

# MODULE CURRICULUM AND ASSESSMENT STANDARDS:

## SECTION E: INTERMEDIATE LEVEL

The following pages define the curriculum and assessment standards for the intermediate level of Mechanics.

Intermediate level modules help students build on the competencies developed at the introductory level and focus on developing more complex competencies. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

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**MODULE MEC2010: VEHICLE DETAILING****Level:** Intermediate**Theme:** Vehicle Design and Ownership**Prerequisite:** None**Module Description:** Students develop the skills required to restore and enhance the exterior finishes of a vehicle.**Module Parameters:** Access to commercially available products and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>state personal and environmental hazards associated with the use of cleaning and waxing agents</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>presentation of a report describing: <ul style="list-style-type: none"> <li>hazards associated with use of cleaning and waxing products</li> <li>environmental concerns in the use of cleaning agents</li> <li>products that are less hazardous.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Vehicle Detailing, Part 1, MEC2010-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15
<ul style="list-style-type: none"> <li>identify and describe materials available to enhance the appearance of a vehicle</li> </ul>	<ul style="list-style-type: none"> <li>identification of materials and products used in detailing a vehicle such as: <ul style="list-style-type: none"> <li>surface-enhancing material</li> <li>trim additions.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Vehicle Detailing, Part 2, MEC2010-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15
<ul style="list-style-type: none"> <li>demonstrate correct cleaning and treatment of engine parts and exterior finishes including paint, glass, vinyl and rubber surfaces</li> </ul>	<ul style="list-style-type: none"> <li>observed performance related to cleaning and enhancing painted, glazed, vinyl and rubber surfaces including engine compartment and exterior components.</li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Vehicle Detailing, Part 3, MEC2010-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	20

**MODULE MEC2010: VEHICLE DETAILING (continued)**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>install a trim or accessory part according to standard practice</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance associated with trim installation including:                             <ul style="list-style-type: none"> <li>use of instructional resources</li> <li>use of tools and materials</li> <li>identification of parts.</li> </ul> </li> </ul> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Vehicle Detailing, Part 4, MEC2010-1</i></p> <ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tools</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>50</p> <p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow safety rules and procedures in the handling of dangerous cleaning agents</li> <li>demonstrate safe handling and application of volatile cleaners used for engine cleaning</li> <li>demonstrate knowledge of and follow procedures outlined to prevent damage to electrical or other parts when engine cleaning</li> <li>identify hazards that are present, including acid powder.</li> </ul>	<p>Be aware of WHMIS regulations.</p> <p>Use environmentally friendly products.</p>
Identify/Analyze	<ul style="list-style-type: none"> <li>identify and demonstrate the correct procedures when using cleaning and polishing/treatment agents on various surfaces</li> <li>identify surface flaws and solutions that could be used other than spray painting</li> <li>explain the value of using waxes to treat painted surfaces (including longevity and monetary implications)</li> </ul>	<p>Relate to paintless dent repair.</p>

**MODULE MEC2010: VEHICLE DETAILING (continued)**

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify common types of trim fasteners and tools</li> <li>• list the precautions needed to prevent damage to trim or adjacent surfaces when removing and replacing trim parts</li> <li>• explain the value and methods used to enhance the appearance of a vehicle without painting.</li> </ul>	Recommend that silicone-free products be used.
Inspect/Repair	<ul style="list-style-type: none"> <li>• show knowledge of and demonstrate the procedures and tools used to remove and replace trim parts</li> <li>• demonstrate the application of decals, pin striping and/or molding as a method of enhancing vehicle appearance and value</li> <li>• demonstrate the ability to follow installation instructions by completing an accessory installation project</li> <li>• use materials available to complete an engine clean and, if possible, apply enhancing materials such as paints or coatings</li> <li>• describe the value of maintaining a clean and neat engine compartment.</li> </ul>	Discuss the use of decals, pin striping and moldings to improve the value of a vehicle.
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities related to vehicle detailing.</li> </ul>	



**MODULE MEC2020: VEHICLE MAINTENANCE****Level:** Intermediate**Theme:** Vehicle Design and Ownership**Prerequisite:** MEC1020 Vehicle Service & Care**Module Description:** Students perform the basic service requirements necessary to ensure adequate maintenance of a motor vehicle.**Module Parameters:** Access to vehicles, specialty tools, hand tools and related resources.**Note:** Customer work to be checked by certified technician when work performed on brakes, steering and suspension.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with vehicles, and follow established lab procedures</li> <li>identify vehicle service requirements as per manufacturer's recommendations</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance in:               <ul style="list-style-type: none"> <li>following established lab/shop routines</li> <li>use of WHMIS information as it applies to oil, grease, gasoline and antifreeze</li> <li>working with others</li> <li>safe use of materials/tools/equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Vehicle Maintenance, Part 1, MEC2020-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15
	<ul style="list-style-type: none"> <li>creation of a service schedule for a given vehicle indicating:               <ul style="list-style-type: none"> <li>make, model, year and serial number</li> <li>system or unit to be checked, serviced or replaced</li> <li>time, distance travelled and service condition.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Vehicle Maintenance, Part 2, MEC2020-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15

**MODULE MEC2020: VEHICLE MAINTENANCE** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>conduct a motor vehicle inspection considering age of vehicle, distance travelled, service conditions and history</li> <li>service and repair a motor vehicle according to vehicle condition and service schedule</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to the inspection of:                             <ul style="list-style-type: none"> <li>lights and accessories</li> <li>engine cooling, fuel, exhaust, ignition emission, lubrication and mechanical systems</li> <li>drive train, running gear and body</li> <li>overall condition of body parts.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Vehicle Maintenance, Part 3, MEC2020-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	25
	<ul style="list-style-type: none"> <li>observed performance in servicing a given vehicle according to the prepared schedule.</li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Vehicle Maintenance, Part 4, MEC2020-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	45
	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow lab safety procedures.</li> </ul>	Be aware of WHMIS and school district's guidelines.
Identify/Analyze	<ul style="list-style-type: none"> <li>identify the service requirements for a specific motor vehicle considering the odometer reading, conditions of operation and service history</li> </ul>	

**MODULE MEC2020: VEHICLE MAINTENANCE** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify and describe condition of the camshaft timing belt or chain and recommend the appropriate service</li> <li>• evaluate brake system fluid integrity and brake pedal feel and identify repair requirements.</li> </ul>	Compare with manufacturer's specifications.
Inspect/Service	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– inspect an engine for oil leaks</li> <li>– renew engine gaskets or seals, where necessary</li> <li>– change engine oil and filter</li> <li>– service PCV valve and breather</li> <li>– inspect the condition of coolant, hoses, belts, fan and radiator; adjust belts if required</li> <li>– change or recondition the engine coolant and flush the cooling system, if required</li> <li>– pressure test the cooling system</li> <li>– replace the thermostat, if necessary</li> <li>– locate and inspect the fuel filter; replace if required</li> <li>– replace the air filter, if required</li> <li>– inspect and service throttle linkage</li> <li>– inspect manifolds, pipes, catalytic converter, muffler and hangers for structural integrity; repair as required</li> <li>– inspect and service or replace spark plugs, distributor cap and rotor and spark plug wires and boots as required by the service schedule</li> <li>– inspect and replace fuel purge canister filter, if required</li> <li>– inspect and replace fluids as required in transmissions, transaxle transfer cases and differential assemblies</li> <li>– inspect and recommend service for constant velocity joints, seals, drive shaft, drive axles and U-joints</li> </ul> </li> </ul>	Demonstrate proper jacking/hoisting systems.

**MODULE MEC2020: VEHICLE MAINTENANCE** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>– check tire condition</li> <li>– mount and balance tires</li> <li>– rotate tires to maximize wear life</li> <li>– inspect steering and suspension system components</li> <li>– inspect, repack and adjust wheel bearing</li> <li>– lubricate steering and suspension system joints</li> <li>– replenish fluids in power steering pump</li> <li>– inspect and top up brake fluid reservoir</li> <li>– inspect and assess the wear characteristics of disc brake and drum brake components</li> <li>– lubricate parking brake linkages</li> <li>– inspect and service battery and battery clamps, renew clamps if required</li> <li>– adjust alternator belt tension if necessary</li> <li>– check the operation of all lights and replace required bulbs</li> <li>– inspect fuse panel and renew inoperative fuses</li> <li>– use a multimeter to test a charging system</li>   <li>– lubricate hinges on all opening panels and weather strips</li> <li>– lubricate locks or lock plates, as required</li> <li>– inspect and change windshield wiper blades, if necessary</li> <li>– inspect for loose trim or moldings.</li> </ul>	<p>Be aware of the effects of brake fluid on painted surfaces.</p> <p>Be aware of hazards when working with lead-acid storage batteries.</p> <p>Students need to be reminded to keep clear of all moving parts when checking a system.</p> <p>Access vehicle inspection forms from auto dealers and auto body repair shops.</p>
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities.</li> </ul>	

**MODULE MEC2030: LUBRICATION & COOLING****Level:** Intermediate**Theme:** Propulsion Systems**Prerequisite:** MEC1040 Engine Fundamentals**Module Description:** Students diagnose, maintain and service the lubrication and cooling systems of a typical four-cycle gasoline engine.**Module Parameters:** Access to pressure tester, hand tools and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with vehicle engine fluids</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>appropriate selection of personal and vehicle protective equipment when working with engine fluids</li> <li>maintaining an organized and tidy workplace</li> <li>using correct tools and materials in a safe and efficient manner</li> <li>using appropriate fluids for oil changes/cooling systems</li> <li>ensuring used fluids are placed in appropriate marked containers and stored correctly.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Lubrication &amp; Cooling, Part 1, MEC2030-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	10
<ul style="list-style-type: none"> <li>identify and describe functions and operations of engine cooling and lubrication system components</li> </ul>	<ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>engine cooling and lubrication system components identification</li> <li>description of properties of coolants and lubricating oils</li> <li>selection and use of resources including service manuals.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Lubrication &amp; Cooling, Part 2, MEC2030-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	35



**MODULE MEC2030: LUBRICATION & COOLING (continued)**

Concept	Specific Learner Expectations	Notes
<p>Identification/ Functions (continued)</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• describe the design and operation of a:               <ul style="list-style-type: none"> <li>– gear and rotor-type oil pump</li> <li>– pressure regulator or relief valve</li> <li>– oil pressure sensor gauge or indicator</li> <li>– oil level and change indicator</li> </ul> </li> <li>• identify possible cause of low/high oil pressure and high levels of oil consumption under normal operating conditions</li> <li>• explain the function of the cooling system</li> <li>• describe the relationship between the percentage of antifreeze and water to the coolant’s freezing and boiling points</li> <li>• identify the most appropriate percentage of antifreeze to meet local conditions</li> <li>• describe the design and operation of a:               <ul style="list-style-type: none"> <li>– radiator and cap</li> <li>– thermostat</li> <li>– water pump</li> <li>– radiator</li> <li>– fan</li> <li>– hoses</li> <li>– recovery tank</li> <li>– block heater</li> </ul> </li> <li>• identify possible causes for engine overheating or running cold under normal operating conditions.</li> </ul>	<p>Provide sample pumps for students to examine.</p> <p>Examine a direct clutch and electric fan assembly.</p> <p>If activities are not done on live units, have students perform them on shop units.</p>
<p>Inspect/Service</p>	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– inspect engine for oil leaks owing to gasket/seal failure</li> <li>– replace seal/gaskets if necessary</li> <li>– disassemble and inspect a gear or rotor pump for pitting and galling or abnormal wear</li> <li>– test oil pressure sensor; gauge/light circuit service if necessary</li> <li>– test temperature sensing system; service if necessary</li> <li>– inspect hoses for cracks, soft spots and leaks; replace if necessary</li> <li>– test thermostat; replace if necessary</li> </ul> </li> </ul>	<p>Students, at some point, should have the opportunity to remove and replace an oil and water pump, radiator, thermostat, fan and fan belt.</p>

**MODULE MEC2030: LUBRICATION & COOLING (continued)**

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	<i>The student should:</i> <ul style="list-style-type: none"><li>– inspect water pump for leaks and bearing condition</li><li>– inspect radiator fan</li><li>– inspect radiator for leaks, blockages; replace if necessary</li><li>– check condition and tension of fan belt; replace if necessary.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• identify further education and work opportunities related to aftermarket parts supply and rebuilding.</li></ul>	

**MODULE MEC2040: FUEL & EXHAUST SYSTEMS****Level:** Intermediate**Theme:** Propulsion Systems**Prerequisite:** MEC1040 Engine Fundamentals**Module Description:** Students diagnose, maintain and service the fuel and exhaust system of a typical four-cycle gasoline engine.**Module Parameters:** Access to ventilated area, fuel pump vacuum/pressure tester and related resources and to instruction from a certified technician when working on a customer vehicle.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with volatile liquids and combustion gases</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>following shop routines and procedures</li> <li>following safe practices and proper use of storage containers, safety devices, tools and equipment while working on fuel and exhaust systems</li> <li>proper use of fire extinguishers, storage containers, measuring devices, meters and related tools and equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Fuel &amp; Exhaust Systems, Part 1, MEC2040-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	10
<ul style="list-style-type: none"> <li>identify and describe functions and operations of engine fuel and exhaust system components</li> </ul>	<ul style="list-style-type: none"> <li>identification and description of fuel and exhaust system components, functions and operations</li> <li>description of the importance and effects of correct air fuel ratio on combustion</li> <li>description of the symptoms associated with a rich mixture-lean mixture</li> <li>discussion of air flow, atomizing, pre- and post-ignition</li> <li>explanation of factors that affect exhaust system performance.</li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Fuel &amp; Exhaust Systems, Part 2, MEC2040-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	25

**MODULE MEC2040: FUEL & EXHAUST SYSTEMS** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>diagnose and correct fuel and exhaust system faults</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>use of service manuals and related resources</li> <li>diagnosing fuel and exhaust system faults</li> <li>servicing/repairing fuel and exhaust systems.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Fuel &amp; Exhaust Systems, Part 3, MEC2040-1</i></p> <p><i>Standard</i>  <i>Performance rating of at least 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>65</p> <p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow all safety procedures associated with volatile liquids and exhaust gases</li> <li>demonstrate how to:                             <ul style="list-style-type: none"> <li>store fuels and solvents in the appropriate manner</li> <li>maintain proper venting and air supply in the work area.</li> </ul> </li> </ul>	Be aware of the dangers of gasoline spills and carbon monoxide gases in the work environment.

**MODULE MEC2040: FUEL & EXHAUST SYSTEMS (continued)**

Concept	Specific Learner Expectations	Notes
<p>Identification/ Function</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• describe the chemical composition of gasoline and the effect complete and incomplete combustion have on the environment and engine performance</li> <li>• describe the characteristics of a quality gasoline in relation to its volatility and octane rating</li> <li>• identify measures that are taken to:               <ul style="list-style-type: none"> <li>– prevent the formation of gum deposits</li> <li>– prevent the oxidation of metal parts</li> <li>– retard icing</li> <li>– aid in the identification of fuel types and grades</li> </ul> </li> <li>• describe the factors that affect combustion, such as:               <ul style="list-style-type: none"> <li>– spark plug location</li> <li>– combustion chamber size and shape</li> <li>– compression ratio</li> <li>– valve and combustion chamber design</li> <li>– spark timing, duration and intensity</li> <li>– air temperature and fuel ratio</li> <li>– manifold pressures</li> <li>– valve timing, valve lift and duration</li> </ul> </li> <li>• identify and describe the function of the major fuel system components</li> <li>• explain the difference between a carburetor and a fuel injected system</li> <li>• identify the common problems associated with carburetors and fuel injected systems</li> <li>• locate and describe the function of the major exhaust system components.</li> </ul>	<p>Note the effect of a blocked exhaust system.</p>

**MODULE MEC2040: FUEL & EXHAUST SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service	<p><i>The student should:</i></p> <ul style="list-style-type: none"><li>• inspect fuel filter/strainer and replace if necessary</li><li>• clean and adjust a typical carburetor on and off an engine</li><li>• visually inspect and test a typical fuel injection system</li><li>• test fuel pump pressure and capacity; repair or replace if necessary</li><li>• visually inspect and test for exhaust leaks or blockages; replace converters, pipes, mufflers if necessary.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• identify further education, working conditions and career opportunities.</li></ul>	

**MODULE MEC2050: ALTERNATIVE FUEL ENGINES****Level:** Intermediate**Theme:** Propulsion Systems**Prerequisite:** MEC1040 Engine Fundamentals**Module Description:** Students determine alternative fuels used to power motor vehicles.**Module Parameters:** Access to related resources, basic hand tools.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with alternative fuel vehicles</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to: <ul style="list-style-type: none"> <li>appropriate personal and vehicle safety procedures when starting, stopping, parking and refuelling alternate fuel vehicles</li> <li>safe storage of alternate fuels.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Alternative Fuel Engines, Part 1, MEC2050-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	20
<ul style="list-style-type: none"> <li>determine the type of fuel that is best suited to a particular use and type of vehicle</li> </ul>	<ul style="list-style-type: none"> <li>ability to identify alternate fuels that are best suited to particular tasks and requirements.</li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Alternative Fuel Engines, Part 2, MEC2050-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	35
<ul style="list-style-type: none"> <li>service an alternative fuel vehicle, recognizing its unique maintenance requirements</li> </ul>	<ul style="list-style-type: none"> <li>performance in servicing an alternate fuelled vehicle.</li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Alternative Fuel Engines, Part 3, MEC2050-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	45
<ul style="list-style-type: none"> <li>demonstrate basic competencies.</li> </ul>	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

**MODULE MEC2050: ALTERNATIVE FUEL ENGINES (continued)**

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures</li> <li>• state how alternative fuels affect the environment.</li> </ul>	<p>Note dangers involved in working on vehicles using, e.g., propane, natural gas.</p>
Identification/Function	<ul style="list-style-type: none"> <li>• identify the typical alternative fuels; e.g.:               <ul style="list-style-type: none"> <li>– diesel</li> <li>– propane</li> <li>– methanol</li> <li>– natural gas</li> <li>– hydrogen</li> </ul> </li> <li>• compare the heat-producing characteristics of each fuel</li> <li>• identify resources and methods of marketing different types of fuel</li> <li>• identify ways in which fuels are stored</li> <li>• describe the engine design modifications that are required to operate on:               <ul style="list-style-type: none"> <li>– diesel</li> <li>– propane</li> <li>– methanol</li> <li>– others.</li> </ul> </li> </ul>	<p>Use BTU charts from oil companies.</p> <p>Bulk and vehicle storage.</p>
Application	<ul style="list-style-type: none"> <li>• describe the advantages of using an alternative fuel by considering:               <ul style="list-style-type: none"> <li>– fuel cost</li> <li>– availability</li> <li>– performance</li> <li>– engine life</li> <li>– environmental impact.</li> </ul> </li> </ul>	
Inspect/Service	<ul style="list-style-type: none"> <li>• describe the specific service requirement for an alternative fuel engine</li> <li>• complete a service and maintenance task according to the manufacturer's recommendations; e.g., change oil and fuel filters, engine lubricant, glow plugs and heaters.</li> </ul>	
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities.</li> </ul>	

**COURSE MEC2060: IGNITION SYSTEMS****Level:** Intermediate**Theme:** Propulsion Systems**Prerequisite:** None**Description:** Students identify the basic components and parts of ignition systems used on internal combustion engines, and service and repair an ignition system.**Parameters:** Access to multimeter, timing light, hand tools and related resources.**Supporting Courses:** MEC1090 Electrical Fundamentals  
MEC1040 Engine Fundamentals**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>follow electrical safety guidelines by accurately interpreting and using instruction manuals</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to: <ul style="list-style-type: none"> <li>selection and use of resources and materials</li> <li>recognition of dangers of high voltages and currents.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Ignition Systems, Part 1, MEC2060-1</i></p> <p><i>Standard</i> <i>Performance rating of at least 2 on each criteria</i></p>	10
<ul style="list-style-type: none"> <li>explain how a timed high voltage spark is achieved in magneto, point and electronic ignition systems</li> </ul>	<ul style="list-style-type: none"> <li>ability to explain how the parts of magneto, point and electronic ignition systems function to produce timed ignition spark.</li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Ignition Systems, Part 2, MEC2060-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	20
<ul style="list-style-type: none"> <li>recognize the drivability symptoms, and use visual and instrument checks to diagnose ignition system faults</li> </ul>	<ul style="list-style-type: none"> <li>observed performance related to the ability to: <ul style="list-style-type: none"> <li>visually diagnose ignition faults</li> <li>use instruments to diagnose faults</li> <li>analyze drivability symptoms.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Ignition Systems, Part 3, MEC2060-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	30

**COURSE MEC2060: IGNITION SYSTEMS (continued)**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>service and repair an ignition system</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance in:                             <ul style="list-style-type: none"> <li>servicing point ignition system</li> <li>servicing electronic ignition system</li> <li>correcting a defective system.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Ignition Systems, Part 3, MEC2060-1</i></p> <p><i>Standard</i>  <i>Performance rating of 3 on each criteria</i></p>	40
<ul style="list-style-type: none"> <li>demonstrate basic competencies.</li> </ul>	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Outcomes	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow lab safety procedures</li> <li>describe hazards involved when working with high voltages and currents.</li> </ul>	Be aware of the potential for shocks and burns.
Identification/Function	<ul style="list-style-type: none"> <li>list and describe the three common types of ignition systems</li> <li>name the parts of a:                             <ul style="list-style-type: none"> <li>magneto</li> <li>point type</li> <li>electronic ignition system</li> <li>computer-coil (distributorless ignition)</li> </ul> </li> </ul>	Describe a distributorless ignition system.

**MODULE MEC2060: IGNITION SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Identification/ Function (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify and describe symptoms produced by a typical ignition failure; e.g.:               <ul style="list-style-type: none"> <li>– loose connection(s)</li> <li>– faulty spark plug(s)</li> <li>– faulty coil or wire</li> <li>– bad distributor cap or rotor</li> <li>– faulty points</li> <li>– faulty pick-up coil.</li> </ul> </li> </ul>	
Inspect/Service	<ul style="list-style-type: none"> <li>• test the following:               <ul style="list-style-type: none"> <li>– primary circuit voltage drop</li> <li>– high tension lead resistance</li> <li>– ignition coil</li> <li>– ignition cap</li> <li>– pick-up coil</li> <li>– distributor points and condensor</li> <li>– advance mechanisms</li> </ul> </li> <li>• show how to remove and analyze a spark plug to determine how well the engine is operating; e.g., oil consumption, fuel/air ratio and determine service/ repair required</li> <li>• lubricate distributor</li> <li>• clean and tighten electrical leads and connections</li> <li>• complete the following according to the manufacturer's specifications:               <ul style="list-style-type: none"> <li>– clean gap and/or replace with new spark plugs</li> <li>– clean and/or replace with new contact points</li> <li>– adjust contact points and pick up coil gap</li> <li>– adjust/repair advance mechanisms</li> <li>– set ignition timing statically and check with a timing light.</li> </ul> </li> </ul>	Use and electronic ignition tester for electronic systems.
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities.</li> </ul>	



**COURSE MEC2070: EMISSION CONTROLS****Level:** Intermediate**Theme:** Propulsion Systems**Prerequisite:** None**Description:** Students describe the importance of controlling emissions and the technology applied to vehicles to meet prescribed standards.**Parameters:** Access to specialized equipment and resources related to analyzing and testing emission control.**Supporting Courses:** MEC2030 Lubrication & Cooling  
MEC2040 Fuel & Exhaust Systems  
MEC2060 Ignition Systems**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with emission control systems</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>safety procedures in use of tools and equipment related to vehicle emissions</li> <li>appropriate selection of and use of protective equipment</li> <li>recognition and control of hazards associated with engine emissions.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Emission Controls, Part 1, MEC2070-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	10
	<ul style="list-style-type: none"> <li>list and describe vehicle pollutants and their effects on the environment</li> </ul> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>listing vehicle emissions</li> <li>explaining exhaust emissions and their effects on the environment</li> <li>stating regulations pertaining to exhaust emission levels</li> <li>comparing emissions produced by gasoline as compared to alternate fuels.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Emission Controls, Part 2, MEC2070-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15

**COURSE MEC2070: EMISSION CONTROLS (continued)**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• describe types and characteristics of pre- and post-combustion emission systems</li> <li>• identify emission control components</li> <li>• diagnose and service emission control systems</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• ability to identify and describe:                             <ul style="list-style-type: none"> <li>– types of pre- and post-combustion emission control systems</li> <li>– parts of pre- and post-combustion emission systems</li> <li>– the function and operation of pre- and post-combustion emission systems.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Emission Controls, Part 3, MEC2070-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	15
	<ul style="list-style-type: none"> <li>• observed performance associated with:                             <ul style="list-style-type: none"> <li>– locating and identifying components on a vehicle</li> <li>– describing how components work together to reduce emissions</li> <li>– evaluating a given system for efficiency.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Emission Controls, Part 4, MEC2070-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	25
	<ul style="list-style-type: none"> <li>• observed performance related to:                             <ul style="list-style-type: none"> <li>– connection of a gas analyzer to a vehicle</li> <li>– reading and recording the exhaust emissions</li> <li>– analyses of emission system functions</li> <li>– servicing emission control systems.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Emission Controls, Part 5, MEC2070-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	35
	<ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

**MODULE MEC2070: EMISSION CONTROLS (continued)**

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures.</li> <li>• describe effect of vehicle emissions on the environment and specifically on human life.</li> </ul>	<p>Discuss the effects of smog and carbon monoxide.</p>
Identification/Function	<ul style="list-style-type: none"> <li>• list types and where vehicle pollutants are created</li> <li>• explain how these pollutants are created</li> <li>• identify regulations that dictate maximum pollutant levels</li> <li>• identify and demonstrate knowledge of the operation of the following pre-combustion control systems:               <ul style="list-style-type: none"> <li>– crankcase ventilation system</li> <li>– exhaust gas recirculation system</li> <li>– ignition spark control systems</li> <li>– computerized engine controls</li> <li>– evaporative control systems</li> <li>– engine design modifications; i.e., combustion chamber, piston, cylinder head, manifold and air induction design</li> </ul> </li> <li>• identify and demonstrate knowledge of the operation of the following post-combustion control systems on several different types of vehicles:               <ul style="list-style-type: none"> <li>– air injection system</li> <li>– air aspirator system</li> <li>– catalytic converters</li> </ul> </li> </ul>	

**MODULE MEC2070: EMISSION CONTROLS (continued)**

Concept	Specific Learner Expectations	Notes
Inspect/Service	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– check and service positive crankcase ventilation system</li> <li>– check and service evaporative control system</li> <li>– check and service air injector system</li> <li>– check and service exhaust gas recirculation system</li> <li>– check catalytic converter</li> <li>– check and adjust spark control system</li> <li>– check computerized engine controls</li> <li>– using exhaust gas analyzer (if available), check emissions for a given vehicle.</li> </ul> </li> </ul>	<p>As per manufacturer's specifications.</p> <p>All customer work should be checked by a certified technician.</p> <p>Check readings for hydrocarbons, carbon monoxide, oxygen and carbon dioxide levels.</p>

**MODULE MEC2090: ELECTRICAL COMPONENTS****Level:** Intermediate**Theme:** Guidance and Control Systems**Prerequisite:** MEC1090 Electrical Fundamentals**Module Description:** Students identify and describe the basic use and testing of the electrical components of a typical motor vehicle.**Module Parameters:** Voltmeter, ohmmeter, ammeter, alternator, starter and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when working with electrical components</li> <li>• describe the function and operation of a vehicle's electrical systems and components</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance in relation to: <ul style="list-style-type: none"> <li>– following shop electrical routines</li> <li>– avoiding electrical shorts, sparks and unwanted grounds</li> <li>– observing proper polarity.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Electrical Components, Part 1, MEC2090-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• a report that lists and describes the <ul style="list-style-type: none"> <li>– purpose and function of vehicle electrical systems</li> <li>– principal components in each system</li> <li>– overall operation of the electrical system.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Electrical Components, Part 2, MEC2090-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p>10</p> <p>15</p>

**MODULE MEC2090: ELECTRICAL COMPONENTS (continued)**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>identify electrical faults, by using standard diagnostic and testing procedures</li> <li>test and service electrical components</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance in:                             <ul style="list-style-type: none"> <li>– use of voltmeter, ohmmeter and ammeter</li> <li>– testing for open and closed circuits</li> <li>– testing for load voltage and voltage drop</li> <li>– testing for current draw</li> <li>– testing for resistances</li> <li>– recognizing abnormal electrical circuit conditions.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Electrical Components, Part 3, MEC2090–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	25
	<ul style="list-style-type: none"> <li>observed performance in testing and overhaul of:                             <ul style="list-style-type: none"> <li>– starter motor repair and assembly</li> <li>– alternator repair and assembly</li> <li>– testing assembled starter/alternator.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Electrical Components, Part 4, MEC2090–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	50
	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow lab safety procedures with respect to electrical hazards, such as:                             <ul style="list-style-type: none"> <li>– electrical shocks</li> <li>– electrical burns</li> </ul> </li> <li>demonstrate how to avoid sparks and grounding</li> <li>explain electrical polarity.</li> </ul>	Be aware of the dangers of wearing jewellery.

**MODULE MEC2090: ELECTRICAL COMPONENTS (continued)**

Concept	Specific Learner Expectations	Notes
System/Component Function	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• locate the major electrical/electronic systems in a motor vehicle: lighting, charging and starting</li> <li>• explain the operation and function of each of the electrical/electronic systems</li> <li>• show how electrical/electronic systems interact with other vehicle systems; e.g., suspension and braking systems</li> <li>• for charging, starting and lighting systems, identify and explain the purpose and their basic component parts</li> <li>• identify and draw the symbols for common electrical components</li> <li>• identify and describe the ratings that are given to electrical components; e.g., resistance, voltage, amperage and power rating.</li> </ul>	Draw block diagrams.
Identification/Function	<ul style="list-style-type: none"> <li>• identify and describe the purpose and functions of a:               <ul style="list-style-type: none"> <li>– voltmeter</li> <li>– ohmmeter</li> <li>– ammeter</li> <li>– multimeter</li> <li>– load tester</li> <li>– tack dwell meter</li> <li>– growler</li> </ul> </li> <li>• calibrate correctly, connect accurately and read the appropriate test equipment to determine:               <ul style="list-style-type: none"> <li>– open and closed circuit</li> <li>– load voltage and drop</li> <li>– current draw</li> <li>– component resistance.</li> </ul> </li> </ul>	Perform insulated and ground circuit resistance tests.
Inspect/Repair	<ul style="list-style-type: none"> <li>• identify and correct faults associated with electrical components and instruments</li> <li>• overhaul a starter motor assembly</li> <li>• overhaul an alternator.</li> </ul>	



**MODULE MEC2100: POWER ASSIST ACCESSORIES****Level:** Intermediate**Theme:** Guidance and Control Systems**Prerequisite:** MEC1110 Pneumatics & Hydraulics**Module Description:** Students identify and explain the function of components and parts of power assist accessories.**Module Parameters:** Multimeter, power accessories and related resources.**Note:** Customer work must be checked by certified technician.**Supporting Module:** MEC1090 Electrical Fundamentals**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working on power accessories</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to: <ul style="list-style-type: none"> <li>personal safety and vehicle care when working with power accessories</li> <li>maintenance of a clean and organized workplace</li> <li>safe and efficient use of tools and equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Power Assist Accessories, Part 1, MEC2100-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15
<ul style="list-style-type: none"> <li>list components and state functions of power assist accessories</li> </ul>	<ul style="list-style-type: none"> <li>observed performance related to: <ul style="list-style-type: none"> <li>preparation of a comprehensive list of available power assist accessories</li> <li>identification of components in power assist systems</li> <li>demonstration of power accessories that can be used to assist mechanical systems.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Power Assist Accessories, Part 2, MEC2100-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	20

**MODULE MEC2100: POWER ASSIST ACCESSORIES (continued)**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• describe and check major components of power accessories</li> <li>• service and repair power accessories</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• description and assessment of major components including mechanical and electrical devices.</li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Power Assist Accessories, Part 3, MEC2100-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– following procedures to isolate and identify faulty components/system</li> <li>– servicing and repairing faulty power assist accessories</li> <li>– test to establish that the fault has been remedied</li> <li>– analysis of possible factors that caused the failure in the component.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Power Assist Accessories, Part 4, MEC2100-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>25</p> <p>40</p> <p>Integrated throughout</p>

**MODULE MEC2100: POWER ASSIST ACCESSORIES (continued)**

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate established lab safety procedure</li> <li>• demonstrate practices that prevent damage to components.</li> </ul>	
Identification/Function	<ul style="list-style-type: none"> <li>• describe the types and basic functions of power accessories found on vehicles</li> <li>• compare power accessories to the mechanical system they have replaced</li> <li>• evaluate current power accessories as a means of forecasting types of power accessories that may be used in future vehicles.</li> </ul>	Describe steering, brakes, suspension, windows, door locks, antennae applications.
System/Component Function	<ul style="list-style-type: none"> <li>• list the parts of selected power accessories</li> <li>• describe the function of the major parts of selected power accessories</li> <li>• trace the power path of selected power accessories.</li> </ul>	
Inspect/Repair	<ul style="list-style-type: none"> <li>• demonstrate how to use shop manuals to diagnose power accessory faults specific to power accessories</li> <li>• identify problems and faults in power accessories systems.</li> </ul>	All services, diagnoses, repairs and replacements of parts must be checked by a licenced technician.



## MODULE MEC2110: BRAKING SYSTEMS

**Level:** Intermediate

**Theme:** Guidance and Control Systems

**Prerequisite:** MEC1110 Pneumatics & Hydraulics

**Module Description:** Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practices.

**Module Parameters:** Access to specialized brake tools and related resources.

**Note:** Customer work must be supervised by certified technician.

### Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"><li>demonstrate safe work practices when working on brakes</li></ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"><li>observed performance related to:<ul style="list-style-type: none"><li>appropriate selection and use of protective supplies and equipment for personal safety</li><li>following established safety procedures while working on vehicle brakes</li><li>safe practices when cleaning and repairing asbestos parts.</li></ul></li></ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Braking Systems, Part 1, MEC2110-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	10
<ul style="list-style-type: none"><li>identify brake design and components, and emergency brake systems</li></ul>	<ul style="list-style-type: none"><li>performance measured by:<ul style="list-style-type: none"><li>identification and description of brake components</li><li>identification of primary braking and emergency systems.</li></ul></li></ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Braking Systems, Part 2, MEC2110-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	15



**MODULE MEC2110: BRAKING SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures.</li> </ul>	<p>Be aware of asbestos hazards and effects of brake fluid on painted surfaces.</p>
Identification/Function	<ul style="list-style-type: none"> <li>• identify the parts of a hydraulic brake drum system</li> <li>• compare the operating principles of duo-servo and non-servo brake systems</li> <li>• identify the parts of a disc brake system</li> <li>• compare the operating principles of a fixed, floating and sliding caliper braking system</li> <li>• describe operation of a combined disc and drum system</li> <li>• identify the parts of an emergency brake system</li> <li>• compare the operating principles of an emergency brake system on disc and drum brake applications.</li> </ul>	<p>Consider valves involved.</p>
Inspect/Service	<ul style="list-style-type: none"> <li>• show how to:               <ul style="list-style-type: none"> <li>– prepare a work order, using appropriate questioning to determine brake problem</li> <li>– check a master cylinder fluid level</li> <li>– inspect drum and disc brake linings for wear</li> <li>– inspect drum and rotor for service</li> <li>– adjust an emergency brake cable.</li> </ul> </li> </ul>	
Inspect/Repair	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– machine a brake drum and rotor according to the manufacturer’s specifications</li> <li>– remove and replace disc and drum brake shoes</li> <li>– remove/replace and overhaul master cylinder, wheel cylinder and caliper</li> <li>– replace a flexible brake hose</li> <li>– bleed and flush a brake system.</li> </ul> </li> </ul>	<p>Be familiar with internal components and rebuilding procedures.</p> <p>On road-licenced vehicle must have final inspection done by certified personnel.</p>

**MODULE MEC2110: BRAKING SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Careers	<i>The student should:</i> <ul style="list-style-type: none"><li>• identify further education, working conditions and career opportunities.</li></ul>	

**MODULE MEC2120: HYDRAULIC ACCESSORIES**

<b>Level:</b>	Intermediate
<b>Theme:</b>	Guidance and Control Systems
<b>Prerequisite:</b>	MEC1110 Pneumatics & Hydraulics
<b>Module Description:</b>	Students develop a basic knowledge of hydraulic components, applications and servicing techniques.

**Module Parameters:** Access to basic hand tools hydraulic systems and related resources.

**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe work practices when working with hydraulic systems</li> <li>describe functions of hydraulic components in a hydraulic system</li> <li>interpret parts and service manuals to provide appropriate maintenance and service procedures on a hydraulic system</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>hazards associated with pressurized hydraulic equipment</li> <li>safe use of tools, equipment and materials</li> <li>safe use of personal protective equipment</li> <li>correct use of equipment and supplies used on vehicles.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Hydraulic Accessories, Part 1, MEC2120-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	10
	<ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>the identification and description of hydraulic components</li> <li>appropriate use of hydraulic resources.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Hydraulic Accessories, Part 2, MEC2120-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	15
	<ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>listing appropriate servicing procedures and techniques on hydraulic components</li> <li>developing a service schedule for a given application</li> <li>interpreting parts and service manuals.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Hydraulic Accessories, Part 3, MEC2120-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	50

**MODULE MEC2120: HYDRAULIC ACCESSORIES** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• service hydraulic components</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• servicing individual components on a given a hydraulic system.</li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Hydraulic Accessories, Part 4, MEC2120-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>25</p> <p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures</li> <li>• explain hazards associated with pressure and heat build-up hydraulic systems.</li> </ul>	
Identify/Analyze	<ul style="list-style-type: none"> <li>• describe the properties of hydraulic fluids in relation to: <ul style="list-style-type: none"> <li>– viscosity</li> <li>– lubricating ability</li> <li>– resistance to oxidation</li> <li>– corrosion prevention</li> </ul> </li> <li>• identify the common types of connecting lines/hoses, fitting and seals</li> <li>• describe the internal parts of a reservoir and state the purpose of filters, strainers and breathers</li> <li>• describe the construction and operation of: <ul style="list-style-type: none"> <li>– cylinder</li> <li>– gear and vane motors</li> </ul> </li> </ul>	

**MODULE MEC2120: HYDRAULIC ACCESSORIES** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• describe the function of:               <ul style="list-style-type: none"> <li>– check and pressure control valves</li> <li>– two- and four-way valves</li> </ul> </li> <li>• describe the construction and operation of gear, vane and piston pumps</li> <li>• explain why and when accumulators are used in a hydraulic system.</li> </ul>	
Inspect/Service	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– check fluid levels in reservoirs</li> <li>– clean strainers</li> <li>– replace system filters with the approved parts</li> <li>– check seals for leaks and replace</li> <li>– replace a defective hose, line and fitting</li> <li>– replace the hydraulic fluid in a system.</li> </ul> </li> </ul>	
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities.</li> </ul>	



**MODULE MEC2130: DRIVE TRAINS****Level:** Intermediate**Theme:** Guidance and Control Systems**Prerequisite:** MEC1130 Mechanical Systems**Module Description:** Students identify the purpose, describe the operation and perform the servicing of a vehicle drive train.**Module Parameters:** Access to drive train units, hand tools, specialized drive train tools and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when working with vehicle drive trains</li>   <li>• identify purpose and describe function of the major drive train components</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to: <ul style="list-style-type: none"> <li>– safe practices using equipment, tools and materials</li> <li>– safe procedures when working with vehicle drive train parts and components</li> <li>– following proper lifting and handling procedures.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Drive Trains, Part 1, MEC2130–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• measured performance related to: <ul style="list-style-type: none"> <li>– identification of major drive train components and their purpose</li> <li>– explanation of the inter-relationship between major components</li> <li>– developing a service schedule for drive train components.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Drive Trains, Part 2, MEC2130–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p style="text-align: center;">10</p>      <p style="text-align: center;">20</p>

**MODULE MEC2130: DRIVE TRAINS** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>execute inspection, diagnostic, service and repair procedures on specific drive train components</li> <li>identify career opportunities related to drive train repairs</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>inspection and diagnosis of drive train components (clutch, manual transmission, automatic transmission drive axles/shaft, and differential)</li> <li>service of drive train components</li> <li>removal/replacement of drive train components.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Drive Trains, Part 3, MEC2130-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	50
	<ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>reporting up-to-date information concerning opportunities in the drive train area.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Assessment Guide: Career Profile, MECCPR</i></p> <p><i>Standard</i>  <i>Performance rating of at least 2 on each criteria</i></p>	20
	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of and follow lab safety procedures</li> <li>identify potential back problems associated with lifting heavy objects.</li> </ul>	
Identification/Function	<ul style="list-style-type: none"> <li>state the overall purpose of the power transmission system in a vehicle</li> <li>list and describe the function of component assemblies in a drive train</li> </ul>	

**MODULE MEC2130: DRIVE TRAINS** (continued)

Concept	Specific Learner Expectations	Notes
Identification/ Function (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• differentiate between the following drive trains:               <ul style="list-style-type: none"> <li>– front wheel drive</li> <li>– rear wheel drive</li> <li>– four wheel drive:                   <ul style="list-style-type: none"> <li>• front–rear</li> <li>• rear–front</li> </ul> </li> <li>– all wheel drive.</li> </ul> </li> </ul>	
Inspect/Service and Repair	<ul style="list-style-type: none"> <li>• create a service schedule for each drive train component to include fluid change interval and type</li> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– check fluid levels</li> <li>– remove and install drive train components</li> <li>– assess clutch serviceability</li> <li>– check and adjust clutch linkage for correct free play or check operation of automatic adjuster if so equipped</li> <li>– check manual transmission fluid level and replenish or replace as necessary, considering the service requirement characteristics of the vehicle</li> <li>– check manual transmission for leaks and replace the required seal(s) if possible, or recommend the repair requirement</li> <li>– adjust transmission shifting linkages</li> <li>– service an automatic transmission by replacing the fluid, filter and oil pan gasket</li> <li>– check automatic transmission assembly for leakage and replace the required seal(s) if possible, or recommend the repair requirement</li> <li>– inspect drive shaft or drive axle components such as:                   <ul style="list-style-type: none"> <li>• joints</li> <li>• straps</li> </ul> </li> </ul> </li> </ul>	

**MODULE MEC2130: DRIVE TRAINS** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>– repair the coupling joint or shaft as required to return it to serviceability according to manufacturer’s specifications</li> <li>– inspect transfer case fluid level and replenish or replace as required by service schedule</li> <li>– check transfer case linkage operation and adjust or repair as required to ensure serviceability</li> <li>– assess transfer case operation of the assembly and repair, or recommend repair requirement</li> <li>– inspect the transfer case assembly for leaks and replace the required seal(s), or recommend the repair requirement</li> <li>– locate and inspect viscous clutch if the vehicle is so equipped and repair or recommend the required repair</li> <li>– check differential fluid and either replenish or replace as necessary, considering the vehicle’s operating conditions and service interval scheduling specifications</li> <li>– remove a differential cover and identify the parts enclosed, or if not an integral type of differential, remove the carrier assembly identifying the parts</li> <li>– inspect differential housing for filings and inspect gears and bearings for wear and repair needs</li> <li>– calculate differential gear ratio between the crown and pinion gears and determine the torque multiplication that results</li> <li>– reassemble differential and check assembly for leaks, replacing the required seals or recommending repair required</li> <li>– inspect the drive train components for alignment, wear and looseness</li> <li>– using a mechanics stethoscope, test the assemblies for noise at bearing locations while the system is being operated</li> </ul>	

**MODULE MEC2130: DRIVE TRAINS** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair (continued)	<i>The student should:</i> <ul style="list-style-type: none"><li>– identify the cause of noise or vibration and repair or recommend required repair</li><li>– inspect isolation mounts and bushings at the drive train assemblies to assess capability of noise or vibration transference.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• identify local businesses specializing in drive train repairs, and determine the working conditions and career opportunities.</li></ul>	



**MODULE MEC2140: TRANSMISSIONS/TRANSAXLES****Level:** Intermediate**Theme:** Guidance and Control Systems**Prerequisite:** MEC2130 Drive Trains**Module Description:** Students perform inspection service and repair procedures on manual transmissions, transaxles and clutch assemblies.**Module Parameters:** Access to pilot shafts, specialized manual transmission tools, presses, pullers related resources and clutch, transmission and transaxle units.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when working on transmissions and transaxles</li> <li>• identify parts and trace power flow through a clutch, manual transmission, and differential and manual transaxle assembly</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– safe use of equipment, tools, materials and supplies</li> <li>– proper use of personal safety equipment</li> <li>– correct use of vehicle protective equipment</li> <li>– proper lifting techniques to avoid back injuries.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Transmissions/Transaxles, Part 1, MEC2140–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– identification of the parts/components of drive train utilizing manual transmission/transaxle</li> <li>– tracing the flow of power through a manual transmission/transaxle</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Transmissions/Transaxles, Part 2, MEC2140–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p style="text-align: center;">20</p> <p style="text-align: center;">30</p>



**MODULE MEC2140: TRANSMISSIONS/TRANSAXLES (continued)**

Concept	Specific Learner Expectations	Notes
Identification/ Function (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• for each gear, identify the path of power through transmission or transaxle and compare the gear ratio of each power routing as well as the direction of rotation.</li> </ul>	
Inspection/Report	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– check clutch pedal operation, travel and free play adjustment</li> <li>– remove clutch inspection cover and check for wear to the clutch disc and pressure plate, as well as other visually available parts</li> <li>– inspect clutch linkage for faults and/or wear</li> <li>– inspect shifting linkages for any undue looseness or signs of wear</li> <li>– check lubricant for level, type and recommended change interval</li> <li>– inspect mounts, braces and isolator cushions for wear fatigue or damage</li> <li>– inspect the assembly for leakage and note location and seal at fault</li> <li>– prepare a repair cost estimate, prior to commencement of repairs, as identified during inspection or servicing.</li> </ul> </li> </ul>	
Identify/Analyze	<ul style="list-style-type: none"> <li>• formulate probable causes for typical problems that develop with clutches:               <ul style="list-style-type: none"> <li>– grabbing</li> <li>– slipping</li> <li>– failing to release</li> <li>– noise when disengaged</li> <li>– noise when engaging</li> </ul> </li> <li>• where possible, relate the hypothetical situation to a real vehicle condition</li> </ul>	Where possible, relate the hypothetical situation to a real vehicle condition.

**MODULE MEC2140: TRANSMISSIONS/TRANSAXLES (continued)**

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• formulate probable causes for typical problems that develop with manual gear boxes:               <ul style="list-style-type: none"> <li>– gears clashing</li> <li>– hard shifting</li> <li>– jumps out of gear</li> <li>– noises in specific gears</li> <li>– unable to engage gears</li> <li>– shifter noisy or loose</li> <li>– bearing noises.</li> </ul> </li> </ul>	Where possible, relate the hypothetical situation to a real vehicle condition.
Inspect/Service and Repair	<ul style="list-style-type: none"> <li>• perform the clutch repairs as identified and estimated to the teacher and agreed upon by the owner of the vehicle</li> </ul> <p>AND/OR</p> <ul style="list-style-type: none"> <li>• remove and reinstall a clutch disc, pressure plate assembly, pilot bearing and throw-out bearing; check each part to confirm the continued serviceability of the assembly and clean each part before reassembly. Adjust linkage to specified clearances</li> <li>• adjust clutch linkage for correct free play at pedal or, in the case of an automatic clutch adjuster, confirm the operation as being correct</li> <li>• follow through on agreed-upon transmission/transaxle repairs, identified and estimated to the teacher and the owner of the vehicle</li> </ul> <p>AND/OR</p> <ul style="list-style-type: none"> <li>• disassemble, inspect and reassemble a three- or four-speed manual transmission with external linkage and constant mesh gearing</li> <li>• replace manual transmission lubricant with specified type.</li> </ul>	<p>Does not imply a complete overhaul (refer to MEC3130 Automatic Transmissions).</p> <p>Does not imply a complete overhaul (refer to MEC3130 Automatic Transmissions).</p> <p>As per manufacturer's recommendations.</p>
Careers	<ul style="list-style-type: none"> <li>• identify further education, working conditions and career opportunities.</li> </ul>	

**MODULE MEC2150: SUSPENSION SYSTEMS**

**Level:** Intermediate

**Theme:** Suspension and Structural Systems

**Prerequisite:** MEC1150 Ride & Control Systems

**Module Description:** Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle suspension systems.

**Module Parameters:** Access to suspension systems, specialized suspension tools and related resources.

**Note:** Customer work must be checked by certified technician.

**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when working on suspension systems</li> <li>• identify the purpose and function of suspension parts</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– safe use of equipment, tools, materials, and supplies when working on suspension systems</li> <li>– use of personal protective equipment</li> <li>– use of safety devices and materials to protect vehicle against damage.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Suspension Systems, Part 1, MEC2150-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– identification of suspension parts</li> <li>– a statement of the purpose and function of suspension parts.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Suspension Systems, Part 2, MEC2150-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p>15</p> <p>15</p>

**MODULE MEC2150: SUSPENSION SYSTEMS** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• identify worn or defective suspension parts</li> <li>• service a suspension system</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance on a given vehicle:               <ul style="list-style-type: none"> <li>– identification of worn and defective suspension components</li> <li>– determining reason for worn and/or defective suspension components</li> <li>– determining driveability problems caused by worn/defective suspension parts</li> <li>– identify tolerances and indicators of defective parts.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Suspension Systems, Part 3, MEC2150-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– service of a suspension system</li> <li>– use of tools/ equipment/materials and resources</li> <li>– removal and replacement of suspension components.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Suspension Systems, Part 4, MEC2150-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>25</p> <p>45</p> <p>Integrated throughout</p>

**MODULE MEC2150: SUSPENSION SYSTEMS (continued)**

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures when working on suspensions components.</li> </ul>	<p>Be aware that coil springs exert a tremendous force, and special procedures and equipment are required to prevent serious injury when servicing.</p>
Identification/Function	<ul style="list-style-type: none"> <li>• describe the basic types of front and rear suspensions used on motor vehicles; e.g., short, long arm suspension and MacPherson strut</li> <li>• compare the advantages and disadvantages of using separate and integral frames in relation to suspension design, repair and servicing</li> <li>• explain the advantage of using a:               <ul style="list-style-type: none"> <li>– solid “I” beam</li> <li>– split “I” beam</li> <li>– independent front suspension and a:                   <ul style="list-style-type: none"> <li>• rigid</li> <li>• independent rear suspension</li> </ul> </li> </ul> </li> <li>• explain why it is important to reduce the amount of unsprung weight</li> <li>• list the positive and negative features of using coil, leaf, torsion, rubber biscuit and air springs</li> <li>• explain the meaning of spring rate and travel</li> <li>• list basic types and describe operation of shock absorbers, mounting techniques and methods of testing</li> <li>• explain how shock absorber ratio is calculated.</li> </ul>	<p>Compare gas shocks to oil-filled shock absorbers.</p>
Inspect/Service	<ul style="list-style-type: none"> <li>• describe typical wheel bearing faults; e.g., bent cage, etching, overheating and worn seal</li> <li>• repack a front or rear wheel bearing</li> <li>• lubricate suspension joints where necessary</li> <li>• inspect suspension components for damage and wear</li> <li>• explain how ball joints are checked for wear.</li> </ul>	

**MODULE MEC2150: SUSPENSION SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair	<p><i>The student should:</i></p> <ul style="list-style-type: none"><li>• remove and replace:<ul style="list-style-type: none"><li>– a shock absorber</li><li>– a coil spring</li><li>– a ball joint</li><li>– a strut.</li></ul></li></ul>	<p>On road-licenced vehicle, have final inspection done by certified personnel</p> <p>Review hazards associated with work on suspension components.</p>
Consumer Awareness	<ul style="list-style-type: none"><li>• identify the appropriate lifting and towing procedures relative to electronically controlled suspension systems.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• identify further education, working conditions and career opportunities.</li></ul>	

**MODULE MEC2160: STEERING SYSTEMS****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC1150 Ride & Control Systems**Module Description:** Students develop the knowledge, skills and attitudes necessary to maintain a steering system.**Module Parameters:** Access to steering systems, specialized steering tools and related resources.**Note:** Customer work must be checked by certified technician.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when working on steering systems</li>   <li>• identify different steering system designs and applications</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to: <ul style="list-style-type: none"> <li>– safe use of equipment, tools and supplies</li> <li>– use of personal protective equipment</li> <li>– use of safety devices to protect vehicles against damage.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Steering Systems, Part 1, MEC2160–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to: <ul style="list-style-type: none"> <li>– identifying three or more common steering designs and applications</li> <li>– listing the advantages and limitations of steering designs</li> <li>– knowledge of the evolution of steering designs</li> <li>– identifying steering components and their function.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Steering Systems, Part 2, MEC2160–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p style="text-align: center;">10</p>       <p style="text-align: center;">15</p>

**MODULE MEC2160: STEERING SYSTEMS** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• list driving symptoms that indicate worn or defective steering parts</li> <li>• service/repair a vehicle steering system</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– recognition of driving symptoms and their connection to worn/defective steering parts</li> <li>– evaluation of specifications and measurements to locate worn/defective parts</li> <li>– analysis of parts to determine cause of wear and/or malfunction of steering parts.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Steering Systems, Part 3, MEC2160–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– identification of worn/defective steering systems and their components</li> <li>– procedures followed during service and repair to steering systems</li> <li>– retrieval and use of specifications and measurements in servicing and repairing steering systems</li> <li>– removal and replacement of steering components.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Steering Systems, Part 4, MEC2160–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>20</p> <p>55</p> <p>Integrated throughout</p>

**MODULE MEC2160: STEERING SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of and follow lab safety procedures when working on steering systems, and explain the importance of proper adjustments and torques.</li> </ul>	<p>Never apply heat to steering components or reuse damaged parts.</p>
Identification/Function	<ul style="list-style-type: none"> <li>• identify common types of steering gear used to create the necessary mechanical advantages to overcome tire resistance; e.g.:               <ul style="list-style-type: none"> <li>– worn and sector</li> <li>– Ross cam and lever</li> <li>– recirculating ball</li> <li>– rack and pinion</li> </ul> </li> <li>• identify and compare the operation of two or more steering boxes</li> <li>• describe the steering linkage used with rack and pinion and recirculating ball type systems</li> <li>• describe the construction of a tie rod assembly and explain how it is built to accommodate up and down as well as lateral movement</li> <li>• explain the operation of four-wheel steering and outline the advantages of this type of steering over a conventional two-wheel system.</li> </ul>	
Inspect/Service	<ul style="list-style-type: none"> <li>• show how to:               <ul style="list-style-type: none"> <li>– complete a work order form</li> <li>– check and adjust power steering fluid level</li> <li>– check the lubricant level in a manual steering gear and add the appropriate lubricant if necessary</li> <li>– lubricate steering parts</li> <li>– clean and inspect steering linkage for wear and replace if necessary</li> <li>– inspect steering joints, bushings and replace if necessary</li> <li>– adjust a manual steering gear</li> <li>– inspect and service rack and pinion steering gear</li> <li>– inspect and service power steering components.</li> </ul> </li> </ul>	<p>On road-licenced vehicles must have final inspection done by certified personnel.</p>

**MODULE MEC2160: STEERING SYSTEMS** (continued)

Concept	Specific Learner Expectations	Notes
Consumer Awareness	<i>The student should:</i> <ul style="list-style-type: none"><li>• list symptoms of worn or defective components</li><li>• list factors that create premature steering failures.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• identify further education, working conditions and career opportunities.</li></ul>	

**MODULE MEC2170: METAL REPAIR & FINISHING****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC1170 Metal Forming & Finishing**Module Description:** Students analyze and repair metal damage.**Module Parameters:** Access to gas metal arc welding (GMAW) and oxyacetylene welding (OAW) welders, basic body hand/power tools and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe work practices when metal forming and finishing metal damage</li> <li>• identify different damage conditions and repair procedures for metal damage</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:               <ul style="list-style-type: none"> <li>– following shop procedures</li> <li>– selecting and using metal working, welding and hydraulic equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Metal Repair &amp; Finishing, Part 1, MEC2170-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• use of appropriate resources to produce a report describing:               <ul style="list-style-type: none"> <li>– direct damage</li> <li>– indirect damage</li> <li>– repair procedures.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Metal Repair &amp; Finishing, Part 2, MEC2170-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	<p style="text-align: center;">10</p> <p style="text-align: center;">25</p>

**MODULE MEC2170: METAL REPAIR & FINISHING (continued)**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• repair metal damage to a vehicle</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to:                             <ul style="list-style-type: none"> <li>– problem solving a repair</li> <li>– developing sequence of repair</li> <li>– using metal, welding and finishing equipment</li> <li>– repairing major sheet metal damage</li> <li>– repairing large rust out.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Metal Repair &amp; Finishing, Part 3, MEC2170–1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	65
<ul style="list-style-type: none"> <li>• demonstrate basic competencies.</li> </ul>	<ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe practices in relation to:                             <ul style="list-style-type: none"> <li>– use of welding equipment</li> <li>– use of solder and soldering equipment</li> <li>– sheet metal straightening system.</li> </ul> </li> </ul>	<p>Address personal, property and environmental safety.</p> <p>Demonstrate hydraulic pulling and come-along equipment.</p>
Identify/Analyze	<ul style="list-style-type: none"> <li>• identify and describe type/extent of minor sheet metal damage</li> <li>• list sequence of repair</li> <li>• identify and describe major sheet metal impact damage conditions:                             <ul style="list-style-type: none"> <li>– direct damage</li> <li>– indirect damage</li> </ul> </li> <li>• list sequence of repair.</li> </ul>	<p>Discuss work hardening, tears, gouges, buckles, pressure forces and aluminum versus ferrous sheet metal.</p>

**MODULE MEC2170: METAL REPAIR & FINISHING** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Repair	<p><i>The student should:</i></p> <ul style="list-style-type: none"><li>• demonstrate how to:<ul style="list-style-type: none"><li>– perform metal straightening</li><li>– perform metal replacement work</li><li>– repair damaged aluminum panel</li><li>– repair a panel using body solder</li><li>– complete a large rust out repair</li></ul></li></ul>	<p>May only be possible to do a partial panel. Link module to a CTR project to complete a more extensive panel repair.</p>
Careers	<ul style="list-style-type: none"><li>• identify further education, working conditions and career opportunities.</li></ul>	



**MODULE MEC2180: TRIM REPLACEMENT****Level:** Advanced**Theme:** Suspension and Structural Systems**Prerequisite:** None**Module Description:** Students demonstrate the removal and repair of trim parts, with an emphasis on removal and installation without damage.**Module Parameters:** Access to specialized trim tools and related resources.**Supporting Module:** MEC1190 Surface Preparation 1**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe use of tools and chemicals for trim replacement</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance in:               <ul style="list-style-type: none"> <li>following shop procedures pertaining to use of tools and chemicals.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Trim Replacement, Part 1, MEC2180-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	10
<ul style="list-style-type: none"> <li>investigate interior and exterior trim systems used to enhance appearances</li> </ul>	<ul style="list-style-type: none"> <li>presentation of a report describing:               <ul style="list-style-type: none"> <li>interior/exterior trim materials</li> <li>functions and arrangement of window and door lock hardware/parts</li> <li>fasteners unique to interior/exterior.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Trim Replacement, Part 2, MEC2180-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	10
<ul style="list-style-type: none"> <li>remove and install trim and weather-stripping</li> </ul>	<ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>interior door trim removal and installation</li> <li>exterior trim removal and installation</li> <li>use of trim tools.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Trim Replacement, Part 3, MEC2180-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	45

**MODULE MEC2180: TRIM REPLACEMENT** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>analyze and install enhancement trim</li> <li>identify further education and career opportunities related to trim replacement and repair services</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to a given vehicle:                             <ul style="list-style-type: none"> <li>analyze and propose enhancement trim</li> <li>application of new trim, accessories, decals, vinyl overlays.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Trim Replacement, Part 4, MEC2180-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	20
	<ul style="list-style-type: none"> <li>presentation of a report on career choices related to:                             <ul style="list-style-type: none"> <li>glass installation/removal</li> <li>trim installation</li> <li>accessory centres.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Assessment Guide: Career Profile, MECCR</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	15
	<ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>identify hazards involved when working with trim.</li> </ul>	Personal, property and environment.

**MODULE MEC2180: TRIM REPLACEMENT** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analysis	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify the materials used for interior trim, the fastening system for each and describe the correct method of removal</li> <li>• describe the methods to remove and install interior trim</li> <li>• describe precautions to be adhered to when removing and installing trim</li> <li>• describe methods used to attach trim accessories, door locks, mirrors, etc.</li> <li>• explain how to remove and replace specified trim</li> <li>• identify fasteners specific to exterior trim, including clips and adhesives</li> <li>• explain the inherent value of decals, vinyl and overlays</li> <li>• describe procedures for removal of decals, vinyl and overlays</li> <li>• describe the function of weather-stripping</li> <li>• identify two or three different methods of weather-stripping and explain the significance of the differences</li> <li>• identify two or three procedures needed to remove accessories and implications for repair or replacement.</li> </ul>	
Inspect/Repair	<ul style="list-style-type: none"> <li>• demonstrate correct procedures and tools used in the removal of moldings, emblems and accessories</li> <li>• install selected exterior trim</li> <li>• successfully remove and install a door seal, test seal and adjust hardware accordingly</li> <li>• service accessories considered to be trim; e.g., locks, mirrors, lights.</li> </ul>	
Careers	<ul style="list-style-type: none"> <li>• identify further education, work conditions and opportunities.</li> </ul>	



**MODULE MEC2190: SURFACE PREPARATION 2****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC1190 Surface Preparation 1**Module Description:** Students perform advanced surface preparations.**Module Parameters:** Access to auto body hand/power tools related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate safe practices when performing advanced surface preparation</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>following safe practices and use of proper personal protective equipment</li> <li>following shop routines</li> <li>use of WHMIS bulletins with respect to surface preparation.</li> </ul> </li> </ul>	10
<ul style="list-style-type: none"> <li>explain materials and practices for performing advanced surface preparation</li> </ul>	<p><i>Assessment Tool</i> <i>Task Assessment Checklist: Surface Preparation 2, Part 1, MEC2190-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>observed performance in:               <ul style="list-style-type: none"> <li>listing and identifying metals/metal condition and respective preparation techniques</li> <li>listing and identifying plastics and respective preparation techniques</li> <li>listing abrasives and identifying application</li> <li>listing and describing chemical use in surface preparation</li> <li>listing coatings and application techniques and processes.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Surface Preparation 2, Part 2, MEC2190-1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	40



**MODULE MEC2190: SURFACE PREPARATION 2** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• use correct cleaning agent to match plastics and product used</li> <li>• identify and describe custom masking methods.</li> </ul>	<p>Flexible plastic; rigid plastic; interior/exterior plastics; cleaners. Flames; elaborate striping.</p>
Inspect/Repair	<ul style="list-style-type: none"> <li>• demonstrate how to:               <ul style="list-style-type: none"> <li>– prepare bare metal</li> <li>– clean and treat surface rust as conditions dictate</li> <li>– compound surfaces</li> <li>– prime plastic and metal components</li> <li>– custom mask a small project.</li> </ul> </li> </ul>	<p>Spot blasting; sanding; chemical treatment.</p> <p>Flexible filling primer; special adhesion promoters.</p>
Careers	<ul style="list-style-type: none"> <li>• identify further education, work conditions and opportunities.</li> </ul>	



**MODULE MEC2200: REFINISHING 1****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC2190 Surface Preparation 2**Module Description:** Students demonstrate metal surface refinishing procedures.**Module Parameters:** Access to spray equipment and related resources.**Supporting Module:** MEC2190 Surface Preparation 2**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• demonstrate safe practices and follow all warnings identified by product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety</li> <li>• identify and describe refinishing products and equipment</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• observed performance related to: <ul style="list-style-type: none"> <li>– health hazards involved in refinishing</li> <li>– warnings as outlined in WHMIS bulletins</li> <li>– following proper personal and shop safety routines.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Refinishing 1, Part 1, MEC2200–1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>• presentation of a report identifying and describing: <ul style="list-style-type: none"> <li>– paint spray systems (two)</li> <li>– paint spray techniques</li> <li>– problems created by improper techniques and equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Task Assessment Checklist: Refinishing 1, Part 2, MEC2200–1</i></p> <p><i>Standard</i> <i>Performance rating of 2 on each criteria</i></p>	<p>15</p> <p>30</p>

**MODULE MEC2200: REFINISHING 1** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>demonstrate proper refinishing application</li> <li>demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:                             <ul style="list-style-type: none"> <li>proper use of paint products (paint reducer/hardener)</li> <li>following demonstrated spray techniques</li> <li>following proper spray procedures</li> <li>proper care of spray equipment.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Refinishing 1, Part 3, MEC2200-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p> <ul style="list-style-type: none"> <li>observations of individual effort and interpersonal exploration during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>55</p> <p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>demonstrate knowledge of health hazards and environmental impacts of products used</li> <li>demonstrate use of personal protective equipment as recommended by manufacturer.</li> </ul>	<p>WHMIS; product information. MSDS Sheets available.</p> <p>Respirators; glove, coveralls.</p>
Identify/Analyze	<ul style="list-style-type: none"> <li>identify types of top coats, solvents and additives</li> <li>identify and select colour and type of paint on a given vehicle</li> <li>demonstrate knowledge of proper procedure in paint preparation.</li> <li>inspect pre-paint project and determine deficiencies</li> <li>identify basic spray gun types</li> <li>show how to troubleshoot spray gun</li> </ul>	<p>Mixing measurements; additive, solvents; agitation.</p> <p>Masking, surface preparation to acceptable standards.</p> <p>Suction feed; gravity feed; pressure pot and HVLP paint guns.</p>

**MODULE MEC2200: REFINISHING 1** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of refinishing equipment accessories</li> <li>• demonstrate knowledge of proper top coat application techniques</li> <li>• show how to troubleshoot basic application problems.</li> </ul>	<p>Size and type of air lines; air cleaning and control devices.</p> <p>Dry spray; runs, etc.</p>
Investigate/Repair	<ul style="list-style-type: none"> <li>• prepare booth for spraying</li> <li>• prepare and apply top coat</li> <li>• demonstrate knowledge of and perform cleaning of spray guns</li> <li>• perform final detailing:               <ul style="list-style-type: none"> <li>– removal of masking tape</li> <li>– check and correct surface defects</li> <li>– final cleaning and inspection.</li> </ul> </li> </ul>	<p>Cleanliness; anti-static systems.</p> <p>Polishing if required.</p>
Careers	<ul style="list-style-type: none"> <li>• identify further education, work conditions and opportunities.</li> </ul>	



**MODULE MEC2210: TOUCH-UP & FINISHING****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC2200 Refinishing 1**Module Description:** Students determine and use the appropriate materials, tools and processes for minor surface repairs.**Module Parameters:** Access to spray equipment and related resources.**Supporting Module:** MEC1160 Structures & Materials**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>practise safe handling, use and disposal of hazardous touch-up and finishing products</li> <li>identify the techniques and products required to complete a minor surface repair</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>safe handling of refinish products</li> <li>proper use of refinish tools and equipment</li> <li>following correct safety routines in disposal and clean-up of hazardous materials.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Touch-up &amp; Finishing, Part 1, MEC2210-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	15
	<ul style="list-style-type: none"> <li>given a repair problem demonstrate:               <ul style="list-style-type: none"> <li>ability to outline a spot repair procedure</li> <li>knowledge of repair procedures and products</li> <li>proper use of primers, putties and cleaners</li> <li>listing tools and equipment required for spot repair.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Touch-up &amp; Finishing, Part 2, MEC2210-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	40



**MODULE MEC2210: TOUCH-UP & FINISHING** (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Repair	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• perform a surface flaw repair of a painted panel, using sandpaper and compounds without repainting</li> <li>• prepare a panel for a spot repair and follow appropriate instructions in application of primer and paint</li> <li>• show proper procedure in the application and sanding of putties.</li> </ul>	
Career Exploration	<ul style="list-style-type: none"> <li>• identify further education and work opportunities related to touch-up and repair.</li> </ul>	Chip repair and air brush use.



**MODULE MEC2220: INTERIOR REPAIRS****Level:** Intermediate**Theme:** Suspension and Structural Systems**Prerequisite:** MEC1160 Structures & Materials**Module Description:** Students search for and use the appropriate products and techniques to maintain vehicle interior surface materials.**Module Parameters:** Access to interior materials, products, tools, equipment and related resources.**Curriculum and Assessment Standards**

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>practise safe handling, use and disposal of hazardous cleaning and repair products</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>observed performance related to:               <ul style="list-style-type: none"> <li>proper handling of volatile chemicals</li> <li>proper disposal of environmentally unfriendly chemicals</li> <li>following procedures necessary for protection of vehicle and persons.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Interior Finishes &amp; Repairs, Part 1, MEC2220-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	20
	<ul style="list-style-type: none"> <li>analyze type of repair or restoration required, and identify the techniques/products necessary to repair and/or restore an interior surface</li> </ul> <ul style="list-style-type: none"> <li>given samples of interior material:               <ul style="list-style-type: none"> <li>identify and describe usage</li> <li>describe proper care with products and procedures</li> <li>relate common stains, spots and soils to methods needed for removal.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Task Assessment Checklist: Interior Finishes &amp; Repairs, Part 2, MEC2220-1</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criteria</i></p>	35



**MODULE MEC2220: INTERIOR REPAIRS** (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify cleaners for the following materials:               <ul style="list-style-type: none"> <li>– leather</li> <li>– cloth</li> <li>– vinyl</li> <li>– rubber</li> <li>– plastic</li> <li>– polyurethane foam</li> </ul> </li> <li>• describe the correct procedures and products that can safely be used for cleaning and maintenance, including volatile cleaners, neutral soaps and specialty products</li> <li>• compile an identification of interior parts and clean the parts to like-new condition or “best as can be expected,” depending on condition. Include glass in the cleaning</li> <li>• identify and describe the nature of stains: soil, grease, oil, tar, blood, wax, chocolate and non-chocolate candy</li> <li>• identify correct procedures for removal of three of the above</li> <li>• compile a chart showing the stain-removal procedures, including special products, if required.</li> </ul>	Non-silicon products.
Inspect/Repair	<ul style="list-style-type: none"> <li>• replace the vinyl or cloth covering on a door rest</li> <li>• complete a vinyl or plastic repair of a crack or hole in an interior part and refinish</li> <li>• successfully remove and replace weather stripping in either a door glass area or door opening</li> <li>• identify signs of poor sealing by weather stripping and adjust if possible.</li> </ul>	
Career Exploration	<ul style="list-style-type: none"> <li>• identify further education and career opportunities related to interior finishes and repairs.</li> </ul>	

