Rotor service
 - Machining
 - On car
 - Off car
- Parking brake adjustment
- Road test

Achievement Criteria:

Given a written and/or a practical assessment on disc brake systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G5 Inspect Power Assist Systems

Learning Objectives:

1. The learner will be able to identify power assist system components.
2. The learner will be able to diagnose causes of power assist system failure.

LEARNING TASKS	CONTENT
1. Describe the components of power assist systems	<ul style="list-style-type: none">• Hydro boost<ul style="list-style-type: none">– Power steering fluid– Brake fluid• Vacuum booster layout• Common control valve designs• Vacuum pumps<ul style="list-style-type: none">– Electrical– Mechanical
2. Describe the design and operation of power assist systems	<ul style="list-style-type: none">• Vacuum booster layout• Common control valve designs• Vacuum pumps<ul style="list-style-type: none">– Electrical– Mechanical• Emergency brake assist
3. Inspect power assist systems	<ul style="list-style-type: none">• Test vacuum circuit• Test power assist function

Achievement Criteria:

Given a written and/or a practical assessment on inspecting power assist systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line G: Brake Systems

Competency: G6 Service Anti-Lock Brake Systems

Learning Objectives:

1. The learner will be able to identify anti-lock brake system components.
2. The learner will be able to remove, replace and adjust anti-lock brake system components.
3. The learner will be able to diagnose causes of power assist system failure.

LEARNING TASKS	CONTENT
1. Describe the benefits and limitations of anti-lock braking systems	<ul style="list-style-type: none">• History of ABS• Improved steering control while braking• Improved braking in most situations• Foundation for traction control• Foundation for dynamic stability control
2. Describe the design and construction of anti-lock braking systems	<ul style="list-style-type: none">• Two wheel Vs four wheel• Three / four channel• Hydraulic<ul style="list-style-type: none">– Pump– Valves– Accumulators– Fluid• Electrical<ul style="list-style-type: none">– Sensors– Computer– Controller• Electronic brake force distribution
3. Inspect and repair of anti-lock braking systems	<ul style="list-style-type: none">• Safety• Diagnostic fault codes• Bleeding procedures• System self check• Pinpoint testing• Speed sensor signal testing• Road testing• Component replacement• Diagnostic flow chart

Achievement Criteria:

Given a written and/or a practical assessment on electrical test equipment the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H1 Service Steering Gears

Learning Objectives:

1. The learner will be able to identify steering gear components.
2. The learner will be able to remove, replace and adjust steering gears.
3. The learner will be able to diagnose causes of steering gear failure.
4. The learner will be able to describe the components of the rack and pinion steering gears.
5. The learner will be able to describe the design and operation of the rack and pinion steering gears

LEARNING TASKS	CONTENT
1. Describe the components of conventional steering gears	<ul style="list-style-type: none">• Recirculating ball steering box design<ul style="list-style-type: none">– Ball nut assembly– Sector shaft– Trust bearings– Seals– Lubrication
2. Describe the design and construction of conventional steering gears	<ul style="list-style-type: none">• Steering box ratio• Materials• Mounting
3. Service conventional steering gears	<ul style="list-style-type: none">• Seal leakage• Shaft wear• Gear tooth wear• Pitman arm spine wear or damage• Sequence of adjustments<ul style="list-style-type: none">– Bearing preload– Gear tooth lash– Over centre adjustment
4. Describe the components of rack and pinion steering gears	<ul style="list-style-type: none">• Housing and seals• Rack and pinion• Bearings• Tie rod ends• Bellows (boots)
5. Describe the design and operation of rack and pinion steering	<ul style="list-style-type: none">• Steering gear ratio• Materials• Lubrication

6. Service rack and pinion steering gears

- Mounting
- Tie rod ends
- Pinion shaft and bearing wear
- Leaks
- Mounting
- Condition of bellows

Achievement Criteria:

Given a written and/or a practical assessment on service steering gears the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H2 Disarm and Rearm Passenger Restraint Systems

Learning Objectives:

1. The learner will be able to identify passenger restraint system components.
2. The learner will be able to safely disarm and rearm passenger restraint systems.
3. The learner will be able to remove and replace passenger restraint system components.

LEARNING TASKS	CONTENT
1. Describe passenger restraint systems	<ul style="list-style-type: none">• Regulations• Construction• Passive<ul style="list-style-type: none">– Air bags– Shoulder belts– Whiplash protection– Side impact– Passenger detection– Crash avoidance• Active<ul style="list-style-type: none">– Pyrotechnical Seat belts
2. Disarm and rearm air bag system	<ul style="list-style-type: none">• Safety• Diagnostic codes• Visual inspection• Functional testing• Repair / replacement procedures<ul style="list-style-type: none">– Centre clock spring• Liability• Tampering• System disabling

Achievement Criteria:

Given a written and/or a practical assessment on electrical test equipment the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H3 Inspect Steering Columns

Learning Objectives:

1. The learner will be able to identify steering columns and related components.
2. The learner will be able to describe the removal, replacement and adjustment of steering columns and related components.
3. The learner will be able to diagnose causes of steering column and related component failure.

LEARNING TASKS	CONTENT
1. Describe the components of steering columns	<ul style="list-style-type: none">• Mounting• Bearings• Coupling assemblies• Collapsing function• Dust seals• Steering wheel security systems• Master splines for steering wheel• Noise suppression and sealing• Air bag precautions and procedures
2. Describe the design and construction of steering columns	<ul style="list-style-type: none">• Tilting and telescoping function• Collapsing function• Noise transmission• Vibration suppression• Supplementary restraint systems (SRS)• Shift linkage
3. Describe the inspection and replacement of steering columns	<ul style="list-style-type: none">• SRS safety awareness• Steering wheel alignment• Alignment for noise and vibration• Electrical connections• Mounting procedures and hardware• Shift linkage adjustment• Collapsing feature

Achievement Criteria:

Given a written and/or a practical assessment on steering columns the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H4 Service Steering Linkage

Learning Objectives:

1. The learner will be able to identify steering linkage components.
2. The learner will be able to remove, replace and adjust steering linkage components.
3. The learner will be able to diagnose steering linkage wear or damage.

LEARNING TASKS	CONTENT
1. Describe the components of steering linkage	<ul style="list-style-type: none">• Tie rod ends and sockets• Pitman arm• Idler arm• Centre (drag) link• Associated hardware
2. Describe the design and construction of steering linkage	<ul style="list-style-type: none">• Parallelogram linkage• Haltenberger
3. Inspect and repair steering linkage	<ul style="list-style-type: none">• Wear• Ball joint play• Axial• Radial• Idler arm• Lubrication and boot condition• Ball joint and clamp alignment• Torque of hardware• Cotter pin of castellated nuts

Achievement Criteria:

Given a written and/or a practical assessment on steering linkage the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H5 Service Power Steering Systems

Learning Objectives:

1. The learner will be able to identify power steering system components.
2. The learner will be able to remove, replace and adjust power steering system components.
3. The learner will be able to diagnose causes of power steering system problems.
4. The learner will be able to describe the operation of four wheel steering systems.

LEARNING TASKS	CONTENT
1. Describe the components of a power steering system	<ul style="list-style-type: none">• Pump• Associated hoses• Spool valve• Power cylinder• Fluid types• Electric supply to steering gear
2. Describe the design and construction of a power steering system	<ul style="list-style-type: none">• Pump pressure and flow regulation• Spool valve operation• Power cylinder operation• Speed control and variable assist• Electric power steering
3. Diagnose causes of power steering system problems.	<ul style="list-style-type: none">• Fluid level and condition• Leaks<ul style="list-style-type: none">– Internal– External• Pump replacement• Pump mounting and belt adjustment• Pressure and flow testing• Bleeding• Road test• Turning effort test
4. Describe the operation of four wheel steering systems.	<ul style="list-style-type: none">• Overview<ul style="list-style-type: none">– Electrical systems– Mechanical systems

Achievement Criteria:

Given a written and/or a practical assessment on power steering systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line H: Steering Systems

Competency: H6 Perform Wheel Alignment

Learning Objectives:

1. The learner will be able to describe wheel alignment angles.
2. The learner will be able to measure and adjust wheel alignment angles.
3. The learner will be able to diagnose wheel alignment problems.

LEARNING TASKS	CONTENT
1. Describe steering geometry	<ul style="list-style-type: none">• Caster• Camber• Toe• Steering axis inclination• Scrub radius• Toe out on turns• Thrust angle• Two wheel versus four wheel alignment• Collision damage
2. Describe methods of adjusting steering geometry	<ul style="list-style-type: none">• Pre-checks• Factory adjustment methods• Aftermarket adjustment methods
3. Adjust wheel alignment	<ul style="list-style-type: none">• Four wheel alignment procedures• Rear wheels<ul style="list-style-type: none">– Thrust angle– camber– Toe• Front wheels<ul style="list-style-type: none">– Camber– Caster– Toe• Check toe out on turns• Check steering axis inclination• Check steering wheel centre

Achievement Criteria:

Given a written and/or a practical assessment on performing wheel alignments the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line I: Suspension Systems

Competency: II Describe Frame Types

Learning Objectives:

1. The learner will be able to identify frame types.
The learner will be able to describe the advantages and disadvantages of unit body and
2. conventional frame designs.

LEARNING TASKS	CONTENT
1. Describe unit body frame design	<ul style="list-style-type: none">• Advantages• Disadvantages<ul style="list-style-type: none">– Welding construction– Rivet construction– Material selection– Strength– Accident crush zones
2. Describe conventional frame design	<ul style="list-style-type: none">• Advantages• Disadvantages<ul style="list-style-type: none">– Perimeter– Ladder– Hydro-formed– Material selection– Strength– Accident crush zones

Achievement Criteria:

Given a written and/or a practical assessment on frame types the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line I: Suspension Systems

Competency: I2 Describe Suspension Geometry

Learning Objectives:

1. The learner will be able to describe the design and operation of suspension systems.
2. The learner will be able to describe the forces acting upon a suspension system.

LEARNING TASKS	CONTENT
1. Describe suspension types	<ul style="list-style-type: none">• Front<ul style="list-style-type: none">– Rigid– Independent<ul style="list-style-type: none">▪ McPherson strut▪ Short and long arm▪ Multi link▪ Twin I beam• Rear<ul style="list-style-type: none">– Rigid– Independent<ul style="list-style-type: none">▪ Chapman strut▪ Short and long arm▪ Multi link▪ Semi - rigid
2. Describe suspension dynamics	<ul style="list-style-type: none">• Forces<ul style="list-style-type: none">– Lateral– Acceleration– Braking• Body roll• Suspension travel• Weight shifting

Achievement Criteria:

Given a written and/or a practical assessment on suspension geometry the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line I: Suspension Systems

Competency: I3 Describe Suspension Components

Learning Objectives:

1. The learner will be able to identify components of suspension systems.
2. The learner will be able to describe the design and operation of suspension components.

LEARNING TASKS	CONTENT
1. Describe common automotive spring designs	<ul style="list-style-type: none">• Coil• Leaf• Mono leaf• Air• Torsion bar• Anti sway bar• Modification<ul style="list-style-type: none">– Ride height<ul style="list-style-type: none">▪ Towing▪ Off road▪ Performance
2. Describe the construction and operation of shock absorbers and struts	<ul style="list-style-type: none">• Purpose• Components• Types• Conventional<ul style="list-style-type: none">– Gas– Low pressure– High pressure• Adjustable<ul style="list-style-type: none">– Mechanical– Electrical– Pneumatic• Modification<ul style="list-style-type: none">– Towing– Off road– Performance
3. Describe suspension components design and construction	<ul style="list-style-type: none">• Ball joints<ul style="list-style-type: none">– Loaded– Follower• King pins• Rubber bushings

- Frame and body mounting points
- Construction materials

Achievement Criteria:

Given a written and/or a practical assessment on suspension components the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line I: Suspension Systems

Competency: I4 Service Suspension Systems

Learning Objectives:

1. The learner will be able to remove, replace and adjust suspension system types.
2. The learner will be able to diagnose suspension system problems.

LEARNING TASKS	CONTENT
1. Inspect and service shock absorbers and struts	<ul style="list-style-type: none">• Visual inspection• Functional test• Bounce and rebound test• Leaks• corrosion• Safety• Removal and replacement• Alignment
2. Inspect and service ball joints and bushings	<ul style="list-style-type: none">• Safety• Lubrication• Visual• Measurements• Removal and replacement• Torquing sequence and procedures
3. Inspect and service suspension systems	<ul style="list-style-type: none">• Ride height measurements• Damaged / worn components• Safety<ul style="list-style-type: none">– Unloading springs– Compressing springs• Removal and replacement• Torquing sequence and procedures

Achievement Criteria:

Given a written and/or a practical assessment on service suspension systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

Line I: Suspension Systems

Competency: I5 Describe Electronic Suspension Systems

Learning Objectives:

1. The learner will be able to identify electronic suspension system components.
2. The learner will be able to describe the removal, replacement and adjustment of electronic suspension system components.

LEARNING TASKS	CONTENT
1. Describe electronic suspension systems	<ul style="list-style-type: none">• Basic• Electrically controlled shocks• Load levelling system• Advanced• Air springs / struts• Electronic / computer controlled dynamic systems
2. Describe the inspection and repair of electronic suspension systems	<ul style="list-style-type: none">• Safety• Visual inspection• Function test• Electrical test• Diagnostic codes• Removal and replacement• Alignment

Achievement Criteria:

Given a written and/or a practical assessment on electronic suspension systems the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.

SECTION 3: TRAINING PROVIDER STANDARDS

AUTOMOTIVE SERVICE TECHNICIAN 1: TOOL LIST

Standard Tools

1. air drills/tools
2. air hammer/chisel
3. air ratchet
4. antifreeze tester
1. axle boot clamp tool
2. battery post service and reshape tool
3. belt tension release tool
4. blow gun
5. bolt extractor set (easy outs)
6. brake service tools (adjusters, spring removal, installation and caliper tools)
7. caulking gun
8. centre punch
9. chisels, punches
10. creeper/fender covers
11. crowfoot wrenches (flare and std, SAE and Metric)
12. dial indicator set (flare and std, SAE and Metric)
13. die grinder
14. drill and bits
15. drill gauge
16. feeler gauges – SAE and metric
17. files – bastard cut/half round/mill cut/square and thread file
18. filter wrenches
19. flare nut wrenches – SAE and metric
20. flaring tool (SAE, metric and ISO)
21. flash lights
22. fuel line disconnect set
23. hacksaw
24. hammers – ball peen/dead blow/rubber
25. mallet/softface
26. hex keys – SAE and metric
27. impact driver and bits
28. impact wrench and impact socket set – SAE and metric
29. inspection mirror
30. jumper lead
31. magnetic pick up tool
32. mechanic's pick set
33. multimeter (DVOM)
34. nut driver set – SAE and metric
35. pliers – slip joint, needle nose, adjustable, wheel weight, side cutter, snap ring, locking, hog ring and battery types
36. pry bar
37. pullers – gear, pulley, battery terminal and steering wheel
38. ratchet and sockets – ¼, 3/8 and ½ drive – SAE and metric, swivel, spark plug, extensions and adapters
39. rivet gun
40. scraper (gasket and carbon)

41. screwdriver set
42. seal drivers and extractors
43. soldering tools
44. standard test leads and probes
45. steel rule
46. stethoscope
47. straight edge
48. stud extractor
49. tamper-proof torx set
50. tap and die set – SAE and metric
51. tap extractor
52. tape and ruler
53. terminal remover tools
54. test lamp –electronics safe (powered and non-powered)
55. thermometer
56. thread files
57. thread pitch gauge
58. tin snips – centre, left and right cut
59. tire pressure gauge
60. tool box
61. torque angle meter/indicator
62. torque limited sockets (torque sticks)
63. torque wrenches – various sizes and ranges
64. torx bits
65. tread depth gauge (for tires and brakes)
66. trouble light
67. tube bending tool
68. tube cutters
69. upholstery tools – trim panel tools, hog ring pliers
70. utility knife
71. vacuum pump
72. vacuum/pressure gauge
73. vernier caliper – SAE and metric
74. vise grips
75. wire brush
76. wire stripper/crimping tool
77. wrench set – SAE and metric/various designs

Shop Tools and Equipment

1. acetylene torches
2. air bag for alignment adjustments
3. airbag removal tools
4. airbag simulators
5. air buffer
6. air compressor – hoses – inline filter and water separators
7. alignment lift
8. and equipment- 4 wheel
9. angle grinder
10. anti-static devices

11. arbor press
12. ball joint press and adapters
13. battery charger/boosting equipment
14. battery hydrometer
15. battery tester/alternator and starter tester (AVR)
16. bearing remover
17. belt tension gauge
18. bench grinders
19. bench vises
20. bottle jacks (2)
21. brake adjustment calipers
22. brake bleeder wrenches
23. brake cylinder hone
24. brake fluid moisture tester
25. lathe
26. brake pedal depressor
27. brake pressure tester
28. brake rotor gauge/micrometer
29. brake system bleeder
30. calibrated vessel
31. caliper tools for rear-wheel disc
32. chassis ears
33. brake washer system (for 2 and 4 post hoists)
34. computer – PC
35. drill press
36. electrical short detector
37. floor jack
38. funnels
39. grease gun and fluid suction pump
40. heat gun
41. heli-coil kits
42. hub service kit
43. hydraulic press
44. jack stands and supports
45. leak detection equipment (refrigerants)
46. leak detection tank (tires)
47. oil drain barrels and disposal system
48. parts washers
49. pickle-fork tool set
50. Pitman arm pullers
51. power steering pressure tester
52. presses
53. pressure washer
54. reamer
55. vacuum
56. slide hammer
57. smoke machine
58. spreaders (tire)
59. spring compressors – coil spring and strut
60. spring

61. steering wheel holder
62. steering wheel puller set
63. steering lock plate removal tool
64. steering tilt pin removal tool
65. tie-rod end puller
66. tie-rod sleeve tools
67. tire changing machine (run-flat capable)
68. tire balancer equipment (road force type recommended)
69. tire repair equipment
70. TPMS system service tools
71. transmission fixtures
72. u-joint press
73. door trim tools
74. vehicle lifts
75. vehicle service information system
76. water hose
77. welding equipment – GMAW welder and oxy fuelled

Measuring Tools and Equipment

1. ABS pressure tester
2. ball joint dial indicator set
3. brake drum gauge (for brake shoe adjusting)
4. brake drum micrometer
5. battery tester (electronic)
6. DVOM (Digital Volt Ohm Meter)
7. headlight aiming equipment
8. infrared thermometer
9. lab scope or graphing multimeter; 8 per class of 6 (channel, digital, curser function with time capture capability)
10. lab scope accessories (shielded cables and back probes)
11. low amp probe
12. logic probe
13. micrometer – SAE and metric
14. power steering pressure tester
15. pressure gauges
16. scan tools; 8 per class of 6 (CAN bus capable with appropriate software no older than 5 years of current MY vehicles)
17. spring scale

FACILITY REQUIREMENTS

CLASSROOM AREA

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating / Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

SHOP AREA (fixed properties)

- Ceiling shall be a minimum height of 16' or as varied by good engineering practices and code
- Appropriate lifting devices (hoists) used in industry
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Compliance with all local and national fire code and occupational safety requirements
- Must meet Municipal and Provincial bylaws in regards to waste water management and environmental laws
- Adequate hoist to student ratio

SECTION 4: LEARNING RESOURCES

Learning Resources

The following list of learning resources has been provided as support for teachers in instruction, assessment, and delivery of Level 1 or Certificate of Qualification Programs. As with all supplementary resources, local approval is required before use. If a school is partnered with a post-secondary training provider, consultation is advised to ensure continuity or sequential use of learning resources. Teachers wishing to use these materials should preview and select those that are appropriate for use in their classroom and by their students. The resources are not intended as an exhaustive or exclusive list; rather, these materials represent a useful collection, relating to many of the key elements of the program.

ALBERTA LEARNING GUIDES

7850001029	Measuring Tools
7850001030	Specialty Hand Tools
7850001031	Fastening Devices
7850001868	Introduction to Scan Tools
7850001034	Oxy-Acetylene Heating and Cutting
7850001867	Gas Metal Arc Welding
7850001047	Hydraulic System Components
7850001050	Power Brakes
7850001044	Steering Columns
7850001037	Frames
7850001041	Power Steering
7850001042	Steering Angles
7850001039	Wheels, Hubs and Tires

Erjavec Automotive Technology - Workbook	0-17-610439-9
American Lift Institute Lifting It Right	ALI SMO1-2

ADDITIONAL REFERENCES

Halderman Automotive Electricity and Electronics 0-13-084224-9
CDX Global

- *Automotive Fundamentals*
By Martin W Stockel/Martin T. Stockel
Goodheart-Wilcox, publishers

- *Automotive Steering Suspension and Alignment*
By Check-Chart, HM. Gousha Company
Harper and Row, publishers