

# Automotive Technology Technology

## Strand 2: Technical Knowledge and Skills

2.A	<b>Automotive Technology Specific Safety Practices</b>	
	<b>Hours of Instruction</b>	50
	<b>Equipment Needed – (Must Meet Industry Standards)</b>	
	Industry standard automotive lifting equipment, i.e., lifts and floor jacks and jack stands.	
2.A.01	<b>Identify and describe safety procedures when dealing with different types of automotive lifts according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.A.01.01	Demonstrate procedures for safe lift operations.	B, E
2.A.01.02	Demonstrate safe use, placement and storage of floor jacks and jack stands.	B, E
	<b>Performance Example:</b> Student will set up lift using manufacturer's suggested lift points.	
2.A.02	<b>Demonstrate and describe safety procedures when dealing with high pressure systems including necessary ventilation according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.A.02.01	Describe and demonstrate the importance of safety procedures to be used when servicing high pressurized systems (fuel systems, brakes, air conditioning, suspension, hydraulic systems, etc.).	B, E, A
2.A.02.02	Describe and demonstrate safe use of oxygen/acetylene torches and electric welding equipment.	B, E, A
2.A.02.03	Demonstrate ventilation procedures to be followed when working in the lab/shop area.	B, E
	<b>Performance Example:</b> Student will relieve fuel system pressure to perform necessary repairs.	
2.A.03	<b>Identify and describe safety procedures when dealing with electrical circuits according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.A.03.01	Describe safety procedures to be followed when servicing supplemental restraint systems.	B, E, A
2.A.03.02	Demonstrate safety awareness of high voltage circuits of electric or hybrid electric vehicles and related safety precautions.	B, E
	<b>Performance Example:</b> Safely disable Supplemental Restraint System (SRS) air bag for repair using manufacturer's recommendations.	
2.B	<b>Hand Tools</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b>	
	Sufficient quantities of all industry standard hand tools should be available to provide quality instruction.	

<b>2.B.01</b>	<b>Demonstrate the appropriate use of hand tools according to current industry and OSHA standards</b>	<b>SKILL LEVEL</b>
2.B.01.01	Identify and describe various types of screwdrivers.	B
2.B.01.02	Identify and describe various types of pliers.	B
2.B.01.03	Identify and describe various types of combination wrenches.	B
2.B.01.04	Identify and describe various types of sockets and drive tools.	B
2.B.01.05	Identify and describe various types of hammering tools.	B
2.B.01.06	Identify and describe various types of metal working tools.	B
2.B.01.07	Identify and describe various types of surface prep tools.	B
2.B.01.08	Identify and describe various types of holding tools.	B
	<b>Performance Example:</b> Student will select and use the appropriate hand tool for the task assigned.	
<b>2.C</b>	<b>Power Tools</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard pneumatic and electric power tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.C.01</b>	<b>Demonstrate and explain the use of electric power tools according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.C.01.01	Describe safety procedures to be followed when using corded electric tools.	B, E
2.C.01.02	Describe safety procedures to be followed when using cordless electric tools.	B, E,
	<b>Performance Example:</b> Student will drill a hole to given specification using appropriate speeds and bits for various metals.	
<b>2.C.02</b>	<b>Demonstrate and explain the use of pneumatic power tools according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.C.02.01	Identify and explain the purpose of industry standard pneumatic tools.	B, E
2.C.02.02	Describe the maintenance needs of industry standard pneumatic tools	B, E
2.C.02.03	Demonstrate and describe safety procedures to follow when using industry standard pneumatic tools.	B, E
2.C.02.04	Identify and explain the purpose of impact sockets.	B, E
	<b>Performance Example:</b> Student will remove wheel fasteners using an impact wrench, selecting appropriate size and type of socket.	
<b>2.C.03</b>	<b>Demonstrate and explain the use of electric automotive technology tools according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.C.03.01	Identify and explain the purpose of a bench grinder.	B, E
2.C.03.02	Demonstrate and describe safety procedures to follow when using a bench grinder.	B, E
2.C.03.03	Identify and explain the purpose of a drill press.	B, E
2.C.03.04	Demonstrate and describe the safety procedures to follow when using a drill press.	B, E
	<b>Performance Example:</b> Student will operate a bench grinder according to current industry safety standards.	

<b>2.D</b>	<b>Precision Measuring</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard pneumatic tools should be available for quality instruction. (I.e. ASE Educational Foundation certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.D.01</b>	<b>Describe and demonstrate the use of commonly used low precision measuring tools.</b>	<b>SKILL LEVEL</b>
2.D.01.01	Identify and demonstrate the use of inside and outside calipers.	B, E
2.D.01.02	Identify and demonstrate the use of a hole gauge.	B, E
2.D.01.03	Identify and demonstrate the use of a steel rule, measuring tape, and combination square.	B, E
<b>2.D.02</b>	<b>Describe commonly used high precision measuring tools.</b>	<b>SKILL LEVEL</b>
2.D.02.01	Identify and demonstrate the use of an outside and inside micrometer.	B, E, A
2.D.02.02	Identify and demonstrate the use of a depth micrometer.	B, E, A
2.D.02.03	Identify and demonstrate the use of a dial indicator.	B, E, A
	<b>Performance Example:</b> Student will use a variety of measuring tools to verify accurate brake rotor dimensions.	
<b>2.E</b>	<b>Fasteners</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.E.01</b>	<b>Identify and demonstrate the use of commonly used fasteners.</b>	<b>SKILL LEVEL</b>
2.E.01.01	Identify bolt head markings and bolt grading.	E, A
	<b>Performance Example:</b> Student will distinguish between SAE and metric dimensional fasteners.	
<b>2.E.02</b>	<b>Explain the concept of fastener torque.</b>	<b>SKILL LEVEL</b>
2.E.02.01	Explain how to find fastener torque specifications.	B
2.E.02.02	Explain how to use a general fastener torque chart.	B
2.E.02.03	Explain what torque sequence refers to.	B
2.E.02.04	Explain and demonstrate the basic rules to follow when using a torque wrench.	B
2.E.02.05	Explain the concept of torque yield fasteners.	B
	<b>Performance Example:</b> Student will torque wheel fasteners to manufacturer's specifications using the vehicle's specific tightening sequence.	
<b>2.F</b>	<b>Vehicle Service Information</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Access to appropriate current vehicle service information.	

<b>2.F.01</b>	<b>Access and use service information to perform step-to-step diagnosis and repair.</b>	<b>SKILL LEVEL</b>
2.F.01.01	Research applicable vehicle and service information, such as suspension, steering system operation, vehicle service history, service precautions, technical service bulletins and recalls.	B
2.F.01.02	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).	B
	<b>Performance Example:</b> Student will research the vehicle identification number (VIN) of the vehicle being serviced to obtain correct engine size.	
<b>2.G</b>	<b>Wheels and Tires</b>	
	<b>Hours of Instruction</b>	50
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.G.01</b>	<b>Perform appropriate wheel and tire inspection.</b>	<b>SKILL LEVEL</b>
2.G.01.01	Diagnose tire wear patterns and determine necessary action.	B, E
2.G.01.02	Inspect tires for sizing, tread wear and pattern. Determine necessary action. Check and adjust air pressure.	B, E
2.G.01.03	Measure wheel, tire, axle and hub run out.	B, E
2.G.01.04	Measure loaded run out and tire rigidity simultaneously using wheel balancing equipment.	B, E
	<b>Performance Example:</b> Student will inspect tire size, compare with manufacturer tire size recommendations and determine necessary action.	
<b>2.G.02</b>	<b>Perform appropriate wheel and tire mounting.</b>	<b>SKILL LEVEL</b>
2.G.02.01	Dismount/mount tire on/off wheel rim.	B, E
2.G.02.02	Remove and install a tire and wheel assembly and torque wheel fasteners.	B, E
2.G.02.03	Inspect and replace wheel studs.	B, E
2.G.02.04	Rotate tires according to the manufacturer's recommendations.	B, E
	<b>Performance Example:</b> Student will dismount and mount a tire on a wheel rim with tire pressure monitoring system (TPMS) and rotate according to manufacturer's recommendations.	
<b>2.G.03</b>	<b>Perform appropriate wheel and tire balancing.</b>	<b>SKILL LEVEL</b>
2.G.03.01	Balance wheel and tire assembly as required.	B, E
2.G.03.02	Balance a tire on wheel, measure loaded run out and tire stiffness simultaneously to determine recommended location of wheel and tire assemblies to minimize tire pull.	B, E
	<b>Performance Example:</b> Student will balance a wheel and tire assembly using different modes on a dynamic wheel balancer	
<b>2.G.04</b>	<b>Diagnose and repair tire and tire pressure monitoring systems (TPMS) components.</b>	<b>SKILL LEVEL</b>

2.G.04.01	Inspect a tire for leaks and repair a tire puncture.	B, E
2.G.04.02	Remove and replace a valve stem.	B, E
2.G.04.03	Identify tire pressure monitoring system equipped vehicles.	B, E
2.G.04.04	Identify different types (direct and indirect) of TPMS systems and components.	B, E
2.G.04.05	Set up and use tire pressure monitoring system, service, and resetting equipment.	B, E
2.H	<b>Performance Example:</b> Student will verify if there is a TPMS sensor, then dismount, mount, and balance a new tire on the rim.	
	<b>Suspension Systems</b>	
	<b>Hours of Instruction</b>	50
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
	<b>2.H.01 Inspect suspension system for noises, body sway and uneven ride height concerns.</b>	<b>SKILL LEVEL</b>
	2.H.01.01 Inspect short and long arm suspension system for noises, body sway and uneven ride height concerns.	B, E
	2.H.01.02 Inspect strut suspension systems for noises, body sway and uneven ride height concerns	B, E
	2.H.01.03 Inspect leaf spring suspension system for noises, body sway and uneven ride height concerns.	B, E
	<b>Performance Example:</b> Student will verify correct curb ride height using a tape measure and follow manufacturer's recommendations and specifications to determine necessary action.	
	<b>2.H.02 Lubricate suspension and steering systems.</b>	<b>SKILL LEVEL</b>
	2.H.02.01 Lubricate suspension and steering systems per manufacturer's recommendations.	B, E
	<b>Performance Example:</b> Student will identify and lubricate all applicable suspension components.	
	<b>2.H.03 Remove, inspect, and install suspension components.</b>	<b>SKILL LEVEL</b>
	2.H.03.01 Remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers.	B, E
	2.H.03.02 Remove, inspect, and install strut rods (compression/tension) and bushings.	B, E
	2.H.03.03 Remove, inspect, and install upper and/or lower ball joints.	B, E
	2.H.03.04 Remove, inspect, and install steering knuckle assemblies.	B, E
	2.H.03.05 Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.	B, E
	2.H.03.06 Remove, inspect, and install and adjust suspension system torsion bars; inspect mounts.	B, E
	2.H.03.07 Remove, inspect, and install stabilizer bar bushings, brackets and links.	B, E

2.H.03.08	Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers) and upper strut bearings/mounts.	B, E
2.H.03.09	Remove, inspect, and install coil springs and spring insulators.	B, E
2.H.03.10	Remove, inspect, and install transverse links, control arms, bushings, and mounts.	B, E
2.H.03.11	Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.	B, E
2.H.03.12	Inspect, remove, and replace shock absorbers.	B, E
2.H.03.13	Inspect, remove, and replace self-leveling suspension components.	B, E, A
<b>Performance Example:</b> Student will inspect suspension components for wear, replace and lubricate as necessary		
<b>2.H.04</b>	<b>Diagnose and repair wheel bearing failures and concerns.</b>	<b>SKILL LEVEL</b>
2.H.04.01	Diagnose wheel bearing noise, wheel shimmy and vibration concerns; determine necessary action.	B, E
2.H.04.02	Remove, clean, inspect, wheel bearings, seals, hub, and spindle; determine necessary action.	B, E, A
<b>Performance Example:</b> Student will remove and install a sealed wheel bearing assembly.		
<b>2.I</b>	<b>Steering Systems</b>	
<b>Hours of Instruction</b>		50
<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)		
<b>2.I.01</b>	<b>Identify and diagnose power steering concerns and perform necessary service.</b>	<b>SKILL LEVEL</b>
2.I.01.01	Identify power steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage.	B, E
2.I.01.02	Inspect power steering fluid levels and condition.	B, E
2.I.01.03	Flush, fill and bleed the power steering system.	B, E
2.I.01.04	Diagnose power steering fluid leakage; determine necessary action.	B, E
2.I.01.05	Remove, inspect, replace, and adjust the power steering pump belt.	B, E
2.I.01.06	Remove and reinstall the power steering pump.	B, E
2.I.01.07	Inspect and replace power steering hoses and fittings.	B, E
2.I.01.08	Identify and inspect electric power steering components.	E, A
<b>Performance Example:</b> Student will inspect steering system to locate source of binding.		
<b>2.I.02</b>	<b>Identify and diagnose mechanical steering concerns and perform necessary service.</b>	<b>SKILL LEVEL</b>
2.I.02.01	Remove and replace manual or power steering gear; inspect mounting bushings and brackets.	B, E
2.I.02.02	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends and bellows boot.	B, E
2.I.02.03	Inspect and replace pitman arm, center link/intermediate rod, idler arm, mountings, and steering linkage dampener.	B, E
2.I.02.04	Inspect, replace, and adjust the tie rod ends, tie rod sleeves and clamps on a linkage type steering system.	B, E



	<b>Performance Example:</b> Student will inspect steering system for wear and identify faulty component.	
<b>2.I.03</b>	<b>Identify and interpret steering column concerns and perform necessary service.</b>	<b>SKILL LEVEL</b>
2.I.03.01	Disable and enable supplemental restraint system (SRS).	E, A
2.I.03.02	Remove and replace the steering wheel; align supplemental restraint system (SRS) coil (clock spring).	E, A
2.I.02.03	Identify steering column noises, excessive play and binding concerns (including tilt mechanism).	B, E, A
	<b>Performance Example:</b> Student will disable and enable supplemental restraint system (SRS) according to manufacturer's specification.	
<b>2.J</b>	<b>Wheel Alignment</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Wheel alignment equipment capable of performing the following framework competencies.	
<b>2.J.01</b>	<b>Perform appropriate pre-alignment inspections.</b>	<b>SKILL LEVEL</b>
2.J.01.01	Differentiate between steering and suspension concerns using principles of steering geometry (caster, camber, toe, etc.).	B, E
2.J.01.02	Inspect vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer and steering return concerns.	B, E
	<b>Performance Example:</b> Student will perform a pre-alignment inspection using a check list from either the vehicle manufacturer or the equipment manufacturer.	
<b>2.J.02</b>	<b>Perform four- wheel alignment to manufacturer's specifications.</b>	<b>SKILL LEVEL</b>
2.J.02.01	Measure and adjust caster.	B, E
2.J.02.02	Measure and adjust front and rear wheel camber.	B, E
2.J.02.03	Measure and adjust front and rear wheel toe.	B, E
2.J.02.04	Check steering wheel centering.	B, E
2.J.02.05	Check and measure toe-out-on-turns (turning radius), determine necessary action.	B, E, A
2.J.02.06	Check and measure steering axis inclination (SAI) and included angle, determine necessary action.	B, E, A
2.J.02.07	Check and measure rear wheel thrust angle, determine necessary action.	B, E, A
2.J.02.08	Check and measure front wheel set back, determine necessary action.	B, E, A
2.J.02.09	Perform post alignment calibration procedures according to manufacturer's specifications.	B, E, A
	<b>Performance Example:</b> Student will attach alignment measuring equipment and measure caster, camber, and toe.	
<b>2.K</b>	<b>Automotive Basic Maintenance</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Equipment Needed: Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational	

	Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B), maintenance light reset equipment.	
<b>2.K.01</b>	<b>Perform appropriate basic maintenance service skills.</b>	<b>SKILL LEVEL</b>
2.K.01.01	Perform oil/filter change, reset maintenance reminder light where applicable.	B, E
2.K.01.02	Inspect all fluids and determine necessary action.	B, E
2.K.01.03	Inspect air and cabin filters; determine necessary action.	B, E
2.K.01.04	Replace a serviceable fuel filter.	B, E
2.K.01.05	Inspect exhaust system and undercarriage; determine necessary action.	B, E
2.K.01.06	Inspect transmission/transaxle, front and rear differential fluids; determine necessary action.	B, E
2.K.01.07	Inspect automotive drive belts and cooling system hoses; determine necessary action.	B, E
2.K.01.08	Lubricate suspension and steering systems per manufacturer's recommendations.	B, E
	<b>Performance Example:</b> Student will perform a multi-point inspection to include an oil and filter change, as well as an undercarriage inspection.	
<b>2.L</b>	<b>Heating, Ventilation and Air Conditioning (HVAC)</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.L.01</b>	<b>Describe and perform appropriate automotive refrigerant handling according to current industry standards.</b>	<b>SKILL LEVEL</b>
2.L.01.01	Follow EPA regulations for refrigerant handling.	E, A
2.L.01.02	Identify refrigerant.	E, A
2.L.01.03	Recover, evacuate, and recharge refrigerant.	E, A
2.L.01.04	Recycle, label and store refrigerant.	E, A
	<b>Performance Example:</b> Student will identify the refrigerant type in a vehicle using service information.	
<b>2.L.02</b>	<b>Describe HVAC operation and general repair.</b>	<b>SKILL LEVEL</b>
2.L.02.01	Research applicable vehicle service information, vehicle service history, service precautions, and technical service bulletins.	B, E
2.L.02.02	Follow EPA regulations for refrigerant handling.	B, E
2.L.02.03	Identify heating, ventilation, and air conditioning (HVAC) components and configuration.	B, E
2.L.02.04	Identify and interpret HVAC issues, determine necessary action.	B, E
	<b>Performance Example:</b> Conduct performance A/C system testing; identify problems.	
<b>2.M</b>	<b>Brake System Research and Service</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b>	



	Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Access to appropriate current service vehicle information	
<b>2.M.01</b>	<b>Research brake system concerns and vehicle information.</b>	<b>SKILL LEVEL</b>
2.M.01.01	Identify and interpret brake system concern; determine necessary action.	B, E
2.M.01.02	Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions and technical service bulletins.	B, E
2.M.01.03	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.	E, A
	<b>Performance Example:</b> Student uses automotive information system to research applicable brake-related technical service bulletins and report findings.	
<b>2.N</b>	<b>Hydraulic Brake Systems</b>	
	<b>Hours of Instruction</b>	40
	Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.N.01</b>	<b>Diagnose and identify pressure concerns in the brake system using hydraulic principles (Pascal's Law).</b>	<b>SKILL LEVEL</b>
2.N.01.01	Measure brake pedal height; determine necessary action.	B, E
2.N.01.02	Check master cylinder for internal and external leaks and proper operations; determine necessary action.	B, E
2.N.01.03	Remove, bench bleed, and reinstall master cylinder.	B, E
2.N.01.04	Identify poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.	E, A
2.N.01.05	Inspect brake lines, flexible hoses and fittings for leaks, dents, kinks, rust cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.	B, E
	<b>Performance Example:</b> Student measures brake pedal height using a tape measure and compare the measurement to specifications.	
<b>2.N.02</b>	<b>Perform appropriate maintenance and repair of hydraulic brake systems</b>	<b>SKILL LEVEL</b>
2.N.02.01	Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings and supports, as needed.	B, E, A
2.N.02.02	Identify, handle, store, and fill brake fluids to proper level.	B, E
2.N.02.03	Inspect, test and/or replace components of brake warning light system.	E, A
2.N.02.04	Bleed (Gravity, manual, pressure, vacuum) brake system.	B, E
2.N.02.05	Flush and fill hydraulic braking system.	B, E
	<b>Performance Example:</b> Student selects the DOT rated brake fluid for the vehicle being serviced according to the vehicle manufacturer's recommendations.	
<b>2.0</b>	<b>Drum Brake Systems</b>	
	<b>Hours of Instruction</b>	50

<b>Equipment Needed</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)		
<b>2.0.01</b>	<b>Remove and inspect brake drums; determine necessary action.</b>	<b>SKILL LEVEL</b> B, E
2.0.01.01	Remove and inspect brake drums; determine necessary action.	B, E
2.0.01.02	Refinish brake drum.	B, E, A
<b>Performance Example:</b> Student de-adjusts, removes, and installs a brake drum, re-adjust as necessary.		
<b>2.0.02</b>	<b>Remove and inspect brake shoes and drum brake components; determine necessary action.</b>	<b>SKILL LEVEL</b> B, E
2.0.02.01	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware and backing support plates; lubricate and reassemble.	B, E
2.0.02.02	Remove, inspect, and install wheel cylinders.	B, E
2.0.02.03	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.	B, E
2.0.02.04	Install wheel, torque wheel fasteners, and make final checks and adjustments.,	B, E
<b>Performance Example:</b> Student removes and installs brake shoes.		
<b>2.P</b>	<b>Disc Brake Systems</b>	
<b>Hours of Instruction</b>		75
<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)		
<b>2.P.01</b>	<b>Remove and inspect brake caliper assembly; determine necessary action.</b>	<b>SKILL LEVEL</b> B, E
2.P.01.01	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.	B, E
2.P.01.02	Clean and inspect caliper mounting, slides, and pins for wear and damage; determine necessary action.	B, E
2.P.01.03	Remove, clean and inspect pads and retaining hardware; measure brake pad thickness, compare to manufacturer's specifications, determine necessary action.	B, E
2.P.01.04	Retract caliper piston on vehicles equipped with an integrated parking brake system.	B, E
2.P.01.05	Reassemble, lubricate and reinstall caliper, pads and related hardware; seat pads and inspect for leaks.	B, E
2.P.01.06	Install wheel, torque wheel fasteners and make final checks and adjustments.	B, E
<b>Performance Example:</b> Student removes the brake calipers and checks the caliper slides/pins for proper operation.		

<b>2.P.02</b>	<b>Remove and inspect brake rotors; determine necessary action.</b>	<b>SKILL LEVEL</b> B, E
2.P.02.01	Inspect and measure rotor with a dial indicator and a micrometer and compare readings to manufacturer's specifications; determine necessary action.	
2.P.02.02	Remove and refinish rotor according to manufacturer's recommendations.	B, E
2.P.02.03	Prep hub mating service and reinstall brake rotor.	B, E
	<b>Performance Example:</b> Student removes the brake rotor and using a high precision measuring device measures the rotors brake surface in several locations comparing to factory specifications.	
<b>2.Q</b>	<b>Power Brake Systems</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.Q.01</b>	<b>Identify and describe the operation of a vacuum brake assist unit.</b>	<b>SKILL LEVEL</b> B, E
2.Q.01.01	Test pedal free travel with and without engine running; check power assist operation.	
2.Q.01.02	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	B, E
2.Q.01.03	Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.	B, E
	<b>Performance Example:</b> Student will perform a test of the brake booster check valve and verify operation according to manufacturer's specifications.	
<b>2.Q.02</b>	<b>Identify and describe the operation of a brake hydraulic assist unit.</b>	<b>SKILL LEVEL</b> B, E
2.Q.02.01	Test pedal free travel with and without engine running; check power assist operation.	
2.Q.02.02	Inspect and test hydro-boost system and accumulator for leaks and proper operation; determine necessary action.	B, E
	<b>Performance Example:</b> Student will be able to identify hydraulic assist brake components.	
<b>2.R</b>	<b>Parking Brake Components and Systems</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.R.01</b>	<b>Diagnose and repair parking brake failures and concerns.</b>	<b>SKILL LEVEL</b> B, E
2.R.01.01	Check parking brake operation; determine necessary action.	
2.R.01.02	Check parking brake cables and components for wear, rusting, binding and corrosion; clean, lubricate or replace as needed.	B, E

	<b>Performance Example:</b> Student will apply and release parking brake and determine if cables are moving freely.	
<b>2.R.02</b>	<b>Diagnose and repair electrical brake circuit failures and concerns.</b>	<b>SKILL LEVEL</b>
2.R.02.01	Identify and check operation of parking brake indicator light system and perform repairs as needed.	B, E
2.R.02.02	Identify and check operation of electric parking brake system and perform repairs as needed.	B, E
	<b>Performance Example:</b> Student will apply parking brake and check operation of brake warning lamp.	
<b>2.S</b>	<b>Antilock Brake System</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B), SCAN TOOL FOR AUTOMOTIVE PROGRAM, Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States., Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.S.01</b>	<b>Identify, inspect, and diagnose antilock brake system (ABS) components.</b>	<b>SKILL LEVEL</b>
2.S.01.01	Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment.	E, A
2.S.01.02	Diagnose and repair wheel speed sensors using scan tool.	E, A
	<b>Performance Example:</b> Student will use the appropriate scan tool to retrieve possible ABS trouble codes.	
<b>2.S.02</b>	<b>Service antilock brake system high pressure hydraulic system to manufacturer's specifications.</b>	<b>SKILL LEVEL</b>
2.S.02.01	Depressurize high-pressure components of the antilock brake systems (ABS).	E, A
2.S.02.02	Bleed the antilock brake system (ABS) front and rear hydraulic circuits.	E, A
	<b>Performance Example:</b> Student will bleed an ABS system according to the manufacturer's recommendation.	
<b>2.T</b>	<b>General Electrical Systems</b>	
	<b>Hours of Instruction</b>	60
	<b>Equipment Needed – (Must Meet Industry Standards)</b>	

	Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
<b>2.T.01</b>	<b>Research and identify electrical system concern; determine necessary action.</b>	<b>SKILL LEVEL</b>
2.T.01.01	Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions and technical service bulletins.	B, E
2.T.01.02	Identify electrical integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).	B, E, A
2.T.01.03	Use wiring diagrams during diagnosis of electrical circuit problems.	B, E, A
	<b>Performance Example:</b> Student will research and report applicable service information to obtain correct wiring diagram.	
<b>2.T.02</b>	<b>Research and identify electrical system concern; determine necessary action.</b>	<b>SKILL LEVEL</b>
2.T.02.01	Check electrical circuits with a test light; determine necessary action.	B, E, A
2.T.02.02	Measure source voltage and perform voltage drop tests in electrical circuits using the voltmeter scale on a digital multimeter (DMM); determine necessary action.	B, E, A
2.T.02.03	Measure current flow in electrical circuits and components using the ammeter scale on a DMM; determine necessary action.	B, E, A
2.T.02.04	Check continuity and measure resistance in electrical circuits and components using an ohmmeter scale on a DMM; determine necessary action.	B, E, A
2.T.02.05	Check electrical circuits using fused jumper wires; determine necessary action.	B, E, A
2.T.02.06	Locate shorts, grounds, opens and resistance problems in electrical; determine necessary action.	B, E, A
	<b>Performance Example:</b> Student will measure circuit source voltage using a DMM.	
<b>2.T.03</b>	<b>Repair common electrical circuits.</b>	<b>SKILL LEVEL</b>
2.T.03.01	Inspect and test fusible links, circuit breakers and fuses; wiring, harnesses, and connectors, determine necessary action.	B, E, A
2.T.03.02	Perform solder repair of electrical wiring.	B, E, A
2.T.03.03	Inspect and test switches, connectors, relays, devices and wires of electrical circuits; perform necessary action.	B, E, A
	<b>Performance Example:</b> Student will repair a wire choosing the appropriate solder type and wire gauge necessary for the repair.	
<b>2.U</b>	<b>Automotive Batteries</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) SCAN TOOL FOR AUTOMOTIVE PROGRAM, Diagnostic scan tool capable of bi-directional interfacing and programmable	

	capabilities on CAN and ISO communication networks with all makes and models sold in the United States., Capability of communicating with all vehicle systems (i.e. ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.U.01</b>	<b>Identify, maintain and service the various types of commonly used automotive batteries.</b>	<b>SKILL LEVEL</b>
2.U.01.01	Perform battery state-of-charge test; determine necessary action.	B, E
2.U.01.02	Measure and identify the possible cause(s) of excessive key-off battery drain (parasitic draw).	B, E
2.U.01.03	Maintain or restore electronic memory functions.	B, E
2.U.01.04	Inspect, clean, fill and repair/replace battery, battery cables, connectors, clamps and hold downs.	B, E
2.U.01.05	Identify battery type, perform applicable battery charge procedures.	B, E
2.U.01.06	Start a vehicle using jumper cables or auxiliary power supply.	B, E
	<b>Performance Example:</b> Student will determine cold cranking amps of battery and perform a battery load capacity test.	
<b>2.V</b>	<b>Automotive Starting System</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.V.01</b>	<b>Diagnose and repair starting systems.</b>	<b>SKILL LEVEL</b>
2.V.01.01	Perform starter current draw tests; determine necessary action.	B, E
2.V.01.02	Perform starter circuit voltage drop tests; determine necessary action.	B, E
2.V.01.03	Inspect and test starter relays and solenoids; determine necessary action.	B, E
2.V.01.04	Remove and install starter in a vehicle.	B, E, A
2.V.01.05	Inspect fly wheel and ring gear for wear and cracks.	B, E
2.V.01.06	Inspect and test switches, connectors and wires of starter control circuits; perform necessary action.	B, A
2.V.01.07	Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.	B, E, A



2.V.01.08	Demonstrate knowledge of an automatic start-stop system.	B, E
2.W	<b>Performance Example:</b> Student will test and replace starter in a vehicle.	
	<b>Automotive Charging System</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
	<b>2.W.01 Diagnose and repair charging systems.</b>	<b>SKILL LEVEL</b>
2.W.01.01	Perform charging system output test; determine necessary action.	B, E
2.W.01.02	Diagnose charging system for the cause of undercharge, no-charge and overcharge conditions.	B, E
2.W.01.03	Inspect, adjust, or replace generator (alternator) drive belts, pulleys and tensioners; check pulley and belt alignment.	B, E
2.W.01.04	Remove, inspect, and install generator (alternator).	B, E, A
2.W.01.05	Perform charging circuit voltage drop tests; determine necessary action.	B, E, A
2.X	<b>Performance Example:</b> Student will perform various charging system tests to determine the cause of low alternator output.	
	<b>Electrical Accessories</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
	<b>2.X.01 Diagnose and repair lighting systems.</b>	<b>SKILL LEVEL</b>

2.X.01.01	Inspect, replace, and aim headlights and bulbs.	B, E, A
2.X.01.02	Identify system voltage and safety precautions associated with high intensity discharge headlights.	B, E, A
2.X.01.03	Inspect, diagnose, and repair all exterior lamps (i.e., headlight, brake, turn, or signal, reverse, fogs, etc.); perform necessary action.	B, E
	<b>Performance Example:</b> Student will replace a faulty headlight bulb and check for proper headlight aim.	
<b>2.X.02</b>	<b>Diagnose and repair gauges, warning devices and driver information systems.</b>	<b>SKILL LEVEL</b>
2.X.02.01	Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.	B, E, A
2.X.02.02	Inspect and test sensors, connectors, and wires of electronic instrument circuits; determine necessary action.	B, E, A
	<b>Performance Example:</b> Student will test oil pressure gauge circuit and determine cause of failure.	
<b>2.X.03</b>	<b>Diagnose and repair horn and wiper/washer systems.</b>	<b>SKILL LEVEL</b>
2.X.03.01	Diagnose incorrect horn operation; perform necessary action.	B, E, A
2.X.03.02	Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.	B, E, A
2.X.03.03	Diagnose incorrect washer operation; perform necessary action.	B, E, A
	<b>Performance Example:</b> Student will replace horn assembly and recheck for proper operation.	
<b>2.X.04</b>	<b>Diagnose and repair accessories.</b>	<b>SKILL LEVEL</b>
2.X.04.01	Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.	B, E, A
2.X.04.02	Diagnose incorrect heated glass operation; determine necessary action.	B, E, A
2.X.04.03	Diagnose incorrect electric lock operation; determine necessary action.	B, E, A
2.X.04.04	Diagnose incorrect operation of cruise control systems; determine necessary action.	E, A
2.X.04.05	Activate bi-directional controls when applicable using a scan tool.	E, A
2.X.04.06	Describe the operation of keyless entry/remote-start systems.	B, E
	<b>Performance Example:</b> Student will remove and replace a window motor and confirm operation according to manufacturer's specifications.	
<b>2.Y</b>	<b>Basic Hybrid/Electric Vehicle (EV) Theory</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock	

	brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.Y.01</b>	<b>Identify and describe hybrid/EV electrical circuits.</b>	<b>SKILL LEVEL</b>
2.Y.01.01	Identify and describe high-voltage circuits of hybrid/EV vehicle and related safety precautions	B, E, A
2.Y.01.02	Identify and describe hybrid/EV vehicle auxiliary (12v) battery service, repair, and test procedures.	B, E, A
2.Y.01.03	Describe the operation of a regenerative braking system.	E, A
2.Y.01.04	Identify and describe hybrid/EV vehicle power steering system electrical circuits and safety precautions.	E, A
2.Y.01.05	Describe hybrid vehicle internal combustion engine service precautions.	B, E
	<b>Performance Example:</b> Student uses service information to determine the location of the (12v) battery.	E, A
<b>2.Z</b>	<b>General Engine Problems</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.Z.01</b>	<b>Identify, test and repair leaks, abnormal sounds and odors commonly associated with engine malfunctions.</b>	<b>SKILL LEVEL</b>
2.Z.01.01	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	B, E
2.Z.01.02	Identify abnormal engine noise or vibration concerns; determine necessary action.	B, E
2.Z.01.03	Identify abnormal exhaust color, odor, and sound; determine necessary action.	B, E
2.Z.01.04	Perform oil pressure tests; determine necessary action.	B, E, A, A+
	<b>Performance Example:</b> Student will remove and replace a valve cover gasket to repair an engine oil leak.	
<b>2.Z.02</b>	<b>Perform general engine diagnostic procedures.</b>	<b>SKILL LEVEL</b>

2.Z.02.01	Interpret engine performance concern; determine necessary action.	E, A
2.Z.02.02	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	B, E
2.Z.02.03	Inspect and test mechanical and electrical fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	B, E
2.Z.02.04	Inspect the integrity and test the catalytic converter and heat shield(s); perform necessary action.	B, E
2.Z.02.05	Verify accurate camshaft timing.	B, E, A
2.Z.02.06	Perform cylinder power balance test; determine necessary action.	B, E
2.Z.02.07	Perform cylinder compression tests; determine necessary action.	B, E
2.Z.02.08	Perform cylinder leakage test; determine necessary action.	B, E
2.Z.02.09	Identify engine mechanical, electrical, fuel and ignition concerns with engine diagnostic equipment.	B, E, A
2.Z.02.10	Retrieve and record stored On Board Diagnostics II (OBD II) diagnostic trouble codes; clear codes.	B, E
	<b>Performance Example:</b> Student will perform a fuel pressure test and determine necessary action.	
<b>2.Z.03</b>	<b>Inspect, diagnose, and repair cooling system concerns.</b>	<b>SKILL LEVEL</b>
2.Z.03.01	Verify engine operating temperature; determine necessary action.	B, E
2.Z.03.02	Remove and replace thermostat, radiator, and water pump.	B, E, A
2.Z.03.03	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank and hoses; perform necessary action.	B, E
2.Z.03.04	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams and fan control devices; perform necessary action.	B, E
2.Z.03.05	Identify causes of engine overheating.	B, E, A, A+
2.Z.03.06	Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	E, A, A+
2.Z.03.07	Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	B, E, A, A+
	<b>Performance Example:</b> Student will pressurize a cooling system to locate the source of a leak.	
<b>2.Z.04</b>	<b>Forced induction systems.</b>	<b>SKILL LEVEL</b>
2.Z.04.01	Research applicable vehicle service information, vehicle service history, service precautions, and technical service bulletins.	E, A
2.Z.04.02	Identify components and configuration of forced air induction system.	E, A
	<b>Performance Example:</b> Verify proper operation of forced induction system.	
<b>2.AA</b>	<b>Ignition Systems</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B)	
	Diagnostic scan tool capable of bi-directional interfacing and	

	programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.AA.01</b>	<b>Diagnose and repair engine performance concerns relative to the ignition primary circuit.</b> <b>Hours of Instruction</b>	<b>SKILL LEVEL</b>
2.AA.01.01	Inspect and test ignition primary circuit wiring and components; perform necessary action.	B, E, A
2.AA.01.02	Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action.	B, E, A
2.AA.01.03	Inspect, and test ignition coil(s); perform necessary action.	B, E
2.AA.01.04	Inspect, diagnose, and replace spark plugs).	B, E
2.AA.01.05	Identify ignition system related problems such as no-starting engine misfire, spark knock, power loss, concerns on vehicles with electronic ignition (i.e., distributor less and distributor) systems.	B, E, A
	<b>Performance Example:</b> Student will test for input voltage at ignition coil.	
<b>2.AA.02</b>	<b>Diagnose and repair engine performance concerns relative to the ignition secondary circuit.</b>	<b>SKILL LEVEL</b>
2.AA.02.01	Inspect and test ignition system secondary circuit wiring and components; perform necessary action.	B, E
	<b>Performance Example:</b> Student will use a spark tester to determine secondary voltage output.	
<b>2.BB</b>	<b>Emissions Control Systems</b>	
	<b>Hours of Instruction</b>	40
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.BB.01</b>	<b>Identify and diagnose common causes of positive crankcase ventilation and evaporative emissions system concerns.</b>	<b>SKILL LEVEL</b>
2.BB.01.01	Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	B, E

2.BB.01.02	Diagnose test and repair components and hoses of evaporative emissions control system; perform necessary action.	B, E
	<b>Performance Example:</b> Student will perform a leak test on evaporative emission system.	
<b>2.BB.02</b>	<b>Identify and diagnose common causes of catalytic converter, secondary air and exhaust gas recirculation system concerns.</b>	<b>SKILL LEVEL</b>
2.BB.02.01	Inspect and test catalytic converter performance.	B, E, A
2.BB.02.02	Diagnose, test, and repair components of secondary air injection systems; perform necessary action.	B, E, A
2.BB.02.03	Identify emission and drivability problems caused by malfunctions in the exhaust gas recirculation (EGR) system.	B, E, A
2.BB.02.04	Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.	B, E, A
	<b>Performance Example:</b> Student will perform catalytic converter efficiency test.	
<b>2.BB.03</b>	<b>Drive Train.</b>	<b>SKILL LEVEL</b>
2.BB.03.01	Inspect, remove, and replace constant velocity (CV) axles	B, E
2.BB.03.02	Inspect, remove, or replace power train mounts.	B, E
2.BB.03.03	Diagnose universal joint noise and vibration concerns; perform necessary action.	B, E
2.BB.03.04	Inspect fly wheel and ring gear for wear and cracks.	B, E
2.BB.03.05	Inspect and lubricate shift linkage bushings.	B, E
2.BB.03.06	Clean and inspect differential housing vents.	B, E
	<b>Performance Example:</b> Student will inspect for torn or damage CV boot.	
<b>2.CC</b>	<b>Demonstrate appropriate engine repair techniques. (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.CC.01</b>	<b>Perform appropriate cylinder head repair.</b>	<b>SKILL LEVEL</b>
2.CC.01.01	Diagnose, remove, and replace cylinder head(s).	A+
2.CC.01.02	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition; determine necessary action.	A+



<b>2.CC.02</b>	<b>Demonstrate appropriate valve, valve train, and camshafts service techniques.</b>	<b>SKILL LEVEL</b>
2.CC.02.01	Identify overhead cam, dual overhead cam, and overhead valve engines.	A+
2.CC.02.02	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action	A+
2.CC.02.03	Check drive gear wear and backlash, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.	A+
2.CC.02.04	Inspect and replace camshaft and drive belt/chain.	A+
2.CC.02.05	Establish camshaft position sensor indexing.	A+
<b>2.CC.03</b>	<b>Identify, assess, and repair cylinder block and internal components.</b>	<b>SKILL LEVEL</b>
2.CC.03.01	Identify block cylinder arrangement.	A+
2.CC.03.02	Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).	A+
2.CC.03.03	Measure crankshaft end play, compare to specification; determine necessary action.	A+
<b>2.CC.04</b>	<b>Engine Lubrication</b>	
2.CC.04.01	Inspect auxiliary coolers; determine necessary action.	A+
2.CC.04.02	Inspect, test, and replace oil temperature and pressure switches and sensors.	A+
<b>2.DD</b>	<b>Automatic Transmission/Transaxle (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B) Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e. ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.DD.01</b>	<b>Demonstrate appropriate vehicle service techniques. (A+)</b>	<b>SKILL LEVEL</b>
2.DD.01.01	Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.	A+
2.DD.01.02	Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins.	A+
2.DD.01.03	Diagnose fluid loss condition concerns; determine necessary action.	A+
2.DD.01.04	Check fluid level in a transmission or a transaxle not equipped with a dipstick.	A+

2.DD.01.05	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.	A+
2.DD.01.06	Diagnose noise and vibration concerns; determine necessary action	A+
2.DD.01.07	Perform stall test; determine necessary action.	A+
2.DD.01.08	Perform lock-up converter system tests; determine necessary action.	A+
2.DD.01.09	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	A+
2.DD.01.10	Diagnose electronic transmission/transaxle control systems using appropriate test.	A+
2.DD.01.11	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	A+
2.DD.01.12	Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.	A+
2.DD.01.13	Inspect for leakage; replace external seals, gaskets, and bushings.	A+
2.DD.01.14	Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.	A+
<b>2.DD.02</b>	<b>Demonstrate appropriate out of vehicle service techniques.</b>	<b>SKILL LEVEL</b>
2.DD.02.01	Remove and reinstall transmissions/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.	A+
2.DD.02.02	Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.	A+
2.DD.02.03	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot.	A+
2.DD.02.04	Describe the operational characteristics of a continuously variable transmission (CVT).	A+
<b>2.EE</b>	<b>Manual Transmission and Drivetrain (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B).	
<b>2.EE.01</b>	<b>Demonstrate appropriate hub, joint, shaft, and yolk techniques.</b>	<b>SKILL LEVEL</b>
2.EE.01.01	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.	A+
2.EE.01.02	Diagnose universal joint noise and vibration concerns; perform necessary action.	A+
2.EE.01.03	Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.	A+
2.EE.01.04	Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	A+
2.EE.01.05	Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	A+
		<b>SKILL LEVEL</b>

<b>2.EE.02</b>	<b>Demonstrate appropriate differential repair and service techniques</b>	
2.EE.02.01	Clean and inspect differential housing; check for leaks; inspect housing vent.	A+
2.EE.02.02	Diagnose noise and vibration concerns; determine necessary action.	A+
2.EE.02.03	Inspect and replace companion flange and pinion seal; measure companion flange run out.	A+
<b>2.FF</b>	<b>Drive Axles (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.FF.01</b>	<b>Perform appropriate axle shaft service techniques.</b>	<b>SKILL LEVEL</b>
2.FF.01.01	Remove and replace drive axle shafts	A+
2.FF.01.02	Inspect and replace drive axle shaft seals, bearings, and retainers.	A+
2.FF.01.03	Measure drive axle flange runout and shaft end play; determine necessary action.	A+
2.FF.01.04	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.	A+
<b>2.GG</b>	<b>Four Wheel Drive (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.GG.01</b>	<b>Inspect, adjust, and repair transfer cases and locking hubs.</b>	<b>SKILL LEVEL</b>

2.GG.01.01	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	A+
2.GG.01.02	Inspect locking hubs; perform necessary action(s).	A+
2.GG.01.03	Check for leaks at drive assembly seals; check vents; check lube level.	A+
2.GG.01.04	Identify concerns related to variations in tire circumference and/or final drive ratios.	A+
2.GG.01.05	Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.	A+
<b>2.HH</b>	<b>Manual Transmissions/Transaxle and Clutch Assembly (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.HH.01</b>	<b>Assess and repair manual transmissions/transaxles.</b>	<b>SKILL LEVEL</b>
2.HH.01.01	Identify and interpret manual drive train concerns; determine necessary action.	A+
2.HH.01.02	Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	A+
2.HH.01.03	Inspect, remove or replace manual transmission/transaxle.	A+
2.HH.01.04	Describe the operational characteristics of an electronically controlled manual transmission/transaxle.	A+
2.HH.01.05	Diagnose noise concerns through the application of transmission/transaxle power flow principles.	A+
2.HH.01.06	Diagnose hard shifting and jumping out of gear concerns; determine necessary action.	A+
2.HH.01.07	Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.	A+
<b>2.HH.02</b>	<b>Inspect, diagnose, and repair clutch assembly.</b>	<b>SKILL LEVEL</b>
2.HH.02.01	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.	A+
2.HH.02.02	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.	A+
2.HH.02.03	Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing.	A+
2.HH.02.04	Bleed clutch hydraulic system.	A+
2.HH.02.05	Check and adjust clutch master cylinder fluid level; check for leaks.	A+

2.HH.02.06	Measure flywheel run-out and crankshaft end play; determine necessary action.	A+
<b>2.II</b>	<b>Heating and Air Conditioning (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.II.01</b>	<b>Heating System.</b>	<b>SKILL LEVEL</b>
2.II.01.01	Inspect and test heater control valve(s); perform necessary action.	A+
2.II.01.02	Inspect heater blend door for proper operation.	A+
<b>2.II.02</b>	<b>Inspect, diagnose, and repair air conditioning systems.</b>	<b>SKILL LEVEL</b>
2.II.02.01	Identify abnormal operating noises in the A/C system; determine necessary action.	A+
2.II.02.02	Select and connect gauge set; record temperature and pressure readings according to current industry standards.	A+
2.II.02.03	Leak test A/C system; determine necessary action.	A+
2.II.02.04	Inspect condition of refrigerant oil removed from A/C system; determine necessary action.	A+
2.II.02.05	Identify the source of A/C system odors.	A+
<b>2.II.03</b>	<b>Inspect, diagnose, and repair heating and air conditioning controls.</b>	<b>SKILL LEVEL</b>
2.II.03.01	Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.	A+
2.II.03.02	Diagnose A/C compressor clutch control systems; determine necessary action.	A+
2.II.03.03	Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.	A+
2.II.03.04	Inspect and test A/C-heater control panel assembly; determine necessary action.	A+
2.II.03.05	Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.	A+
2.II.03.06	Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.	A+
2.II.03.07	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.	A+

2.II.03.08	Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.	A+
<b>2.JJ</b>	<b>Engine Performance (A+)</b>	
	<b>Hours of Instruction</b>	
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.	
<b>2.JJ.01</b>	<b>Inspect, diagnose and repair performance issues with no Diagnostic Trouble Codes (DTC)</b>	<b>SKILL LEVEL</b>
2.JJ.01.01	Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles.	A+
2.JJ.01.02	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	A+
2.JJ.01.03	Perform exhaust system back-pressure test; determine necessary action.	A+
<b>2.JJ.02</b>	<b>Inspect, diagnose and repair performance issues with Diagnostic Trouble Codes (DTC)</b>	<b>SKILL LEVEL</b>
2.JJ.02.01	Check for module communication errors using a scan tool	A+
2.JJ.02.02	Obtain and interpret scan tool data., stalling, poor mileage, dieseling, and emissions problems on vehicles.	A+
2.JJ.02.03	Diagnose the causes of emissions or drivability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.	A+
<b>2.KK</b>	<b>New/Emerging Technologies (A+)</b>	
	<b>Hours of Instruction</b>	25
	<b>Equipment Needed – (Must Meet Industry Standards)</b> Sufficient quantities of industry standard tools should be available for quality instruction. (i.e., ASE Educational Foundation Certification tools) (See Automotive Service Excellence Education Foundation Appendix B). Diagnostic scan tool capable of bi-directional interfacing and programmable capabilities on CAN and ISO communication networks with all makes and models sold in the United States. Capability of communicating with all vehicle systems (i.e., ABS/TC (antilock brake/traction control, ECM (engine control module), TCM (transmission control module), BCM (body control module), RDCM (rear differential control module), TCCM (Transfer Case Control	



Module), CCM (Climate Control Module), Entertainment systems (Audio, Bluetooth, etc.), SODM (side object detection module, lane departure) other unstated vehicle specific systems.

**2.KK.01 Identify driver assist technology systems. (A+)**

- 2.KK.01.01 Identify and describe autonomous systems.
- 2.KK.01.02 Identify and describe adaptive cruise control.
- 2.KK.01.03 Identify and describe lane departure systems.
- 2.KK.01.04 Identify and describe blind spot monitoring systems.
- 2.KK.01.05 Identify and describe autonomous braking systems.
- 2.KK.01.06 Identify and describe parking aid systems.
- 2.KK.01.07 Identify and describe adaptive lighting systems.
- 2.KK.01.08 Identify and describe in-vehicle Wi-Fi systems.

**SKILL  
LEVEL**

A+  
A+  
A+  
A+  
A+  
A+  
A+  
A+

DRAFT