Automotive Service Technician Level I
WORKPLACE PROGRAM GUIDE

BRITISH COLUMBIA
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Ministry of Education

ita
industry training authority

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Contents

Introduction

Rationale

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

Accelerated Credit Enrolment in Industry Training (ACE IT) is an industry certification program for BC secondary school students. (See www.itabc.ca/) The program enables students to earn both graduation credits and credit for the first level of technical training associated with an Industry Training Program. High school students have an opportunity to gain a head start by earning their credential in one of the many trades or industry occupations that the Industry Training Authority (ITA) recognizes. An ACE IT Level 1 program complements the existing programs:

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

Students can register in both programs and be well on their way toward a trades credential by the time they finish secondary school.

Level 1 technical training is the industry-standard credential 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. This helps graduates make a smooth transition to either the workplace or an appropriate post-secondary program. The course credits obtained through an ACE IT program count toward graduation and the Level 1 credential. The ITA will record the Level 1 credential, 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. It is important to note that this program guide contains the same learning competencies and content tasks that an adult apprentice would study in his or her first year of technical training in a college Level 1 program. ACE IT students write the same ITA Level 1 final exam as all other apprentices in the trade, and must achieve a minimum mark of 70 percent.

Goals for ACE IT Level 1 Technical Training

The goals of ACE IT include:

- providing students with a smooth transition from school to work
- enhancing students' existing trade-specific job-readiness skills, or providing opportunities for the development of new skills
- providing students with the opportunity to obtain a Level 1 technical training certification in a given trade
- helping 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

Level 1 program guides in all the trades subjects define the knowledge, skills, and attitudes that will give students a solid foundation in the subject as a preparation for employment. 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. The competencies discussed in this program guide are equivalent to learning outcomes 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 delivery of the content can best take place in individual classrooms.

This guide uses the following terms in discussing student learning:
lines, competencies, learning objectives, and learning tasks and content.

1. Lines
   - Lines can be described as the overall sections or units required for a Level 1 program in any trade area.

2. Competencies
   - Lines are then divided into competencies that are equivalent to a learning outcome and have specific learning tasks associated with them.

3. Learning Objectives
   - Learning objectives are a concise summary of the learning to be achieved.

4. Learning Tasks and Content
   - In each competency, the learning tasks and content constitute the theoretical and practical study and/or tasks to be completed.

Classroom Assessment

Teachers are encouraged to develop assessment methods that best represent student performance as they complete the program. For effective delivery of Level 1 competencies, a form or method of classroom criterion-referenced assessment and evaluation will be needed to track progress and measure student achievement. Such methods range from very broad criteria 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 outcomes, 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 being a cognitive skill. Rather, it must be translated into actions and behaviours that students apply on a daily basis. This knowledge and experience will endure after their 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 will 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 (e.g., hoist safe-use training)
- 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, including the use of Safety STAR and similar programs

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 the Planning 10 course to all students. The Graduation Portfolio includes an organizer that reinforces the importance of employability skills. The competencies in this program guide provide students with the opportunity to develop 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/education/learning-tools/default.htm

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.

Included in this section is information about:

- addressing local labour market information and needs
- facilities, equipment, and resources
- program delivery options
- partnerships
- teacher qualifications
- ITA assessment exam
- suggested timeframe
- work-based training

Addressing Local Labour Market Information and Needs

In B.C. there are currently more than 150 recognized trades and industry career choices. What these occupations have in common is that they require specialized skills, involve working with your hands as well as your head, and most training is done both in school or college and balanced with on-the-job learning.

Trades and industry occupations are vital to the economy, and make excellent sense as a career choice. Many people are attracted to careers in trades because they let them use a hands-on ability or because they allow them to work in an environment that they enjoy.

For students, 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: www.aved.gov.bc.ca/labourmarketinfo/cppa.htm

Facilities, Equipment, and Resources

To deliver these programs in BC schools, training sites must provide the required facilities, equipment, and resources. These facilities, equipment, and resources must be addressed to adequately support the programs.

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 is partnered 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: www.red-seal.ca/Site/trades/analist_e.htm

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

www.red-seal.ca/Site/english/pdf/Carpenter_2005.pdf
www.red-seal.ca/Site/english/pdf/Automotive_Service_Technician_2005.pdf
www.red-seal.ca/Site/english/pdf/Cook_2003.pdf

ACE IT Program Delivery

For districts to offer these programs as ACE IT-funded programs, districts must submit an ACE IT application to ITA and receive approval for their program. The ACE IT application process is described on the ITA website: www.itabc.ca

A key ACE IT program goal is that school districts/board authorities develop and maintain active partnerships with both industry and post-secondary institutions that have experience in delivering the relevant industry training program.

The outcomes of the ACE IT pilot projects demonstrated that these two factors are critical to ensuring quality programs that result in relevant skills and knowledge, and in smooth transitions for students to the workplace.

Partnership Delivery Model

Program development and delivery takes place in a cooperative partnership between school districts/board authorities and a post-secondary institution.

In the partnership delivery model, classes can be taught at the school and/or the college 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. ITA is currently developing this model.

Teacher/Instructor Qualifications

Under the partnership model, the school district/board authority and post-secondary institution partner 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 an ACE IT program will be provided a school report to complete for each student and submit to ITA.

The classroom instructor determines practical assessment methods, which may consist of student demonstrations of the appropriate competencies.

Standardized Level 1 assessment examinations are currently in development and will be available by January 2007. These standardized ITA Level 1 examinations will replace any existing Level 1 examinations.

Suggested Courses for Automotive Service Technician Level I

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

- Automotive Service Technician Level 1 12A
- Automotive Service Technician Level 1 12B
- Automotive Service Technician Level 1 12C
- Automotive Service Technician Level 1 12D

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

In addition to these four primary ACE IT courses, schools may also use the existing Ministry Automotive Technology 11 and 12 courses if students require additional time to complete the Level 1 Automotive Service Technician program.

Work-Based Training

Work-based training is an integral part of an industry training program. Under the ACE IT delivery model, it is strongly recommended that students engage in either SSA or Work Experience 12.

School districts/board authorities offering ACE IT programs become the sponsor for the ACE IT student.

Lines, Competencies and Suggested Timeframe

Line A — Describe Safety — 5%	Line B — Describe Employability Skills — 2%
1 Describe Workers' Compensation Board Regulations	1 Use Personal Computers
2 Describe Workplace Hazardous Materials Information System (WHMIS) Regulations	2 Demonstrate Employability Skills
3 Describe Safe Vehicle Operation	3 Describe Business Practices
4 Describe Safe Work Practices	4 Demonstrate Employment Readiness Skills
Line D — Use Tools and Equipment — 5%	**Line E — Demonstrate General Automotive Maintenance — 8%**
1 Use Hand Tools	1 Select Lubricants and Fluids
2 Use Power Tools	2 Service Filters, Belts and Hoses
3 Use Diagnostic Equipment	3 Assess Leaks
4 Use Shop Tools and Equipment	4 Inspect Tires and Wheels
5 Use Reference Sources	5 Replace Exterior Lamps
6 Use Measuring Instruments	6 Service Body Trim, Hardware and Accessories
Line F — Demonstrate General Automotive Practices — 8%	**Line H — Service Brakes — 25%**
1 Service Gaskets and Seals	1 Service Brake Hydraulic Systems
2 Use Fasteners	2 Service Drum Brake Systems
3 Service Tubing and Fittings	3 Service Disk Brake Systems
4 Demonstrate Welding Techniques	4 Service Power Assist Systems
5 Service Bearings and Bushings	
8 Describe Diagnostic Procedures	
Line I — Service Steering Systems — 20%	**Line J — Service Suspension Systems — 14%**
1 Service Steering Gears	1 Describe Frame Types
2 Service Steering Columns	2 Describe Suspension Types
3 Service Steering Linkage	3 Service Shocks and Struts
4 Service Power Steering Systems	4 Service Spring Types
5 Perform Wheel Alignment	5 Service Suspension Components
6 Describe Four-Wheel Steering Systems	6 Service Spindles and Hubs
Line M — Service Electrical/Electronic Systems — 13%	
1 Describe Principles of Electricity	
2 Service Batteries	
9 Service Anti-Lock Brake Systems	
11 Service Electronic Suspension Systems	
13 Service Vehicle Restraint Systems	
15 Service Wiring Harnesses	

Line A: Describe Safety
Competency: A - 1 Describe Workers' Compensation Board Regulations

Learning Objectives:

1. The learner will be able to describe the application of the parts of the *Workers' 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 Technicians' workplace.

Learning Tasks	Content
1. Define terms used in the *Workers' Compensation Act*	• Definitions, Section 1 of the Act
2. Describe the conditions under which compensation will be paid (Book 1)	• Part 1, Division 2 of the Act
3. State the general duties of employers, employees and others (Book 1)	• Part 2, Division 3, Sections 115-124 of the Act
4. State the *Workers' Compensation Act* requirements for the reporting of accidents (Book 1)	• Part 1, Division 5, Sections 53 and 54 of the Act
5. State the "Core Requirements" of the Occupational Health and Safety Regulation (Book 1)	• Definitions • Application • Rights and Responsibilities – Health and safety programs – Investigations and reports – Workplace inspections – Right to refuse work • General Conditions – 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 (Book 2)

- Chemical and biological substances
- Substance specific requirements
- Noise, vibration, radiation and temperature
- Personal protective clothing and equipment
- Confined spaces
- De-energization and lockout
- Fall protection
- Tools, machinery and equipment
- Ladders, scaffolds and temporary work platforms
- Cranes and hoists
- Rigging
- Mobile equipment
- Transportation of workers
- Traffic control
- Electrical safety

Line A: Describe Safety
Competency: A - 2 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 MSDSs and label products as a condition of sale and importation	• 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)	• 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 disruption of trade • Recognition of rights – Workers – Employers – Suppliers – Regulators
3. Describe the key elements of WHMIS	• Material safety data sheets (MSDSs) • Labelling of containers of hazardous materials • Worker education programs
4. Describe the responsibilities of suppliers under WHMIS	• Provide – MSDSs – Labels
5. Describe the responsibilities of employers under WHMIS	• Provide – MSDSs – Labels – Work education programs in the workplace

6. Describe information to be disclosed on a MSDS	• 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 infectious materials – Materials Causing Immediate and Serious Toxic Effects – Materials Causing Other Toxic Effects – Biohazardous Infectious 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 – Alcohol used for cleaning – Gasoline – Diesel fuel – L.P.G. – C.N.G. – Asbestos – Battery acid – Refrigerants – Brake fluid – Antifreeze – Lubricants – Tracer Dyes

Line A: Describe Safety
Competency: A - 3 Describe 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 in conformance with law.

Learning Tasks	Content
1. Describe Licensing Requirements	• Drivers licence requirements • Use of repair plates
2. Describe vehicle safety inspection requirements	• Walk around – Tires and wheels – Area clear – Tools put away • Brakes • Steering • Final check on work completed
3. Describe shop driving safety rules	• Right of ways • Etiquette

Line A: Describe Safety
Competency: A - 4 Describe Safe Work Practices

A-4

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	• Personal apparel
	  – clothing
	  – hair and beards
	  – jewellery
	• Personal protection
	  – 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 egress	• 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 necessary to support a fire	• Air • Fuel • Heat
4. Describe the classes of fires according to the materials being burned	• Class A • Class B • Class C • Class D • Symbols and colours

5. Describe fire safety precautions when working near, handling or storing flammable liquids or gases, combustible materials and electrical apparatus	• Fuels – Diesel – Gasoline – Propane – Natural Gas • Lubricants • Oily rags • Combustible metals • Aerosols
6. Describe the considerations and steps to be taken prior to fighting a fire	• Warning others and fire department • Evacuation of others • Fire contained and not spreading • Personal method of egress • Training
7. Describe the procedure for using a fire extinguisher	• P.A.S.S. – Pull – Aim – Squeeze – Sweep

Line B: Describe Employability Skills
Competency: B - 1 Use Personal Computers

Learning Objectives:

1. The learner will be able to use a personal computer to maintain files and access technical information.
2. The learner will be able to use a personal computer for vehicle diagnostics.

Learning Tasks	Content
1. Describe the keyboard functions and the use of a mouse in Windows	• Function keys • CRTL and ALT keys • Windows key • Special key combinations • Mouse functions
2. Describe the purpose of an operating system	• Controlling hardware • Running application programs • Managing files • Providing graphic user interfaces
3. Describe the application of the desktop in Windows	• Start menu options, settings and programs • Taskbar • Notification area • Shortcuts
4. Describe the use of an applications window	• Title bar • Minimize, maximize, restore and close buttons • Control menu and menu bar • Resizing and moving windows • On-line help for applications
5. Describe how to manage files in Windows	• Formatting and copying disks • Creating a Windows 95® (or later version) start-up disk • Use of Explorer or My Computer • Working with files and file folders • Creating shortcuts

6. Run application specific software and network programs	• Graphics applications
	• Communications applications
	• Tutorials
	• Work orders
	• Manuals
	  – Parts
	  – Service
	  – Bulletins
	• E-mail
	• Web resources
	• Diagnostics

Line B: Describe Employability Skills
Competency: B - 2 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	• Taking instructions • Giving instructions • Ordering parts • Explaining concepts
2. Use and maintain record keeping	• Service/work order • Parts requisition • Purchase order • Time card • Vehicle maintenance log • Maintenance schedule
3. Use written reports	• Service • Instructional

Line B: Describe Employability Skills
Competency: B - 3 Describe Business Practices

Learning Objectives:
1. The learner will be able to describe effective methods of shop management and recycling.

Learning Tasks	Content
1. Describe shop efficiency and shop management methods	• Flat rate • Hourly • Salary • Personal productivity • Incentive programs
2. Describe recycling programs	• Material costs • Minimizing waste • Most cost effective method • Disposal of hazardous materials

Line B: Describe Employability Skills
Competency: B - 4 Demonstrate Employment Readiness Skills

Learning Objectives:

1. The learner will be able to demonstrate the skills required to obtain and retain employment.

Learning Tasks

1. Describe responsibilities of employees and expectations employers have of employees

Content

- Communication
  - Use of trade language
  - Reading and comprehending
  - Writing
- Thinking
  - Problem solving and decision making
  - Use of mathematics
  - Use of current technology
  - Ability to research
- Desire to continue learning
- Positive attitude
  - Self esteem
  - Confidence
  - Honesty and integrity
  - Initiative
  - Energy
  - Persistence
  - Cooperative
- Responsibility
  - Dependability
  - Goal and priority setting
  - Time management
  - Money management
  - Punctuality
- Adaptability
  - Positive attitude towards change
  - Respect for other diversity and differences
  - Creativity
  - Flexible
- Team skills
  - Work with others
  - Group planning
  - Respect for others thoughts and opinions
  - Leadership when appropriate
  - Ability to handle conflict
  - Self control
- Care for quality
- Personal Care
  - Clean
  - Neat
  - Dress appropriately
  - Rested
  - No substance abuse
- Following safety regulations

2. Describe responsibilities of employers and expectations employees have of employers	• Respect • Trust • Fairness • Care • Concern • Feelings • Safe work site • Timely payment
3. Describe responsibilities employees have to customers	• Vehicle protection precautions – Smoking – Fender covers • Road testing • Privacy
4. Prepare a resumé	• Gathering information – Goals – Skills – Education - Dates – Experience - Dates - Relationships and responsibilities – Activities – References • Statements of accomplishment – Challenge – Action - Skills applied – Results • Types of resumes – Chronological – Functional – Generic – Specific
5. Prepare a letter of introduction	• Not to exceed one page • Highlight important accomplishments in same order as they appear in the posting
6. Identify job search resources	• Newspapers • Internet • Networking • Industry publications • Direct approach

7. Prepare for an interview

- Research of the organization
- Review of job qualifications
- Prepare for broad personal questions
- Review of resume
- Interview practice
- Arriving ahead of time
- Appropriate dress

Line D: Use Tools and Equipment
Competency: D - 1 Use Hand Tools

D-1

Learning Objectives:
1. The learner will be able to select and demonstrate the safe use of technician's hand tools.

Learning Tasks

1. Select and use hand tools

Content

- General
  - Purchase quality
  - Insurance
  - Orderly storage
    - Tool chest
  - Cleaning and maintenance
  - Used for intended purpose
  - Proximity to other people
  - Personal protective equipment
  - Ventilation
- Wrenches
  - Open end
  - Box end
  - Combination
  - Flare nut
  - adjustable
  - pipe
  - Allen
- Socket wrenches
  - Drive sizes
  - Points
  - Handles
  - Extensions
  - Universal joints
- Screwdrivers
  - Standard
  - Phillips
  - Robertson
  - Torx
  - Offset
  - Stubby
  - Impact
- Pliers
  - Combination
  - Water pump
  - Needle nose
  - Lineman
  - Vice grip
  - Snap ring
  - Diagonal cutters

- Hammers
  - Ball peen
  - Sledge
  - Brass or lead
  - Plastic or rawhide
  - Dead blow
  - Rubber mallet
- Punches
  - Centre
  - Drift
  - Pin
  - Aligning
- Chisels
  - Flat
  - Cape
  - Round nose
  - Diamond point
  - Safety
- Pry bars
- Files
  - Single-cut
  - Double-cut
  - Shapes
- Saws
  - hacksaw
    - Blade selection
- Vices and clamps
- Scrapers and brushes
- Pickup tools and mirrors
- Pullers and slide hammers
- Fender covers
- Seat covers
- Miscellaneous and specialty tools

Line D: Use Tools and Equipment
Competency: D - 2 Use Power Tools

D-2

Learning Objectives:

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

Learning Tasks

1. Select and use power tools

Content

- General
  - Purchase quality
  - Insurance
  - Orderly storage
    - Tool chest
  - Cleaning and maintenance
  - Used for intended purpose
  - Proximity to other people
  - Personal protective equipment
  - Ventilation
  - Emergency Shutdown systems
- Air tools
  - Maintenance and safety
  - Water filters
  - Lubricators
  - Pressure regulators
  - Air hose
  - Impact Wrenches
  - Ratchets
  - Impact sockets and extensions
  - Air hammers (chisels)
  - Blow guns
  - Drills
  - Rotary brushes
  - Grinders
- Electric tools
  - Grounded or double insulated
  - Maintenance and safety
  - Portable drills
    - Bit selection and maintenance
  - Impact wrenches
  - Saws
  - Grinders
  - Work lights
  - Soldering irons and guns
  - Battery chargers

Line D: Use Tools and Equipment
Competency: D - 3 Use Diagnostic Equipment

D-3

Learning Objectives:
1. The learner will be able to demonstrate the use of diagnostic equipment.
2. The learner will be able to interpret diagnostic information

Learning Tasks	Content
1. Use mechanical diagnostic equipment	• Gauges – Vacuum – Pressure – Tire pressure • Hydrometer
2. Use electrical diagnostic equipment	• Voltmeter • Ammeter • Ohmmeter • Multimeter • Analog/Digital • Engine Analyzer • Scan tool • Breakout box • AVR (charging systems)

Line D: Use Tools and Equipment
Competency: D - 4 Use Shop Tools and Equipment

D-4

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

Learning Tasks	Content
1. Select and use machine tools	• Drill press • Bench grinder • Tire changers • Brake lathes
2.Select and use lifting and jacking equipment	• Mechanical jacks • Hydraulic jacks • Transmission jacks • Hoists • Stands • Portable cranes • Care and inspection of lifting and blocking equipment • Creepers
3. Select and use presses and pullers	• Hydraulic presses and pullers • Arbor press • Slide hammers • Pullers – Bearing – Steering Component
4. Maintain air compressors	• Construction • Tank • Compressor • Motor or engine • Drives, belts, couplings • Water filters/traps • Lubricators • Pressure regulators • Piping and hoses
5. Select and use cleaning equipment	• Solvent and chemical cleaning facilities • Pressure washers • Steam cleaners • Abrasive blast machines • Brake cleaning equipment

Line D: Use Tools and Equipment
Competency: D - 5 Use Reference Sources

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	• Maintenance • Repair procedures • Torque requirements • Technical service bulletins • Vacuum diagrams • Wiring diagrams • Other
2. Use parts manuals to locate information	• Exploded diagrams
3. Describe the use of microfiche to locate information	• Care and maintenance of fiche • Machine operation and maintenance
4. Use computers to locate information	• Maintenance • Repair procedures • Torque requirements • Technical service bulletins • Vacuum diagrams • Wiring diagrams • Internet and Intranets • Other

Line D: Use Tools And Equipment
Competency: D - 6 Use Measuring Instruments

D-6

Learning Objectives:

1. The learner will be able to select appropriate measuring tools for servicing automobiles.
2. Use appropriate measuring tools with the required speed and accuracy.

Learning Tasks	Content
1. Select measuring tools	• Steel Rules • Tapes • Callipers and dividers – Inside – Outside – Dividers – Vernier • Micrometers – Inside – Outside – Depth • Telescoping gauges • Ball gauges • Feeler gauges • Dial indicator • Torque wrenches and torque sticks
2. Use measuring tools metric and standard	• Accurate reading • Accurate interpretation • Proper procedure

Line E: Demonstrate General Automotive Maintenance
Competency: E - 1 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	• Synthetic or mineral • Additives • Engine oils • Transmission fluids – Manual – Automatic • Drive axle fluids • Greases and other lubricants • Aerosols
2. Describe and identify fluids	• Antifreeze – Ethylene glycol – Propylene glycol-based – Additives • Brake fluid • Power steering fluid • Windshield washer fluid
3. Describe and Identify shop fluids	• Engine shampoo • Floor cleaner • General cleaners • Solvent • Wheel acid • Car wash
4. Select lubricants and fluids for specific purposes	• Engine oil • Transmission fluid • Drive axle fluids • Greases • Antifreeze • Brake fluid • Power steering fluid • Windshield washer fluid • Shop fluids

Line E: Demonstrate General Automotive Maintenance
Competency: E - 2 Service Filters, Belts and Hoses

E-2

Learning Objectives:

1. The learner will be able to select the correct filters, belts and hoses necessary to maintain and service automobiles.
2. The learner will be able to inspect, diagnose and replace filters, belts and hoses.

Learning Tasks	Content
1. Describe and identify filters	• Serviceable • Replaceable – Whole filter – Element • Oil • Fuel • Air
2. Service filters	• Oil • Fuel • Air
3. Describe and identify drive belts	• Non-metallic – Vee – Serpentine – Gilmer (toothed)
4. Service drive belts	• Diagnose wear and defects • Replacement • Tension adjustment • Pulley alignment • Bearings • Manufacturer's specifications
5. Describe and identify hoses and clamps	• Construction – Pressure – Vacuum – Reinforced • Material compatibility – Fuel – Oil – Coolant – Air/vacuum – Turbo – Brake – Flexibility – Moulded

6. Service hoses and clamps

- Inspection
- Replacement
- Fuel
- Oil
- Coolant
- Air/vacuum
- Turbo
- Brake

Line E: Demonstrate General Automotive Maintenance
Competency: E - 3 Assess Leaks

E-3

Learning Objectives:

1. The learner will be able to locate leaks and determine causes and solutions.

Learning Tasks	Content
1. Describe leak detection methods	• Visual • Audible • Black light • Fluid analysis • Pressurization/vacuum • Smoke generator
2. Assess leak relevance	• Cost of repair • Potential damage

Line E: Demonstrate General Automotive Maintenance
Competency: E - 4 Inspect 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	• Materials • Belts • Side walls • Sizing • Ratings • Tread design • Space saver spares
2. Service tires	• Inspection • Rotation • Repair • Mount • Balance
3. Describe wheel construction	• Alloy • Steel • Offset • Sizing • Bolt pattern
4. Inspect wheels	• Curb damage • Run out • Fatigue damage • Lug nut torque

Line E: Demonstrate General Automotive Maintenance
Competency: E - 5 Replace Exterior Lamps

Learning Objectives:

1. The learner will be able to inspect and diagnose exterior lamp faults.
2. The learner will be able to select and install replacement exterior lamps.

Learning Tasks	Content
1. Describe and identify filters	• Describe exterior lamps • Headlights – Xenon – Halogen – Sealed beam • Driving lights • Tail lights • Brake lights • Marker lights • Turn signals • Licence plate lights • Reverse lights
2. Describe lamp integrity systems	• Operation • Reset
3. Service exterior lamps	• Aiming (headlights) • Handling procedures • Sealing

Line E: Demonstrate General Automotive Maintenance
Competency: E - 6 Service Body Trim, Hardware and Accessories

Learning Objectives:

1. The learner will be able to select and install accessories.
2. The learner will be able to inspect and repair body trim and hardware.

Learning Tasks	Content
1. Describe components of body, trim and accessories	• Power accessories • Windows • Mirrors • Bumpers • Mouldings and trim • Door hardware • Body panels • Interior components – Seats – Carpet – Dashboard – Headliners
2. Service components of body, trim and accessories	• Power accessories • Windows • Mirrors • Bumpers • Mouldings and trim • Door hardware • Body panels • Interior components – Seats – Carpet – Dashboard – Headliners

Line F: Demonstrate General Automotive Practices
Competency: F - 1 Service Gaskets and Seals

F-1

Learning Objectives:

1. The learner will be able to identify causes of gasket and seal failure.
2. The learner will be able to select gaskets and seals.
3. The learner will be able to remove and replace gaskets and seals.

Learning Tasks	Content
1. Describe gasket and seal construction	• Gaskets – Cylinder head gaskets – Other gaskets - Rubber - Non-rubber - Reusable - Form-in-place • Sealers – Aerobic – Anaerobic – Sensor safe • Seals – O rings – Lip seals • Sealing washers
2. Diagnose cause of failure	• Incorrect assembly • Excessive heat • Over pressurization • Lack of lubrication • Seal deterioration • Mating surface damage
3. Service gaskets and seals	• Removal techniques • Surface preparation • Installation techniques • Speedy sleeves • Torque sequence

Line F: Demonstrate General Automotive Practices
Competency: F - 2 Use Fasteners

F-2

Learning Objectives:

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

Learning Tasks	Content
1. Describe threaded fastener terminology	• Nominal sizes • Major and minor diameter • Head markings and tensile strength • Pitch and thread angle • Thread series – UNC – UNF – NPT – Metric • Right and left-hand threads • Classes or fits
2. Select and use threaded fasteners	• Fastener materials • Machine screws • Bolts • Studs • Nuts – Hex – Castle – Slotted hex – Self locking – Wing – Speed • Self-tapping screws • Sheet metal screws • Setscrews
3. 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

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. Torque fasteners to specifications

- Torque definition
- Tension
- Elastic limit
- Distortion
- Tensile strength
- Torque wrenches
  - Extensions
- Torque to yield
- Torque sequence
- Torquing in steps

6. Select and use non-threaded fasteners

- Washers
  - Flat
  - Bevel
  - Lock
- Pins
  - Cotter
  - Clevis
  - Spring or roll
  - Shear
  - Taper
  - Dowel
- Keys
  - woodruff
  - tapered
  - gib
- Splines
- Locking plates
- Safety wire
- Snap rings
- Rivets
- Pop rivets
- Snap rings

Line F: Demonstrate General Automotive Practices
Competency: F - 3 Service Tubing and Fittings

F-3

Learning Objectives:

1. The learner will be able to select tubing and fittings.
2. The learner will be able to inspect, and repair or replace tubing and fittings.

Learning Tasks

1. Select and use tubing and fittings

Content

- Tubing
  - Sizing
  - Material
  - Application
- Fittings
  - Flare
    - 45 degree
    - ISO
  - Compression
- Cutting
- Flaring
  - Single or double lap
    - SAE - 45 degree
    - ISO – bubble
- Bending

Line F: Demonstrate General Automotive Practices
Competency: F - 4 Demonstrate Welding Techniques

F-4

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	• Safety • Gases • Tanks, regulators and hoses • Torches
2. Demonstrate oxy-acetylene procedures	• Set up • Lighting • Welding, cutting and brazing • Shut down
3. Describe electric welding components and methods	• Shielded metal arc welding (SMAW) • Gas metal arc welding (GMAW) • Flux core arc welding (FCAW) • Gas tungsten arc welding (GTAW)
4. Demonstrate electric welding procedures	• Set up • Weld • Shut down

Line F: Demonstrate General Automotive Practices
Competency: F - 5 Service Bearings and Bushings

F-5

Learning Objectives:

1. The learner will be able to identify causes of bearing and bushing failure.
2. The learner will be able to select bearings and bushings.
3. The learner will be able to remove and replace bearings and bushings.

Learning Tasks	Content
1. Describe non-friction bearings	• Conrad (ball) bearing • Tapered roller bearing • Needle bearing • Ball thrust bearing
2. Service non-friction bearings	• Cause of failure • Removal and installation techniques • Lubrication/repacking – Cleaning • Adjustment • Selection
3. Describe friction bearings (bushings)	• Construction and design • Lubrication
4. Service friction bearings	• Cause of failure • Removal and installation techniques • Lubrication – Cleaning • Selection

Line F: Demonstrate General Automotive Practices
Competency: F - 8 Demonstrate Diagnostic Procedures

F-8

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	• Cost of improper diagnosis • Unhappy customers • Lost business • Time management • Efficiency • Damage to components
2. Describe general diagnostic procedures	• Understand system • Understand complaint – 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	• Time saving • Warranty requirement • Diagnosis may not be possible any other way
4. Describe the importance of failure analysis	• Repeat failure • Extended life • Cost • Customer satisfaction

Line H: Service Brakes
Competency: H - 1 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 diagnose causes of brake hydraulic system failure.
3. The learner will be able to remove and replace brake hydraulic system components.

Learning Tasks	Content
1. Describe hydraulic principles	• Pascal's Law • Force, pressure, area relationship
2. Describe components of the brake hydraulic systems	• Master cylinder • Wheel cylinder • Calipers • Valves – Residual pressure – Metering – Proportioning – Pressure differential – Combination • Hoses • Tubing • Hardware • Fluid
3. Service the brake hydraulic system	• Inspect • Diagnose • Repair/replace – Master cylinder – Wheel cylinder – Callipers – Valves - Residual pressure - Metering - Proportioning - Pressure differential - Combination – Hoses – Tubing • Flush • Bleed

Line H: Service Brakes
Competency: H - 2 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 diagnose causes of drum brake system failure.
3. The learner will be able to remove, replace and adjust drum brake system components.

Learning Tasks	Content
1. Describe friction principle	• Coefficient of friction • Factors affecting friction – Material composition – Surface area – Heat – Applied pressure
2. Describe drum brake components	• Drum • Shoes • Springs • Attaching hardware • Backing plate • Adjusters • Parking brake mechanism • Wheel cylinder
3. Describe drum brake design and operation	• Non-energizing and self-energizing • Energization • Parking • Full-floating axles
4. Inspect and overhaul drum brakes	• Inspection – Measurement – Fluid leakage – Wheel seals – Hardware condition – Parking brake cable and mechanism • Shoe replacement/adjustment • Drum service • Parking brake adjustment • Road test

Line H: Service Brakes
Competency: H - 3 Service Disk Brake Systems

Learning Objectives:

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

Learning Tasks	Content
1. Describe friction principle	• Coefficient of friction • Factors affecting friction – Material composition – Surface area – Heat – Applied pressure
2. Describe disk brake components	• Rotor • Calliper • Pistons • Pads • Parking brake mechanisms
3. Describe disk brake design and operation	• Rotor – Solid – Vented – Cross drilled • Calliper – Fixed – Floating • Parking brake – Drum in hat – Calliper style • Pads
4. Inspect and overhaul disk brakes	• Inspection – Measurement – Fluid leakage – Wheel seals – Hardware condition – Parking brake cable and mechanism • Pad replacement • Disk service • Parking brake adjustment • Road test

Line H: Service Brakes
Competency: H - 4 Service Power Assist Systems

H-4

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.
3. The learner will be able to remove, replace and adjust power assist system components.

Learning Tasks	Content
1. Describe the components of power assist systems	• Hydro boost – Power steering fluid – Brake fluid • Vacuum booster layout • Common control valve designs • Vacuum pumps
2. Describe the design and operation of power assist systems	• Vacuum booster layout • Common control valve designs • Vacuum pumps
3. Inspect and replace power assist systems	• Test vacuum circuit • Test power assist function • Replace failed components

Line I: Service Steering Systems
Competency: I - 1 Service Steering Gears

I-1

Learning Objectives:

1. The learner will be able to identify steering gear components.
2. The learner will be able to diagnose causes of steering gear failure.
3. The learner will be able to remove, replace and adjust steering gears.

Learning Tasks	Content
1. Describe the components of conventional steering gears	• Recirculating ball steering box design – Ball nut assembly – Sector shaft – Thrust bearings – Seals – Lubrication
2. Describe the design and operation of conventional steering gears	• Steering box ratios • Materials • Mounting
3. Inspect and repair conventional steering gears	• Seal leakage • Shaft wear • Gear tooth wear • Pitman arm spline wear or damage • Sequence of adjustments – Bearing preload – Gear tooth lash – Over centre adjustment
4. Describe the components of rack and pinion steering gears	• Housing and seals • Rack and pinion • Bearings • Tie rod ends • Bellows (boots)
5. Describe the design and operation of rack and pinion steering gears	• Steering gear ratio • Materials • Lubrication • Mounting
6. Inspect and replace rack and pinion steering gears	• Tie rod ends • Pinion shaft and bearing wear • Leaks • Mounting • Condition of bellows • Wheel alignment

Line I: Service Steering Systems
Competency: I - 2 Service Steering Columns

I-2

Learning Objectives:

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

Learning Tasks	Content
1. Describe the components of steering columns	• Mounting • Bearings • Coupling assemblies • Collapsing function • Dust seals • Steering wheel security systems • Master splines for steering wheel • Noise suppression and sealing
2. Describe the design and construction of steering columns	• Tilting and telescoping function • Collapsing function • Noise transmission • Vibration suppression • Supplementary restraint systems (SRS) • Column mounted electrical controls • Shift linkage
3. Describe the inspection and replacement of steering columns	• SRS safety awareness • Steering wheel alignment • Alignment for noise and vibration • Electrical connections • Mounting procedures and hardware • Shift linkage adjustment

Line I: Service Steering Systems
Competency: I - 3 Service Steering Linkage

Learning Objectives:

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

Learning Tasks	Content
1. Describe the components of steering linkage	• Tie rod ends and sockets • Pitman arm • Idler arm • Centre (drag) link • Associated hardware
2. Describe the design and operation of steering linkage	• Parallelogram linkage • Haltenberger
3. Inspect and repair steering linkage	• 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

Line I: Service Steering Systems
Competency: I - 4 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 diagnose causes of power steering system problems.
3. The learner will be able to remove, replace and adjust power steering system components.

Learning Tasks	Content
1. Describe the components of a power steering system	• Pump • Associated hoses • Spool valve • Power cylinder • Fluid types
2. Describe the design and operation of a power steering system	• Pump pressure and flow regulation • Spool valve operation • Power cylinder operation • Speed control and variable assist
3. Inspect and repair power steering systems	• Fluid level and condition • Leaks – Internal – External • Pump replacement • Pump mountings and belt adjustment • Pressure and flow testing • Devac (bleeding of air) • Road test • Turning effort test

Line I: Service Steering Systems
Competency: I - 5 Perform Wheel Alignment

Learning Objectives:

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

Learning Tasks	Content
1. Describe steering geometry	• 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	• Pre-checks • Factory adjustment methods • Aftermarket adjustment methods
3. Adjust wheel alignment	• Four-wheel alignment procedures – Rear wheels - Thrust angle - Toe - Camber – Front wheels - Caster/camber - Toe - Check toe out on turns - Check steering axis inclination - Check steering wheel centre

Line I: Service Steering Systems
Competency: I - 6 Describe Four-Wheel Steering Systems

Learning Objectives:

1. The learner will be able to identify four-wheel steering system components.
2. The learner will be able to describe the operation of four-wheel steering systems.

Learning Tasks

1. Describe four-wheel steering

Content

- Overview
  - Electrical Systems
  - Mechanical Systems

Line J: Service Suspension Systems
Competency: J - 1 Describe Frame Types

J-1

Learning Objectives:

1. The learner will be able to identify frame types.
2. The learner will be able to identify the advantages and disadvantages unibody and conventional frame designs.

Learning Tasks	Content
1. Describe unibody design	• Advantages • Disadvantages
2. Describe conventional frame design	• Perimeter • Ladder • Advantages • Disadvantages

Line J: Service Suspension Systems
Competency: J - 2 Describe Suspension Types

Learning Objectives:

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

Learning Tasks	Content
1. Describe rigid beam suspensions	• Front – Spring types • Rear – Spring types
2. Describe independent suspensions	• Front – McPherson strut – Short and long arm – Multi-link – Twin I-beam • Rear – Chapman strut – Short and long arm – Multi-link

Line J: Service Suspension Systems
Competency: J - 3 Service Shocks and Struts

J-3

Learning Objectives:

1. The learner will be able to identify shock and strut components.
2. The learner will be able to diagnose shock and strut problems.
3. The learner will be able to remove, replace and adjust shocks and strut components.

Learning Tasks	Content
1. Describe the construction and operation of shock absorbers	• Purpose • Components • Types – Conventional – Gas - Low pressure - High pressure – Adjustable - Mechanical - Electrical - Pneumatic • Modification – Towing – Off road – Performance
2. Describe the construction and operation of struts	• Purpose • Components • Types – Conventional – Modified – Gas - Low pressure - High pressure – Adjustable - Mechanical - Electrical - Pneumatic • Modification – Towing – Off road – Performance
3. Inspect and service shock absorbers and struts	• Visual inspection • Function test • Safety • Removal and replacement • Re-alignment

Line J: Service Suspension Systems
Competency: J - 4 Service Spring Types

J-4

Learning Objectives:

1. The learner will be able to identify springs and related components.
2. The learner will be able to diagnose spring problems.
3. The learner will be able to remove, replace and adjust springs and related components.

Learning Tasks	Content
1. Describe common automotive spring designs	• Springs – Coil – Leaf - Materials – Air • Torsion bars • Anti-sway bars • Modification – Towing – Off road – Performance
2. Inspect and service common automotive springs	• Safety • Visual – Ride height • Functional test • Removal and replacement

Line J: Service Suspension Systems
Competency: J - 5 Service Suspension Components

Learning Objectives:

1. The learner will be able to identify suspension components.
2. The learner will be able to diagnose suspension component problems.
3. The learner will be able to remove, replace and adjust suspension system components.

Learning Tasks	Content
1. Describe vehicle suspension component design and construction	• Ball joints • King pins • Control arms • Locating arms • Rubber bushings • Frame and body mounting points • Construction materials
2. Inspect and service vehicle suspension components	• Safety • Lubrication • Visual • Measurements • Removal and replacement

Line J: Service Suspension Systems
Competency: J - 6 Service Spindles and Hubs

J-6

Learning Objectives:

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

Learning Tasks	Content
1. Describe spindle and hub design and construction	• Ball joints • King pins • Front-wheel drive • Rear-wheel drive • Construction materials • Bearing types • Disk or drum brake
2. Inspect and service spindles and hubs	• Lubrication • Inspection – Visual – Audible – Measurements • Bearing adjustment • Alignment • Removal and installation

Line M: Service Electrical/Electronic Systems
Competency: M - 1 Describe Principles of Electricity

M-1

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.
4. The learner will be able to interpret wiring diagrams and symbols.

Learning Tasks	Content
1. Define electrical terminology	• Electrical quantities and their units and prefixes – Voltage – Current – Resistance – Power • Circuit terminology – Open circuit – Closed circuit – Short circuit – Continuity – Ground – Ground fault – Series circuit – Parallel circuit – Series parallel circuit
2. Explain basic circuit concepts	• Atomic theory • Basic circuit – Source – Load – Complete path • Electrical relationships – Ohm's law – Watt's law (P=ExI) – Series circuits – Parallel circuits – Series parallel circuits

3. Describe electrical components and their purpose	• Wire • Devices – Capacitor – Protective devices – Acutators – Resistors – Switches – Diodes – Transistors – Light Emitting Diodes – Transducers – Conductors
4. Describe magnetic theory	• Properties of magnetic lines of force • Terminology – Flux – Flux density – Reluctance • Relationship to electric 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
5. Interpret electrical wiring diagrams	• Symbols • Conventions • Abbreviations
6. Describe how to connect and use electrical measuring devices	• Analog vs digital • Voltmeters • Ammeters • Ohmmeters • Multimeters

Line M: Service Electrical/Electronic Systems
Competency: M - 2 Service Batteries

M-2

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	• Hydrogen gassing • Acid • Frozen batteries • Short circuit capacity • Environmental considerations
2. Describe the design and construction of a lead acid battery	• Plates • Plate straps • Separators • Electrolyte • Case • Terminals
3. Describe the chemical action that takes place in a lead acid battery during charging and discharging	• Charging cycle • Discharging cycle
4. Describe the various types of automotive batteries	• Low maintenance • Maintenance free • Deep-cycle • Recombination • Gel cell
5. Select automotive batteries	• Battery rating methods • Physical dimensions
6. Inspect and service automotive batteries	• Factors affecting the life cycle of batteries • Inspection • Cleaning • Terminal servicing • Charging • Testing • Replacement

Line M: Service Electrical/Electronic Systems
Competency: M - 9 Service Anti-Lock Brake Systems

M-9

Learning Objectives:

1. The learner will be able to identify anti-lock brake system components.
2. The learner will be able to diagnose anti-lock brake systems.
3. The learner will be able to remove, replace and adjust anti-lock brake system components.

Learning Tasks	Content
1. Describe the benefits and limitations of anti-lock braking systems	• History of ABS • Improved steering control while braking • Improved braking in most situations • Foundation for traction control • Foundation for yaw control • Anti-lock versus anti-skid
2. Describe the design and construction of anti-lock braking systems	• Two-wheel versus four wheel • Hydraulic – Pump – Valves – Accumulators – Fluid • Electrical – Sensors – Computer – Controllers
3. Inspect and repair of anti-lock braking systems	• Safety • Codes • Bleeding procedures • System self-check • Pinpoint testing • Road testing • Component replacement

Line M: Service Electrical/Electronic Systems
Competency: M - 11 Service Electronic Suspension Systems

Learning Objectives:

1. The learner will be able to identify electronic suspension system components.
2. The learner will be able to diagnose electronic suspension system problems.
3. 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	• Basic – Electrically controlled shocks – Load leveling system • Advanced – Air springs/struts • Computer control
2. Describe inspection and repair of electronic suspension systems	• Safety • Visual inspection • Function test • Electrical test • Diagnostic codes • Removal and replacement • Re-alignment

Line M: Service Electrical/Electronic Systems
Competency: M - 13 Service Vehicle Restraint Systems

Learning Objectives:

1. The learner will be able to identify vehicle restraint system components.
2. The learner will be able to diagnose vehicle restraint systems.
3. The learner will be able to remove and replace vehicle restraint system components.

Learning Tasks	Content
1. Describe the benefits and limitations of anti-lock braking systems	• Regulations • Construction • Passive – Air bags – Shoulder belts – Whiplash protection systems • Active – Shoulder belts – Seat belts – Isofix child restraint mounting
2. Inspect and repair vehicle restraint systems	• Safety • Diagnostic codes • Visual inspection • Functional testing • Electrical testing • Repair/replacement procedures • Liability – Tampering – System disabling

Line M: Service Electrical/Electronic Systems
Competency: M - 15 Service Wiring Harnesses

Learning Objectives:

1. The learner will be able to interpret wiring diagrams and relate them to vehicle wiring.
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	• Purpose • Wiring diagrams • Shielding • Routing • Support • Wire – Gauge – Identification – Composition – Connectors – Twisted pair
2. Inspect and repair wiring harnesses	• Visual • Connectors • Soldering • Crimping • Insulation • Supports • Removal and installation • Testing

Learning Resources

Although the following suggested list of learning resources do not have the Ministry title of 'Recommended Status', they have been provided as support for teachers in instruction, assessment, and delivery of the Level 1 Programs.

Teachers wishing to use these materials should preview and select those that are appropriate for use in their classroom and by their students.

As with all supplementary resources, local approval is required before use.

The majority of titles listed are currently used in post-secondary institutions to deliver Level 1 Trades Training. The student resources listed have been reviewed for their suitability by a team of qualified BC teachers. If a school is partnered with a post-secondary training provider, consultation is advised to ensure continuity or sequential use of learning resources.

Comprehensive resources support the majority of the competencies, and additional resources support one or more competencies. Teachers wishing to use these materials should preview and select those that are appropriate for use in their classroom and by their students.

The suggested titles, both comprehensive and additional, are not intended as an exhaustive or exclusive list, rather these materials represent a useful collection, relating to many of key elements of the Level 1 programs.

Suggested Learning Resources Spring 2006	**Automotive Service Technician Level I** Competencies									
Comprehensive Resources	**A**	**B**	**D**	**E**	**F**	**H**	**I**	**J**	**M**	**J**
Automotive Technology, w/CD-ROM, Halderman		✓	✓	✓	✓	✓	✓	✓	✓	✓
Automotive Technology, Erjavec Student Text / Tech Manual Instructor Manual - eResource		✓	✓	✓	✓	✓	✓	✓	✓	✓
Automotive Service Technician, First Period (Trade Secrets Alta)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Additional Resources – Print and Media										
Auto Fundamentals, Stockel Instructor Manual - Workbook	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Automotive Electrical and Electronic Systems, Kershaw			✓	✓	✓				✓	

Automotive Technology
(Halderman, J.) **COMPREHENSIVE**

This comprehensive textbook of 1303-pages is an excellent resource offering extensive coverage for the delivery of Level 1 through Level 4.

The depth of content and the presentation of the topics can effectively serve the requirements of high school and college-level students. Although the concepts are industry level the language and technical expressions would be suitable for high school students.

This Canadian edition has a considerable focus on RED SEAL certification.

The text includes theory of automotive operation, diagnostic tips, general service, and repair procedures and WHIMIS information.

The Student CD-ROM contains a variety of media automotive terms, test questions, presentations, and diagnostic information and presentation is visually rich.

Publisher: Pearson Education Canada
Prentice Hall
ISBN: 0-13-124890-1
Copyright: 2006

Automotive Technology: A Systems Approach
4th Edition (Erjavec, J.) **COMPREHENSIVE**

This 1400-page textbook is an excellent resource offering comprehensive coverage for the delivery of Level 1 through 4.

This resource has significant depth and can function at the school and college level. The text is well laid out with excellent diagrams and pictures and organizes learning into recurring information clusters such as objectives, photo sequences, step-by-step service and maintenance procedures, case studies, key terms and a summary. The major textbook includes a comprehensive set of topics and references in a clear and logical manner for students and teachers with graphics and figures for each chapter.

There are many helpful technological tips throughout the text; useful suggestions for activities, such as career advice, written and practical assignments for students; customer care, shop talk, and other headings are discussed in each chapter.
The text acknowledges the industry use of both Imperial and SI metric for tools and measurements and offers descriptions and side-by-side conversions. There are many cautions, warnings, and observations that contribute to student learning and subject experience. This is a U.S. publication and focuses on ASE certification. A CD-ROM is supplied on the back inside cover.

The Tech Manual 4th Ed. is a B/W student workbook with a variety of student job sheets, step-by-step procedures, practical job sheets, labs, sample report sheets, and line drawing figures related to each textbook chapter.

A CD-Rom provides a visual approach to the automotive concepts and incorporates theory, graphics, or animations and in some cases, live-links to external web sites.

The Instructors Manual 4th Ed. comes as soft cover text, addresses the chapter overviews, instructional topics, and quiz answers.

An additional software tool 'e.resource' contains PDF versions of the Instructor Manual, PowerPoint pages and documents in WORD format, allowing for easy customizing of classroom lessons.

Supplier:	Thomson Delmar Learning
Textbook ISBN:	1-4018-4831-1, Copyright: 2005
Instructor's Manual:	1-4018-4832-X, Copyright: 2005
Tech Manual:	1-4018-4831-1, Copyright: 2005

Automotive Service Technician: First Period
Package: Alberta Complete Set **COMPREHENSIVE**

This package is a comprehensive resource and contains 32 workbook learning guides. These student learning guides are designed for student binders.

Each learning guide contains objectives, theory of operation, self tests, answers, general diagnosis service and repair procedures. It also includes a comprehensive glossary of industry terms.

This series addresses all the Level 1 competencies and learning outcomes and can be a primary student resource directly correlated to the Level 1 program outline.

Distributed by: Government Publications Services; QPPublications@gov.bc.ca
A full description of the modules can be found at
www.publications.gov.bc.ca/pubdetail.aspx?nato=7850000004

Author:	Province of Alberta
QP Stock Number:	7850000004
Format:	Soft Cover
Number of Pages:	1404

Automotive Electrical and Electronic Systems
5th Edition Updated (Kershaw, J. F.) **ADDITIONAL**

This two manual package, consists of a classroom manual and a shop manual. The package covers theory, test procedures, troubleshooting, and repair of automotive electrical and electronic systems, and components.

The 370-page Classroom Manual provides students with all the necessary theoretical electrical and electronic information for LEVELS 1 - 4. Each chapter includes key terms, learning objectives, illustrations, photographs and multiple-choice question chapter tests.

The accompanying 400-page Shop Manual has step-by-step explanations and illustrated procedures for testing, servicing and overhauling modern electrical and electronic systems and their components. To further assist students each chapter of the Shop Manual contains: learning objectives, key terms, safety precautions, repairs tips from professionals, and ASE/NATEF task sheets.

As this is a U.S. publication and focuses on ASE certification and does not address WHIMIS or SAFETY in WCB/BC terminology.

Publisher: Pearson Education Canada
Classroom Manual ISBN: 0-13-238883-9, Copyright 2007
Shop Manual ISBN: 0-13-238884-7, Copy right 2007

Auto Fundamentals
(Stockel, M.W. et al.) **ADDITIONAL**

This comprehensive print series, consisting of a text, workbook and an instructor's manual, covers the design, operation, and construction of the automobile and its related systems.

The 607-page student textbook provides students with all necessary theoretical information. Students can complete the chapter tests – written and multiple-choice questions – in the 351-page black and white workbook with tear-out pages which follows the chapter structure of the main text.

The books are well laid out, have logical sequence and the concepts are clear and provide good coverage of basic theory, accompanied by photographs, coloured images, line drawings, and exploded views and diagrams.

These resources covers fundamentals and do not address repairs. Other resources may be required to give additional depth.

The Instructor's Manual includes answers to the textbooks, review and ASE-type questions, workbook questions, workbook jobs, chapter quizzes, and ASE sample tests.

This is a U.S. publication and focuses on ASE certification and does not address WHIMIS or SAFETY in WCB/BC terminology.

Supplier:	Thomson	
Textbook ISBN:	1-59070-325-1	Copyright: 2005
Instructor's Manual:	1-59070-327-8	Copyright: 2005
Workbook ISBN:	59070-326-X	Copyright: 2005