WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 1 Shop Safety

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Automotive Technology:
Introduction to Automotive Technology
B. Safety</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to keep themselves safe in a working shop environment.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying safety skills when using hand and power tools in all situations.
• Complying with all personal and environmental safety regulations that apply to the shop environment.
• Applying safety skills when handling chemicals for all applications.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun, solvent, acid, caustic, brake parts cleaner, carburetor cleaner, lithium, penetrant, mineral spirits, thinner, reducer, catalyst.
• Performing processes such as:</td></tr>
</table>

	○ Identifying safe ways to use hand and power tools. ○ Identifying and describing the situations that call for protective equipment. ○ Knowing that regulations from all levels of government exist for shop environments. ○ Using personal protective equipment in the shop environment (i.e., clothing and safety glasses). ○ Identifying and describing how fire protection equipment is used. ○ Identifying chemicals used to clean and maintain automotive parts. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Demonstrate the safe use of hand tools.
- Demonstrate the safe use of power tools.
- Practice the safe use of personal protective equipment (ie. clothing and safety glasses).
- Describe how to use fire protection equipment safely.
- Demonstrate the safe use of shop equipment.
- Describe how to use chemicals safely.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 2 Career Skills

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology
B. Shop Operation
C. Employability Skills
D. Leadership Competencies

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.

Learning Goal	Proficiency Scale
The student will be able to apply the skills needed to work in a shop environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Conducting specified searches to locate vehicle and service information. • Completing work order and estimates and communicating results with the customer. • Maintaining a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene). • Displaying the skills of teamwork, etiquette and courtesy in the shop

	environment. • Applying management skills to maintain order and a good work environment. Level 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as: make, manufacture, model, body style, chassis, ethics, responsibility, respect, attitude, teamwork., all data, flat rate, estimate, labor operation, tax rate, mark up, jobber, wholesale, retail, sublet, resume, reference, interview, harassment, prosecution, lawsuit, liability, arrest, citation, driver's license, social security number, suspended, revoke, organization, personal space, shared space, collaborate, requisition, invoice, appearance. • Performing processes such as: o Identifying attitudes and skills that contribute to a positive shop environment. o Identifying possible legal issues that can arise from employment. o Identifying what vehicle and service information needs to be researched. o Identifying make, model, year, and chassis of vehicles needing service. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

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Industrial Technology Department

Learning Targets

The student knows how to:

- Identify make and model of vehicles to facilitate accurate research into needed information.
- Research applicable vehicle and service information.
- Demonstrate a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene).
- Demonstrate teamwork.
- Demonstrate etiquette and courtesy.
- Develop and maintain a code of professional ethics.
- Demonstrate effective communication skills.
- Complete work and order estimates.
- Demonstrate job-seeking techniques.
- Describe legal issues of sexual harassment in the workplace.
- Identify employment eligibility requirements.
- Perform tasks related to effective personal management skills.
- Demonstrate interpersonal skills.
- Demonstrate effectiveness in oral and written communication.
- Maintain a good professional appearance.
- Perform basic parliamentary procedures in a group meeting.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 3 Steering and Suspension

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV. Steering and Suspension
- G. General suspension and steering systems diagnosis.
- H. Steering systems diagnosis and repair.
- I. Suspension systems diagnosis and repair.
- J. Related suspension and steering service.
- K. Wheel Alignment.
- L. Wheel and tires.

Missouri Learning Standards

ELA: Reading in Science and Technical areas 11-12.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Finding and using vehicle service records and service manuals and bulletins).

WGSD Curriculum
Industrial Technology Department

Learning Goal	Proficiency Scale
Students will be able to maintain safe operation of automotive steering and suspension systems	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Interpreting necessary information to determine repair actions in suspension and steering systems in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in power steering components and fluids in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in suspension system joints, balls, coil springs, stabilizer bars, bushings and brackets in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in shock absorbers, wheel bearings and other components of suspension and steering mechanisms. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: spring, ball joint, tie-rod, drag (center), link, idler arm, pitman arm, control arm, stabilizer bar, bushing, belt, pump, hose, power steering fluid, shock absorber, McPhearson strut, zerk fitting, part number, interchange, OE, all data, work order, estimate, requisition, VIN, recall, TSB, SRS, air bag, tilt, telescoping, universal joint, “rag” joint, ignition lock cylinder, ignition switch, knuckle, spindle, torsion bar, key, insulator, silencer, sleeve, shackle, wheel bearing, hub assembly, pressure switch. • Performing processes such as: ○ Identifying correct service information and vehicle service bulletins.

	○ Identifying and describing needed repair actions for suspension and steering systems. ○ Performing routine maintenance on automotive steering and suspension systems. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Complete work order to include customer information and vehicle identification information.
- Identify and interpret suspension and steering system concerns; determine necessary action.
- Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers.
- Disable and enable supplemental restraint system (SRS).
- Diagnose steering column noises.
- Identify power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Identify power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- Inspect steering shaft universal joints, flexible couplings, collapsible columns, lock cylinder mechanisms, and steering wheel.
- Inspect mounting bushings and brackets.
- Determine proper power steering fluid type; inspect fluid level and condition.
- Fill power steering system.
- Identify power steering fluid leakage; determine necessary action.
- Remove, inspect, replace, and adjust power steering pump belt.

- Remove and install power steering pump.
- Remove and install power steering pump pulley.
- Check power steering pulley and belt alignment.
- Remove, inspect, and install and replace pitman arm, relay (center link/intermediate) rod, idler arm mountings, and steering linkage damper.
- Remove, inspect, and install upper and/or lower ball joints.
- Remove, inspect, and install steering knuckle assemblies.
- Remove, inspect, and install short and long arm suspension system coil springs.
- Remove, inspect, and install suspension system torsion bars; inspect mounts.
- Remove, inspect, and install stabilizer bar bushings, brackets, and links.
- Remove, inspect, and install strut cartridge or assembly and strut coil spring, insulators (silencers), and upper strut bearing mounts.
- Inspect, remove, and replace shock absorbers.
- Remove, inspect, and service or replace front and rear wheel bearings.
- Lubricate suspension and steering systems.
- Describe the function of the idle speed compensation switch.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 4 Wheels

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV: Steering and Suspension
E. Wheel Alignment Diagnosis, Adjustment, and Repair.
F. Wheel and Tire Diagnosis and Repair.</td></tr>
<tr><td>Learning Goal

Students will be able to maintain safe operation of automotive wheel and tire systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Diagnosing and repairing problems with wheels and tire systems.
• Maintaining tire and wheel systems to meet road safety regulations.
• Inspecting, balancing, repairing and replacing tire and wheel components.
• Inspecting, diagnosing and repairing problems with alignment systems.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: wander, drift, pull, caster, camber, toe, air pressure, normal wear, abnormal wear, torque wrench, wheel fastener, section width, aspect ratio, bead, bead seat, steel belt, ply, valve stem, wheel weight, patch, plug, torque steer, SAI, cradle, subframe, frame., wheel/tire drag, TPMS, core.</td></tr>
</table>

	• Performing processes such as:
	  o Describing potential problems with wheels and tires.
	  o Checking air pressure.
	  o Dismounting and remounting tires, wheel balancing and tire assembly, and reinstalling wheels.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Diagnose vehicle wander, drift, and pull, hard steering, torque steer, and steering return concerns; determine necessary action.
- Preform pre-alignment inspection, and measure vehicle ride height; perform necessary action.
- Check for front wheel setback; determine necessary action.
- Check front and/or rear cradle (subframe) alignment; determine necessary action.
- Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.
- Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
- Rotate tires according to manufacturer's recommendations.
- Diagnose tire pull problems; determine necessary action.
- Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.
- Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- Reinstall wheel; torque lug nuts.
- Inspect tire and wheel assembly for air loss; perform necessary action.
- Repair tire using internal patch.
- Inspect, diagnose, and calibrate tire pressure monitoring system.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 5 Brakes

High Priority Standards

MoDese Standards for Industrial Automotive Technology
Introduction to Automotive Technology
V. Brakes

A. General brake systems diagnosis and evaluation in accordance with industry standards.
B. Hydraulic system diagnosis and repair.
C. Drum brake system and diagnosis and repair.
D. Disc brake system diagnosis and repair.
F. Miscellaneous diagnosis and repair.
G. Electronic brake and traction control systems.

Missouri Learning Standards
ELA-Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Interpreting technical documentation related to repairs.)

Learning Goal	**Proficiency Scale**
Students will be able to maintain safe operation of automotive brake systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Diagnosing and repairing general brake system concerns. • Locating and interpreting vehicle and major component identification numbers using diagrams, schematics, and online resources.

	• Diagnosing and repairing hydraulic, drum, and disc brake systems problems. • Performing routine and non-routine maintenance all brake systems. • Diagnosing and repairing electronic brake system concerns. Level 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as: shimmy, pulsation, grinding, diagram, part number, pads, rotor, caliper, hose, pipe, shoe, drum, wheel cylinder, master cylinder, combination valve, proportioning valve, metering valve, brake fluid, DOT (Department of Transportation), brake cable, bearing, ABS, traction control, vehicle stability control, all data, work orders, estimates, part number, interchange, VIN, TSB, service precaution, free travel, pedal height, bleed, contaminate, compress, pull, drag, tube bender, inverted flare, double flare, ISO AN, brake light switch, pressure switch, flush, drag, pull, grab, vacuum, vacuum booster, hydraulic booster, check valve, earing, race, cone, hub assembly • Performing processes such as: o Identifying brake system concerns. o Locating ID numbers for parts needed. o Describing different types of brakes and brake systems found in automobiles. o Performing routine maintenance on all brake systems. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Complete work order to include customer information, vehicle identifying information, and customer concerns.
- Identify and interpret brake system concerns and determine necessary action.
- Research applicable vehicle and service information, such as brake system operation, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers to find parts.
- Diagnose pressure concerns in the brake system using hydraulic principles.
- Measure brake pedal height, travel, and free play.
- Check master cylinder for internal/external leaks and proper operation; determine necessary action
- Remove, bench bleed, and reinstall master cylinder
- Diagnose poor stopping, pulling or dragging concerns caused by malfunction in the hydraulic system, determine necessary action.
- Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports, determine necessary action.
- Replace brake lines, hoses, fittings, and supports.
- Fabricate brake lines using proper material and flaring procedures (double flare).
- Select, handle, store, and fill brake fluids to proper level.
- Inspect, test, and/or replce components of brake warning light system.
- Bleed and/or flush brake system.
- Diagnose poor stopping, noise, vibrations, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- Remove, clean, inspect, and measure brake drums; determine necessary action.
- Refinish brake drum; measure final drum diameter.
- Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, and other related brake hardware, and backing support plates; lubricate and reassemble.
- Inspect and install wheel cylinders.
- Install wheel, torque lug nuts, and make final checks and adjustments.
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action.

- Remove caliper assemble; inspect for leaks and damage to caliper housing; determine necessary action.
- Clean and inspect caliper mounting and slide/pins for operation, wear, and damage; determine necessary action.
- Reassemble, lubricate, and install caliper, pads, and related hardware; seat pads, and inspect for leaks.
- Remove and reinstall rotor.
- Refinish rotor off vehicle, measure final rotor thickness.
- Retrace caliper piston on an integrated parking brake system.
- Install wheel, torque lug nuts, and make final checks and adjustments.
- Check vacuum supply to vacuum-type power booster.
- Inspect vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action.
- Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.
- Measure and adjust master cylinder pushrod length.
- Check brake pad wear indicator system operation; determine necessary action.
- Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings.
- Check parking brake and indicator light system operation.
- Replace wheel bearing and race.
- Inspect and replace wheel studs.
- Remove and reinstall sealed wheel bearing assembly.
- Check operation of brake stop light systems.
- Identify and inspect electronic brake control system components.
- Identify poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with electronic brake control system.
- Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes.
- Bleed the electronic brake control system hydraulic circuits.
- Test, diagnose, and service electronic brake control system speed sensors and toothed ring.
- Diagnose electronic brake control system braking concerns caused by vehicle modifications.
- Identify traction control/vehicle stability control system components.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 6 Charging Systems

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VI. Electrical/Electronic Systems

F. General Electrical System Diagnosis.
G. Battery Diagnosis and Service.
H. Starting System Diagnosis and Repair.
I. Charging System Diagnosis and Repair.
J. Lighting System Diagnosis and Repair.
K. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
L. Horn and Wiper/Washer diagnosis and Repair.

Learning Goal	**Proficiency Scale**
Students will be able to maintain safe operation of automotive starting, charging, and warning systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Inspecting, diagnosing, repairing, and maintaining all the following automotive systems such as general electrical system components, battery and battery systems, starting systems, charging systems and lighting systems. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: battery, alternator, cable wire, conductor, insulator, belt, volts, fuse, switch, bulb, motor, crimp, heat

	shrink, solder, discharge, acid, short, open, pulley, tensioner, jumper cable, booster pack, cold cranking amps, cranking amps., all data, work order, estimate, TSB, recall, series circuit, parallel circuit, series parallel circuit, diagram, jumper wire, parasitic draw, starter, volt, amp, OHM, relay, solenoid, DVOM, idler, sending unit,MAP, BARO, sea level, atmospheric pressure, OBD, OBDII, scan tool, ALDL, flow chart, ignition module/ignitor, fuel pump, relay, regulator, infector, EVAP • Performing processes such as: o Identifying major components of the systems listed in level 3. o Using meters and circuit testers accurately. o Safely connecting and charging a low battery. o Inspecting and maintain all of the systems listed in level 3. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- Identify and interpret electrical/electronic systems concern and determine necessary action.
- Research applicable vehicle and service information, such as electrical/electronic system operation, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers.
- Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits.
- Use wiring diagrams during diagnosis of electrical circuit problems.
- Demonstrate proper use of a digital multi-meter (DMM).
- Check electrical circuits with a test light.
- Check electrical circuits using fused jumper wires.
- Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Measure and diagnose the cause(s) of excessive parasitic draw.
- Inspect and test fusible links, circuit breakers, and fuses.
- Inspect and test wires of electrical/electronic circuits.
- Remove and replace terminal end from connector; replace connectors and terminal ends.
- Repair wiring harness.
- Perform solder repair of electrical wiring.
- Perform battery state-of-charge test and determine necessary action.
- Perform battery capacity test and confirm proper battery capacity for vehicle application.
- Maintain or restore electronic memory functions.
- Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.
- Perform battery charge.
- Start vehicle using jumper cables or an auxiliary power supply.
- Perform starter current draw tests.

- Perform starter circuit voltage drop tests.
- Inspect and test starter relays and solenoids.
- Remove and install starter in a vehicle.
- Inspect and test switches, connectors, and wires of starter control circuits.
- Perform charging system output test.
- Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
- Remove, inspect, and install generator (alternator).
- Perform charging circuit voltage tests.
- Diagnose the cause of intermittent, dim, or no light operations.
- Inspect, replace, and aim headlights and bulbs.
- Inspect and diagnose incorrect turn signal or hazard light operation.
- Inspect and test gauges and gauge sending units for cause of abnormal gauge readings.
- Inspect and test connectors and wires of gauge circuits.
- Diagnose causes of incorrect operation of warning devices and other driver information systems.
- Inspect and test sensors, connectors, and wires of electronic instrument circuits.
- Diagnose incorrect horn operation.
- Diagnose incorrect wiper operation.
- Diagnose incorrect operation of motor-driven accessory circuits.
- Remove and reinstall door panel.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 7 Engine Performance

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VIII. Engine Performance

B. General Engine Diagnosis.
G. Ignition System Diagnosis and Repair
H. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair.
I. Emissions Control Systems and Diagnosis.
J. Engine Related Services.

Learning Goal	**Proficiency Scale**

Students will understand and be able to maintain safe engine performance and drivability.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Interpreting and evaluating problems, and determining actions for these automotive systems:
	  o Computerized engine controls.
	  o Ignition systems.
	  o Fuel, air inductions and exhaust systems.
	  o Emission controls.
	• Applying mechanical skills needed to repair diagnosed problems.

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: drivability, no start, crank, hard start, spark plug, spark plug wire, coil, gasoline, engine oil, thermostat, antifreeze/coolant, radiator, pressure cap, coolant recovery, hose, hose clamp, fuel filter, air filter, oil filter, fuel economy.
	• Performing processes such as:
	  ○ Checking and replacing fuels, lubricants and filters.
	  ○ Changing oil and oil filters.
	  ○ Replacing air filters.
	  ○ Identifying abnormal engine conditions, such as excess noise or exhaust.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Complete work order to include customer information, vehicle identifying information and customer concerns.
- Research applicable vehicle and service information, such as engine management, system operation, vehicle service history, service precautions, and technical service bulletins.
- Identify and interpret engine performance concerns.
- Locate and interpret vehicle and major component identification numbers.
- Inspect engine assembly for fuel, oil, coolant, and other leaks.
- Diagnose abnormal engine noise or vibration concerns.
- Diagnose abnormal exhaust color, odor, and sound.
- Perform engine absolute manifold pressure tests.
- Perform cylinder cranking.

- Perform cylinder leakage tests.
- Identify engine mechanical, electrical, electronic, fuel, and ignition concerns.
- Verify engine operating temperature.
- Check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses.
- Verify correct camshaft timing.
- Retrieve and record diagnostic trouble codes, OBD monitor status, and clear codes when applicable.
- Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes, obtain and interpret scan tool data.
- Access and use service information to perform step-by-step diagnosis.
- Identify ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability.
- Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s).
- Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s).
- Inspect and test crankshaft and camshaft position sensor (s).
- Inspect, test, and/or replace ignition control module.
- 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.
- Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
- Replace fuel filters.
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and /or unmetered air.
- Inspect and test fuel injectors.
- Verify idle control operation.
- Inspect air induction system.
- Replace air filter.
- Inspect and replace cabin air filter.
- 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.
- Perform exhaust system back-pressure test.

- Diagnose oil leaks.
- Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses.
- Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system.
- Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses.
- Diagnose emissions and drivability concerns caused by the evaporative emissions control system.
- Inspect and test components and hoses of the evaporative emissions control system.
- Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems.
- Adjust valves on engines with mechanical or hydraulic lifters.
- Remove and replace timing belt; verify correct camshaft timing.
- Remove and replace thermostat and gasket/seal.
- Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices.
- Perform common fastener and thread repairs, to include; remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.
- Perform engine oil and filter change.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Lab
Grade Level: 11-12

LG 1: The curriculum for this course is co-developed with the student and teacher.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 1 Shop Safety

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology:
Introduction to Automotive Technology
1. Basic personal safety
2. 2. Ladder and tool safety
.</td></tr>
<tr><td>Learning Goal

Students will be able to keep themselves safe in a working shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Demonstrating safe work habits, handling of hazardous materials, safe use of lifting/hoisting devices, and power and hand tools.
• Complying with all personal and environmental safety regulations that apply to the shop environment.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun, solvent, acid, caustic, brake parts cleaner, flammable, earplugs, carbon monoxide, OSHA, vise, micrometer, carburetor cleaner,</td></tr>
</table>

	lithium, penetrant, mineral spirits, thinner, reducer, catalyst.
	• Performing processes such as:
	  o Identifying safe ways to use hand and power tools.
	  o Identifying and describing the situations that call for protective equipment.
	  o Knowing that regulations from all levels of government exist for shop environments.
	  o Using personal protective equipment in the shop environment (i.e., clothing and safety glasses).
	  o Identifying and describing how fire protection equipment is used.
	  o Identifying chemicals used to clean and maintain automotive parts.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Demonstrate the safe use of hand tools.
- Demonstrate the safe use of power tools.
- Practice the safe use of personal protective equipment (ie. clothing and safety glasses).
- Describe how to use fire protection equipment safely.
- Demonstrate the safe use of shop equipment.
- Describe how to use chemicals safely.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 2 Shop Skills

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Automotive Technology
3. Lab Procedures
6. Engine/Product Identification

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context (service manuals, parts lists, work orders).</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>The student will be able to apply the skills needed to work in a shop environment.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Conducting specified searches to locate vehicle and service information.
• Completing work order and estimates and communicating results with the customer.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: make, manufacture, model, body style, chassis, work order, service manual, serial number, ytpe</td></tr>
</table>

	number, code number, CO, CO2, HC, NOx, parts manual, flywheel brake • Performing processes such as: o Identifying attitudes and skills that contribute to a positive shop environment. o Identifying what vehicle and service information needs to be researched. o Identifying make, model, year, and chassis of vehicles needing service. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Identify make and model of vehicles to facilitate accurate research into needed information.
- Research applicable vehicle and service information.
- Develop and maintain a code of professional ethics.
- Demonstrate effective communication skills.
- Complete work and order estimates.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 3 Tools and Fasteners

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Automotive Technology
4. Tools and Equipment
5. Fasteners</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand proper use and identification of tools, equipment, and fasteners.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying proper use and care of all tools used in the auto shop such as hand tools, precision measuring tools, power tools, and diagnostic tools.
• Determining torque value and technique for fasteners.
• Applying gaskets and sealants as needed for a completed job.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, flare nut wrench, ratchet, socket, extension, universal, screwdrivers, hammers, pliers, torque wrench, snap ring pliers, punches, chisels, pullers, vise, micrometer, dial indictor, bore gauge, telescoping gauge, caliper, square, drill, impact wrench, grinder, tap, die, test light, DVOM, screw, bolt, nut, lock</td></tr>
</table>

	washer, flat washer, fastener grade, pitch, gasket, RTV, thread sealant.
	• Performing processes such as:
	  o Identifying all industry related tools and fasteners.
	  o Measuring bolts and threads.
	  o Identifying gaskets and sealants for various applications.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 4 Four Stroke cycle engines

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
7. Four-stroke Cycle Engines</td></tr>
<tr><td>Learning Goal

Students will understand four-stroke cycle engine theory and construction.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the operating cycle of the four-stroke cycle engine.
• Disassembling and reassembling a four-stroke cycle engine.
•
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: four-stroke cycle, block, cylinder head, crankshaft, camshaft, connecting rod, piston, piston rings, piston (wrist) pin, lifters, valves, valve springs, valve spring retainer, crankcase cover, oil pump, flywheel, carburetor, muffler, air filter.
• Performing processes such as:
o Inspecting and servicing cylinders, pistons, rings, connecting rods, valve train assemblies, crankshaft assemblies.
o Identifying the difference between L-head and overhead valve trains.
o Testing compression.</td></tr>
</table>

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 5 Trouble Shooting and Failure Analysis

<table>
<tr><td colspan="2">High Priority Standards

MoDese Standards for Industrial Automotive Technology
10. Troubleshooting
23. Failure Analysis</td></tr>
<tr><td>Learning Goal
Students will understand troubleshooting as a systematic approach to identify failures.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Examining the faulty systems and components to determine what repairs are needed.
• Performing specific tests to make an accurate diagnosis.
• Making repairs and retesting to verify repairs.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: service manual, specifications, symptoms, systems, verify complaint, verify repairs, fuel, fuel system, ignition system, lubrications, contamination, spark plug, flywheel key, vacuum, abrasive, overheating, vibration.
• Performing processes such as:
o Identifying the effects of things that can cause engine damage or failure, such as abrasive ingestion, insufficient lubrication, and overheating.
o Identifying engine systems and components.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

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Course: Automotive Technology
Grade Level: 11-12
LG 6 Fuel systems

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
11. Fuel Systems.
12.Governor System</td></tr>
<tr><td>Learning Goal

Students will understand operational components of carburetor fuel systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining all types of fuel system components and their relationship to each other and the rest of the engine.
• Explain the governor system and the purpose of it as part of the engine.
• Testing, repairing/replacing components of the fuel system such as diaphragm-type carburetor, fuel filters and strainers, fuel tank, shut-off valve, fuel lines and hoses, mechanical governor systems and linkages, and float-type carburetor.
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: carburetor, fuel filter, fuel pump, fuel hose/pipe, fuel tank, air filter, gasoline, octane, diaphragm, gravity, governor, air vane, centrifugal force, RPM, rich fuel mixture, lean fuel mixture, CARB, EPA, idle, cold start, hot start, acceleration, vacuum, Venturi principle, choke, float, primer.</td></tr>
</table>

	• Performing processes such as:
	  o Identifying the types and grades of gasoline used in power equipment.
	  o Servicing air cleaners and fuel filters.
	  o Adjusting engine RPM's.
	  o Disposing of contaminated fuel per EPA regulations.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
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Course: Automotive Technology
Grade Level: 11-12
LG 7 Electrical Starting and Charging

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
13. Electrical Systems
14. Ignition Systems</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand components and operation of electrical and starting systems.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining basic electrical theory.
• Explaining battery storage theory and operation.
• Explaining different types of circuit failures and how to repair them.
• Interpreting electrical meter readings.
• Testing, repairing, and/or replacing charging and ignitions system components.
• Explaining the theory of operation of the ignitions system.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: conductor, insulator, circuit, volts, ohms, coil, electrode, ignition, battery, transformer, magneto, gap, DVOM, fuse, fusible link, continuity, gauge, switch, alternator, corrosion, resistance, plate, sulfating, sulfuric acid, hydrogen gas, multi-meter, starter,</td></tr>
</table>

	solenoid, flywheel. • Performing processes such as: o Identifying terminals and connectors. o Identifying electrical wire sizes. o Determining battery state of charge. o Removing and servicing spark plugs. o Removing, cleaning, and replacing batteries. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 8 Lubrication

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
15. Lubrication Sytems.</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand lubrication systems and service.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the importance of lubrication in automotive systems.
• Troubleshooting lubrication systems and describing needed repairs.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: friction, lubrication, oil, API, SAE, viscosity, multiviscosity, detergent/disoersants, splash system, pressure system, pump, dipper, oil filter, bypass, babbit, cooling, foam, corrosion, insert, screen, bearing, antifriction bearing, friction bearing, dipstick, sight glass, seal.
• Performing processes such as:
o Identifying common oil contaminants.
o Changing engine oil and filter.
o Selecting the proper oil.
o Servicing the crankcase breather.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 9 Cooling

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
16. Cooling Systems</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand liquid cooled and air cooled systems used in small engines.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the purpose of a cooling system and the major causes of engine overheating.
• Explaining cooling related service procedures performed on both liquid and air cooled engines.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: conduction, convection, cooling fins, water jacket, antifreeze, pump, thermostat, radiator, tubes, hose neck, petcock, pressure cap, air lock, operating temperature, fan.
• Performing processes such as:
o Identifying the purpose of thermostats, water pumps, and antifreeze.
o Removing and replacing water pump and fan drive belt, thermostat, and radiator.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 10 Exhaust and Emissions

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Automotive Technology
9. Emissions
17. Exhaust Systems</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand the exhaust system and emission controls on automotive engines.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the consequences of noncompliance with emission standards.
• Describing the function of the automotive exhaust system.
• Servicing and/or replacing a four-stroke cycle exhaust system.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: muffler, decibel, pope, clamp, hangar, isolator, heat shield, spark arrestor, catalytic converter, CO, CO2, HC, NOx, valve guide, piston rings, vacuums, rich, lean, back pressure, overlap, scavange, EPA, CARB.
• Performing processes such as:
o Identifying service cleaning procedures for exhaust ports.
o Identifying types of emissions.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

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Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 11 Maintenance

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
22.</td></tr>
<tr><td>Learning Goal

Students will be able to perform normal automotive maintenance.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
•
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: blade, belt, pulley, set screw, air filter, oil, points and condenser, cable/linkages, lubricate, spark plug, fuel filter, air pressure.
• Performing processes such as:

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 1 Safety

High Priority Standards

MoDese Career Profiles: Building Maintenance

1. Orientation to building maintenance.

1.2. Identify safe work site procedures/practices, including fall protection and confined spaces.

1.3. Identify emergency first aid procedures, including MSDS (material safety data sheets).

Learning Goal	Proficiency Scale
Students will understand the importance of safety procedures in the construction crafts.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Explaining the role of OSHA in job-site safety. • Explaining fall protection, and ladder, stair, and scaffold procedures. • Explaining the use of hazard communications and material safety data sheets. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: HazCom, MSDS, OSHA. • Performing processes such as: o Identifying causes of accidents. o Demonstrating use and care of personal protective equipment. o Identifying struck-by and caught in-between safety hazards. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 2 Working With Wood

High Priority Standards

MoDese Career Profiles: Carpentry
Building Materials, Fasteners, and Adhesives
2. State the uses of various types of hardwoods and softwoods.
3. Identify the different grades and markings of wood building materials.
6. State the uses of various types of engineered lumber.
7. Calculate the quantities of lumber and wood products using industry-standard methods.
8. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

Learning Goal	Proficiency Scale
Student will be able to build with wood.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Explaining the use of fasteners, anchors, and adhesives and the best application for each. • Differentiating grades and types of lumber and best application for each. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: hardwood, softwood, grades, markings, engineered wood. • Performing processes such as: ○ Identifying woods and engineered woods

	○ Describing best methods of storing and handling building materials Level 1: Student demonstrates a limited understanding or skill with the learning goal.