

HS.AUT. Automotive Mechanics

Essential Discipline Goals

- Develop and apply the technical competency and related academic skills that allow for economic independence and career satisfaction.
- Acquire the essential learnings and values that foster continued education throughout life.
- Demonstrate the ability to communicate, solve problems, work individually and in groups, and apply information effectively.
- Develop technological literacy and the ability to adapt to future change.

Standards

Indicators

HS.AUT.10 Perform shop procedures according to industry standards

- HS.AUT.10.101 Comply with personal and environmental safety practices associated with clothing eye protection; hand tools; power e Equipment; proper ventilation *and* the handling, storage and disposal of chemicals/materials-in accordance with local, state, and federal safety mid environmental regulations.
- HS.AUT.10.102 Raise, support, and lower vehicles
- HS.AUT.10.103 Identify vehicle types.
- HS.AUT.10.104 Identify and understand vehicle systems and their functions.
- HS.AUT.10.105 Research applicable vehicle and service information, such as system operation, vehicle service history, service precautions, and technical service bulletins.
- HS.AUT.10.106 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).

HS.AUT.20 Suspension and Steering Systems

- HS.AUT.20.131 Lubricate suspension and steering systems
- HS.AUT.20.135 Remove, inspect, and service or replace front and rear wheel bearings.
- HS.AUT.20.150 Inspect tires; check and adjust air pressure.
- HS.AUT.20.152 Rotate tires according to manufacturer's recommendations.
- HS.AUT.20.156 Dismount, inspect, repair, and remount tire on wheel.
- HS.AUT.20.157 Reinstall wheel; torque lug nuts.
- HS.AUT.20.158 Inspect and repair tire.
- HS.AUT.20.201 Identify and interpret suspension and steering concern; determine necessary action.
- HS.AUT.20.202 Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions and technical service bulletins.
- HS.AUT.20.207 Diagnose power steering gear (non-rack and-pinion) binding, uneven turning effort, looseness, hard steering., and fluid leakage concerns; determine necessary action.
- HS.AUT.20.208 Diagnose power steering gear (rack and pinion) binding, uneven turning-effort, looseness, hard steering, and fluke leakage concerns; determine necessary action.
- HS.AUT.20.209 Inspect steering shaft universal-joint(s), fluid coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.
- HS.AUT.20.210 Adjust manual or power non-rack and pinion worm bearing preload and sector lash.
- HS.AUT.20.211 Remove and replace manual or power rack and pinion steering gear; inspect mounting

- bushings and brackets.
- HS.AUT.20.213 Inspect power steering fluid levels and condition.
 - HS.AUT.20.214 Flush, fill, and bleed power steering system.
 - HS.AUT.20.215 Diagnose power steering fluid leakage; determine necessary action.
 - HS.AUT.20.216 Remove, inspect, replace, and adjust power steering pump belt.
 - HS.AUT.20.217 Remove and reinstall power steering pump.
 - HS.AUT.20.218 Remove and reinstall power steering pump pulley; check pulley and belt alignment.
 - HS.AUT.20.219 Inspect and replace power steering hoses and fittings.
 - HS.AUT.20.220 Inspect and replace pitman arm, relay (centerlink/intermediate) rod, Idler arm and mountings, and steering linkage damper.
 - HS.AUT.20.221 Inspect, replace, and adjust tie rod ends(sockets), tie rod sleeves, and clamps.
 - HS.AUT.20.222 Test and diagnose components of electronically controlled steering systems using a scar~ tool; determine necessary action
 - HS.AUT.20.229 Remove, inspect, and install stabilizer bar bushings, brackets, and links.
 - HS.AUT.20.230 Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mounts.
 - HS.AUT.20.232 Remove, inspect, and install transverse links, control arms, bushings, and mounts.
 - HS.AUT.20.234 Inspect, remove, and replace shock absorbers
 - HS.AUT.20.249 Diagnose tire wear patterns; determine necessary action.
 - HS.AUT.20.251 Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
 - HS.AUT.20.253 Measure wheel, tire, axle, and hub run out; determine necessary action.
 - HS.AUT.20.255 Balance wheel and tire assembly (static and dynamic).
 - HS.AUT.20.303 Locate and interpret vehicle and major-component identification-numbers (VIN, vehicle certification labels, calibration decals).
 - HS.AUT.20.304 Disable and enable supplemental restraint system (SRS).
 - HS.AUT.20.305 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
 - HS.AUT.20.306 Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
 - HS.AUT.20.312 Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
 - HS.AUT.20.324 Diagnose short and long arm suspension system noises, body sway, and uneven riding height concerns; determine necessary action.
 - HS.AUT.20.325 Diagnose strut suspension system noises, body sway, and uneven tiding height concerns; determine necessary action.
 - HS.AUT.20.326 Remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers
 - HS.AUT.20.327 Remove, inspect, and install upper and/or lower ball joints.
 - HS.AUT.20.328 Remove, inspect, and install steering knuckle assemblies.
 - HS.AUT.20.333 Remove, inspect, and install strut cartridge or assembly, strut coil spring, and insulators (silencers).
 - HS.AUT.20.336 Differentiate between steering and suspension concerns using principles of steering geometry (caster, camber, toe, etc).
 - HS.AUT.20.337 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.
 - HS.AUT.20.338 Perform pre-alignment inspection; perform necessary action.
 - HS.AUT.20.339 Measure vehicle-riding height; determine necessary action.
 - HS.AUT.20.340 Check and adjust front and rear wheel camber; perform necessary action.
 - HS.AUT.20.341 Check and adjust caster; perform necessary action.
 - HS.AUT.20.342 Check and adjust front wheel toe; adjust as needed.
 - HS.AUT.20.343 Center steering wheel.
 - HS.AUT.20.344 Check toe-out-on-turns (turning radius); determine necessary action.
 - HS.AUT.20.345 Check SAI (steering axis inclination) and included angle; determine necessary action.
 - HS.AUT.20.346 Check and adjust rear wheel toe.
 - HS.AUT.20.347 Check rear wheel thrust angle; determine necessary action.
 - HS.AUT.20.348 Check for front wheel setback; determine necessary action.

HS.AUT.20.354 Diagnose tire pull (lead) problem; determine necessary action.

HS.AUT.30 BRAKE SYSTEMS

- HS.AUT.30.109 Select, handle, store, and fill brake fluids to proper level.
- HS.AUT.30.121 Install wheel, torque lug nuts, and make final checks and adjustments.
- HS.AUT.30.131 Install wheel, torque lug nuts, and make final checks and adjustments.
- HS.AUT.30.201 Identify and interpret brake system concern; determine necessary action.
- HS.AUT.30.204 Check master cylinder for internal and external leaks and proper operation determine necessary action.
- HS.AUT.30.205 Remove, bench bleed, and reinstall master cylinder.
- HS.AUT.30.207 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.
- HS.AUT.30.210 Inspect, test, and/or replace metering (hold-off), proportioning.(balance), pressure differential, and combination valves.
- HS.AUT.30.213 Bleed (manual, pressure, vacuum or surge) brake system.
- HS.AUT.30.214 Flush hydraulic system.
- HS.AUT.30.218 Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- HS.AUT.30.219 Remove, inspect, and install wheel cylinders.
- HS.AUT.30.220 Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
- HS.AUT.30.223 Remove caliper assembly from mountings clean and inspect for leaks damage to caliper housing; determine necessary action.
- HS.AUT.30.224 Clean and inspect caliper mounting and slides for wear and damage; determine necessary action.
- HS.AUT.30.225 Remove, clean, and inspect pads and retaining hardware; determine necessary action.
- HS.AUT.30.226 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.
- HS.AUT.30.228 Remove and reinstall rotor.
- HS.AUT.30.232 Test pedal free travel with and without engine running; check power assist operation.
- HS.AUT.30.233 Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
- HS.AUT.30.234 Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.
- HS.AUT.30.234 Remove; clean, inspect, repack, -and install wheel bearings -and replace seals; install hub and adjust wheel bearings.
- HS.AUT.30.235 Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed.
- HS.AUT.30.236 Check parking brake operation; determine necessary action.
- HS.AUT.30.237 Check operation of parking brake indicator light system.
- HS.AUT.30.240 Inspect and replace wheel studs.
- HS.AUT.30.302 Diagnose pressure concerns in the brake system using hydraulic principles (PASCAL's Law).
- HS.AUT.30.303 Measure brake pedal height; determine necessary action.
- HS.AUT.30.306 Diagnose poor stopping, pulling or dragging, concerns caused by malfunctions in the hydraulic system; determine necessary action.
- HS.AUT.30.308 Install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.
- HS.AUT.30.311 Inspect, test, and adjust height (load) sensing proportioning valve.
- HS.AUT.30.312 Inspect, test, and/or replace components of brake warning light system.
- HS.AUT.30.315 Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- HS.AUT.30.316 Remove, clean (using proper safety procedures), inspect, and measure brake drums; determine necessary action.

- HS.AUT.30.317 Refinish brake drum.
- HS.AUT.30.322 Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- HS.AUT.30.326 Reassemble, lubricate, and reinstall caliper., pads., and related hardware; seat pads, and inspect for leaks.
- HS.AUT.30.327 Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace.
- HS.AUT.30.329 Refinish rotor according to manufacturer's recommendations.
- HS.AUT.30.330 Adjust calipers equipped with an integrated parking brake system.
- HS.AUT.30.335 Diagnose wheel-bearing noises, wheel shimmy and vibration concerns, and determine necessary action.
- HS.AUT.30.338 Check operation of brake stop light system; determine necessary action.
- HS.AUT.30.339 Replace wheel bearing and race.
- HS.AUT.30.341 Remove and reinstall sealed wheel bearing assembly.
- HS.AUT.30.342 Identify and inspect antilock brake system (ABS) components; determine necessary action.
- HS.AUT.30.343 Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS); determine necessary action.
- HS.AUT.30.344 Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.
- HS.AUT.30.345 Depressurize high-pressure components of the antilock brake system (ABS).
- HS.AUT.30.346 Bleed the antilock brake system's (ABS) front and rear hydraulic circuits.
- HS.AUT.30.347 Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (DMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
- HS.AUT.30.348 Identify traction control system components.

HS.AUT.40. ELECTRICAL/ELECTRONIC SYSTEMS

- HS.AUT.40.115 Perform solder repair of electrical wiring.
- HS.AUT.40.116 Perform battery state-of-charge test; determine necessary action.
- HS.AUT.40.119 Inspect, clean, fill, and replace battery.
- HS.AUT.40.122 Start a vehicle using jumper cables and a battery or auxiliary power supply.
- HS.AUT.40.201 Identify and interpret electrical/electronic system concern; determine necessary action.
- HS.AUT.40.205 Check electrical circuits with a test light; determine necessary action.
- HS.AUT.40.209 Check electrical circuits using fused jumper wires; determine necessary action.
- HS.AUT.40.214 Repair wiring harnesses and connectors.
- HS.AUT.40.217 Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action.
- HS.AUT.40.221 Inspect and clean battery-cables, connectors, clamps, -and hold-downs; repair or replace as needed.
- HS.AUT.40.223 Perform starter current draw tests; determine necessary action.
- HS.AUT.40.224 Perform starter circuit voltage drop tests; determine necessary action.
- HS.AUT.40.226 Remove and install starter in a vehicle.
- HS.AUT.40.226 Differentiate between electrical and engine mechanical problems that cause a slow crank or no-crank condition.
- HS.AUT.40.227 Perform charging system output test; determine necessary action.
- HS.AUT.40.228 Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
- HS.AUT.40.229 Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
- HS.AUT.40.230 Remove, inspect, and install generator (alternator).
- HS.AUT.40.231 Perform charging circuit voltage drop tests; determine necessary action.
- HS.AUT.40.233 Inspect, replace, and aim headlights and bulbs.
- HS.AUT.40.234 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.

- HS.AUT.40.241 Diagnose incorrect washer operation; perform necessary action.
- HS.AUT.40.325 Inspect and test starter relays and solenoids; determine necessary action.
- HS.AUT.40.318 Maintain or restore electronic memory functions.
- HS.AUT.40.320 Perform slow/fast battery charge.
- HS.AUT.40.304 Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems.
- HS.AUT.40.306 Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action.
- HS.AUT.40.307 Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
- HS.AUT.40.308 Check continuity and measure resistance in electrical/electronic circuits and P-components using an ohmmeter; determine necessary action.
- HS.AUT.40.310 Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
- HS.AUT.40.311 Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
- HS.AUT.40.312 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
- HS.AUT.40.313 Inspect and test switches, connectors, relays, solid-state devices, and wires of electrical/electronic circuits; perform necessary action.
- HS.AUT.40.327 Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.
- HS.AUT.40.332 Diagnose the cause of brighter than normal, intermittent, or no light operation; determine necessary action.
- HS.AUT.40.335 Inspect and test gauges and gauge sending units for cause of intermittent, high, low, or no gauge readings; determine necessary action.
- HS.AUT.40.336 Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action.
- HS.AUT.40.337 Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.
- HS.AUT.40.338 Inspect and test sensors, connectors, and wires of electronic instrument circuits; determine necessary action.
- HS.AUT.40.339 Diagnose incorrect horn operation; perform necessary action.
- HS.AUT.40.340 Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
- HS.AUT.40.342 Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.
- HS.AUT.40.343 Disarm and enable the airbag system for vehicle service.
- HS.AUT.40.344 Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action.
- HS.AUT.40.345 Check for module communication errors using a scan tool.

HS.AUT.50. ENGINE PERFORMANCE AND RELATED SYSTEMS

- HS.AUT.50.112 Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.
- HS.AUT.50.140 Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.
- HS.AUT.50.201 Identify and interpret engine performance concern; determine necessary action.
- HS.AUT.50.202 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
- HS.AUT.50.203 Diagnose abnormal engine noise or vibration concerns; determine necessary action.
- HS.AUT.50.204 Diagnose abnormal exhaust color, odor, and sound; determine necessary action.
- HS.AUT.50.206 Perform cylinder power balance test; determine necessary action.
- HS.AUT.50.207 Perform cylinder compression tests; determine necessary action.
- HS.AUT.50.208 Perform cylinder leakage test; determine necessary action.
- HS.AUT.50.211 Verify engine operating temperature; determine necessary action.

- HS.AUT.50.213 Verify correct camshaft timing.
- HS.AUT.50.234 Replace fuel filters.
- HS.AUT.50.242 Diagnose oil leaks, emissions, and drivability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system determine necessary action.
- HS.AUT.50.243 Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.
- HS.AUT.50.255 Remove and replace timing belt; verify correct camshaft timing.
- HS.AUT.50.256 Remove and replace thermostat.
- HS.AUT.50.257 Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.
- HS.AUT.50.305 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
- HS.AUT.50.309 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment; determine necessary action.
- HS.AUT.50.310 Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.
- HS.AUT.50.314 Retrieve and record stored OBD I diagnostic trouble codes; clear codes.
- HS.AUT.50.315 Retrieve and record stored OBD II diagnostic trouble codes; clear codes.
- HS.AUT.50.316 Diagnose the causes of emissions or drivability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.
- HS.AUT.50.317 Diagnose emissions or drivability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes; determine necessary action.
- HS.AUT.50.318 Check for module communication errors using a scan tool.
- HS.AUT.50.319 Inspect and test computerized engine control system sensors, power train control module (PCM), actuators, and circuits using a graphing multimeter (DMM)/digital storage oscilloscope (DSO); perform necessary action.
- HS.AUT.50.320 Obtain and interpret scan tool data.
- HS.AUT.50.321 Access and use service information to perform step-by-step diagnosis.
- HS.AUT.50.322 Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributor less) systems; determine necessary action.
- HS.AUT.50.323 Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action.
- HS.AUT.50.324 Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.
- HS.AUT.50.325 Inspect, test and service distributor.
- HS.AUT.50.326 Inspect and test ignition system secondary circuit wiring and components; perform necessary action.
- HS.AUT.50.327 Inspect and test ignition coil(s); perform necessary action.
- HS.AUT.50.328 Check and adjust ignition system timing and timing advance/retard (where applicable).
- HS.AUT.50.329 Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action.
- HS.AUT.50.330 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 with carburetor-type fuel systems; determine necessary action.
- HS.AUT.50.331 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 with injection-type fuel systems; determine necessary action.
- HS.AUT.50.332 Check fuel for contaminants and quality; determine necessary action.
- HS.AUT.50.333 Inspect and test mechanical and electrical fuel pumps and pump control systems for pressure, regulation and volume; perform necessary action.
- HS.AUT.50.335 Inspect and test cold enrichment system and components; perform necessary action.

- HS.AUT.50.336 Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
- HS.AUT.50.337 Inspect and test fuel injectors.
- HS.AUT.50.338 Check idle speed and fuel mixture.
- HS.AUT.50.339 Adjust idle speed and fuel mixture.
- HS.AUT.50.341 Perform exhaust system back-pressure test; determine necessary action.
- HS.AUT.50.344 Diagnose emissions and drivability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determine necessary action.
- HS.AUT.50.345 Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.
- HS.AUT.50.346 Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.
- HS.AUT.50.347 Inspect and test mechanical components of secondary air injection systems; perform necessary action.
- HS.AUT.50.348 Inspect and test catalytic converter performance.
- HS.AUT.50.349 Diagnose emissions and drivability problems resulting from malfunctions in the intake air temperature control system; determine necessary action.
- HS.AUT.50.350 Inspect and test components of intake air temperature control system; perform necessary action.
- HS.AUT.50.351 Inspect and test components of early fuel evaporation control system; perform necessary action.
- HS.AUT.50.352 Diagnose emissions and drivability problems resulting from malfunctions in the evaporative emissions control system; determine necessary action.
- HS.AUT.50.353 Inspect and test components and hoses of evaporative emissions control system; perform necessary action.
- HS.AUT.50.354 Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action.