

# **North Dakota Automotive Technology Education**

## **Content Standards**

*Approved and Adopted – May 2024*



**North Dakota Department of Career and Technical Education**

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# North Dakota Technical Education Standards Process

**This set of standards was reviewed by the North Dakota state Automotive teachers, with special thanks to:**

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# **Career and Technical Education Standards Introduction**

## **Mission**

The mission of the State Board for Career and Technical Education (CTE) is to work with others to provide all North Dakota citizens with the technical skills, knowledge, and attitudes necessary for successful performance in a globally competitive workplace.

## **Vision**

The State Board for Career and Technical Education (CTE) is committed to providing career awareness, work readiness skills, occupational preparation, and retraining of workers throughout the state. Career and technical education will span all educational levels, providing youth with exploration opportunities and the foundation skills needed to enter the world of work while providing adults with skills needed to enter, re-enter, or advance in the workforce.

## **Goal**

North Dakota Career and Technical Education's goal is to create a competitive and knowledgeable work force. This is accomplished through a variety of educational program areas that are organized to prepare students for careers in their chosen fields, to take leadership roles, and balance their multiple roles in life. CTE programs prepare students with the knowledge and skills to make informed career choices, to integrate and apply academic concepts, to prepare for successful participation in a global society, and to engage in lifelong learning.

## **Standards Development Process**

Standards development is a multi-phase process. Existing and/or industry standards are the basis for the North Dakota Program Standards. A team of expert secondary and postsecondary teachers, business and industry representatives, and the state program supervisor draft the standards document. Once the document is finalized, the State Board for Career and Technical Education approves and adopts the standards.

Course Frameworks are also developed by the writing team. A framework includes a brief overview of the course content, topical units of study, and identifies the standards recommended for inclusion within the course. The frameworks are tailored to prepare young people for the opportunities in North Dakota. School Districts will use the frameworks as a guide for developing curriculum that reflects local needs.

# Key Principles of Career and Technical Education

## We believe that Career Technical Education:

**1. Draws its curricula, standards, and organizing principles from the workplace.**

The workplace provides the context, objectives, and organizing constructs for instruction and assessment. The workplace also defines the standards of performance necessary, including those required for academic, technical, and employability skills.

**2. Is a critical and integral component of the total educational system, offering career-oriented benefits for all students.**

CTE classes offer educational benefits to students pursuing careers requiring specific technical skills as well as providing a strong foundation for those pursuing a traditional four-year (or more) degree.

**3. Is a critical and integral component of the workforce development system, providing the essential foundation for a thriving economy.**

Preparation of a well-prepared, qualified workforce requires solid academics, good work ethics, and specific technical skills as well as the ability to communicate, work with others, solve problems, and use information. CTE contributes directly to this preparation by providing a curriculum tied to specific workplace requirements.

**4. Maintains high levels of excellence supported through identification of academic and workplace standards, measurement of performance (accountability), and high expectations for participant success.**

Career Technical Education is committed to continuous improvement, attention to industry certification, and the development of highly qualified teachers.

**5. Is robust and flexible enough to respond to the needs of the multiple educational environments, customers, and levels of specialization.**

CTE involves a large and complex delivery system that (1) integrates career exploration, (2) provides effective tools for organizing all curricula, (3) facilitates the teaching and use of technology, (4) is integrated into the total learning experience, (5) enhances the learning of academic subjects, (6) teaches broad occupational skills, (7) includes all aspects of the industry, (8) teaches how to balance family and work responsibilities, (9) provides job-specific training, (10) is offered at multiple levels of the educational continuum, and (11) is delivered through a variety of educational environments.

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<b>Standard 1</b>	<b><i>AUTO SHOP ORIENTATION</i></b>	
<b>Topic 1.1</b>	<b>Shop and Personal Safety</b>	
	<b>Student Competencies</b>	
	1.1.1	Identify general shop safety rules and procedures.
	1.1.2	Utilize safe procedures for handling of tools and equipment.
	1.1.3	Identify and use proper placement of floor jacks and jack stands.
	1.1.4	Identify and use proper procedures for safe lift operation.
	1.1.5	Utilize proper ventilation procedures for working within the lab/shop area.
	1.1.6	Identify marked safety areas.
	1.1.7	Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
	1.1.8	Identify the location and use of eye wash stations.
	1.1.9	Identify the location of the posted evacuation routes.
	1.1.10	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
	1.1.11	Identify and wear appropriate clothing for lab/shop activities.
	1.1.12	Secure hair and jewelry for lab/shop activities.
	1.1.13	Identify vehicle systems which pose a safety hazard during service such as: supplemental restraint systems (SRS), electronic brake control systems, stop/start systems, and remote start systems.
	1.1.14	Identify vehicle systems which pose a safety hazard during service due to high voltage such as: hybrid/electric drivetrain, lighting systems, ignition systems, A/C systems, injection systems, etc.
	1.1.15	Locate and demonstrate knowledge of safety data sheets (SDS).
<b>Topic 1.2</b>	<b>Tools and Equipment</b>	
	<b>Student Competencies</b>	
	1.2.1	Identify tools and their usage in automotive applications.
	1.2.2	Identify standard and metric designation.
	1.2.3	Demonstrate safe handling and use of appropriate tools.
	1.2.4	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
	1.2.5	Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).
	1.2.6	Perform common fastener and thread repair, including removing broken bolts, restoring internal and external threads, and repairing internal threads with a thread insert.
<b>Topic 1.3</b>	<b>Preparing Vehicle for Service</b>	
	<b>Student Competencies</b>	
	1.3.1	Identify information needed and the service requested on a repair order.
	1.3.2	Identify purpose and demonstrate proper use of fender covers, mats, seat, and steering wheel covers.

	1.3.3	Perform a vehicle walk-around inspection; identify and document existing vehicle conditions such as body damage, paint damage, windshield damage.
	1.3.4	Perform a vehicle multi-point inspection and complete a vehicle inspection report.
	1.3.5	Demonstrate use of the three C's (concern, cause, and correction).
	1.3.6	Create a plan of action for each specific service or diagnostic situation.
	1.3.7	Review vehicle service history.
	1.3.8	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
<b>Topic 1.4</b>	<b>Preparing Vehicle for Customer</b>	
	<b>Student Competencies</b>	
	1.4.1	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).



<b>Standard 2</b>	<b><i>ENGINE REPAIR</i></b>	
<b>Topic 2.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	2.1.1	Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	2.1.2	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	2.1.3	Verify operation of the instrument panel engine warning indicators.
	2.1.4	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
	2.1.5	Install engine covers using gaskets, seals, and sealers as required.
	2.1.6	Demonstrate understanding of the procedure for verifying engine mechanical timing.
	2.1.7	Inspect engine mounts.
	2.1.8	Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.
<b>Topic 2.2</b>	<b>Cylinder Head and Valve Train</b>	
	<b>Student Competencies</b>	
	2.2.1	Identify cylinder head and valve train components and configurations.
<b>Topic 2.3</b>	<b>Engine Block Assembly</b>	
	<b>Student Competencies</b>	
	2.3.1	Identify engine block assembly components and configurations.
<b>Topic 2.4</b>	<b>Lubrication and Cooling Systems</b>	
	<b>Student Competencies</b>	
	2.4.1	Identify lubrication and cooling system components and configurations
	2.4.2	Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.
	2.4.3	Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs.
	2.4.4	Identify causes of engine overheating
	2.4.5	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment
	2.4.6	Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.
	2.4.7	Identify type of water pumps (belt driven, chain driven, and electric).
	2.4.8	Remove, inspect, and replace thermostat and gasket/seal.

<b>Standard 3</b>	<b><i>AUTOMATIC TRANSMISSION AND TRANSAXLE</i></b>	
<b>Topic 3.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	3.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	3.1.2	Identify automatic transmission and transaxle components and configurations.
	3.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	3.1.4	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick.
	3.1.5	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick.
	3.1.6	Demonstrate knowledge of transmission/transaxle gear reduction/multiplication operation using driving, driven, and held member (power flow) principles.
	3.1.7	Demonstrate knowledge of hydraulic principles (Pascal's Law) in a transmission/transaxle.
<b>Topic 3.2</b>	<b>In-Vehicle Transmission/Transaxle</b>	
	<b>Student Competencies</b>	
	3.2.1	Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.
	3.2.2	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.
	3.2.3	Demonstrate understanding of relearn procedures.
	3.2.4	Inspect replace and/or align power train mounts.
<b>Topic 3.3</b>	<b>Off-Vehicle Transmission and Transaxle</b>	
	<b>Student Competencies</b>	
	3.3.1	Describe the operational characteristics of a continuously variable transmission (CVT).
	3.3.2	Describe the operational characteristics of a hybrid vehicle drive train.

<b>Standard 4</b>	<b><i>MANUAL DRIVE TRAIN AND AXLES</i></b>	
<b>Topic 4.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	4.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	4.1.2	Identify manual drive train and axle components and configuration.
	4.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	4.1.4	Check fluid condition; check for leaks.
	4.1.5	Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specifications.
<b>Topic 4.2</b>	<b>Clutch</b>	
	<b>Student Competencies</b>	
	4.2.1	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.
<b>Topic 4.3</b>	<b>Transmission/Transaxle</b>	
	<b>Student Competencies</b>	
	4.3.1	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.
<b>Topic 4.4</b>	<b>Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints</b>	
	<b>Student Competencies</b>	
	4.4.1	Inspect and/or remove/replace bearings, hubs, and seals.
	4.4.2	Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints.
	4.4.3	Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
<b>Topic 4.5</b>	<b>Differential Case Assembly</b>	
	<b>Student Competencies</b>	
	4.5.1	Clean and inspect differential case; check for leaks; inspect housing vent.
	4.5.2	Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.
	4.5.3	Drain and refill differential housing; using proper fluid type per manufacturer specification.
	4.5.4	Inspect and replace drive axle wheel studs.
<b>Topic 4.6</b>	<b>Four-wheel Drive/All-wheel Drive</b>	
	<b>Student Competencies</b>	
	4.6.1	Identify concerns related to variations in tire circumference and/or final drive ratios.

<b>Standard 5</b>	<b><i>SUSPENSION AND STEERING</i></b>	
<b>Topic 5.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	5.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	5.1.2	Identify suspension and steering system components and configurations.
	5.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	5.1.4	Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
<b>Topic 5.2</b>	<b>Steering Systems</b>	
	<b>Student Competencies</b>	
	5.2.1	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
	5.2.2	Inspect power steering fluid level and condition.
	5.2.3	Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.
	5.2.4	Inspect for power steering fluid leakage.
	5.2.5	Remove, inspect, replace, and/or adjust power steering pump drive belt.
	5.2.6	Inspect and replace power steering hoses and fittings.
	5.2.7	Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
	5.2.8	Inspect tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion).
	5.2.9	Inspect electric power steering system.
<b>Topic 5.3</b>	<b>Suspension Systems</b>	
	<b>Student Competencies</b>	
	5.3.1	Inspect upper and lower control arms, bushings, and shafts.
	5.3.2	Inspect and replace rebound and/or jounce bumpers.
	5.3.3	Inspect track bar, strut rods/radius arms, and related mounts and bushings.
	5.3.4	Inspect upper and lower ball joints (with or without wear indicators).
	5.3.5	Inspect suspension system coil springs and spring insulators.
	5.3.6	Inspect torsion bars and mounts.
	5.3.7	Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.
	5.3.8	Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.
	5.3.9	Inspect components of rear suspension systems (Coil, Leaf, and Torsion Beams).
	5.3.10	Inspect components of electronically controlled suspension systems.

<b>Topic 5.4</b>	<b>Related Suspension and Steering Service</b>	
	<b>Student Competencies</b>	
	5.4.1	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.
	5.4.2	Inspect front and rear wheel bearings.
	5.4.3	Describe the function of steering and suspension control systems and components (i.e., active suspension and stability control).
<b>Topic 5.5</b>	<b>Wheel Alignment</b>	
	<b>Student Competencies</b>	
	5.5.1	Perform pre-alignment inspection; measure vehicle ride height.
	5.5.2	Describe four-wheel alignment angles (camber, caster, and toe) and effects on vehicle handling/tire wear.
<b>Topic 5.6</b>	<b>Wheels and Tires</b>	
	<b>Student Competencies</b>	
	5.6.1	Inspect tire condition; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label.
	5.6.2	Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).
	5.6.3	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.
	5.6.4	Inspect tire and wheel assembly for air loss; perform necessary action; determine necessary action.
	5.6.5	Repair tire following vehicle manufacturer approved procedure.
	5.6.6	Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps.
	5.6.7	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS), including relearn procedure.
	5.6.8	Perform Road Force balance/match mounting.

<b>Standard 6</b>	<b><i>BRAKES</i></b>	
<b>Topic 6.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	6.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	6.1.2	Identify brake system components and configuration.
	6.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	6.1.4	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
	6.1.5	Install wheel and torque lug nuts.
<b>Topic 6.2</b>	<b>Hydraulic System</b>	
	<b>Student Competencies</b>	
	6.2.1	Demonstrate understanding of hydraulic principals (Pascal's law).
	6.2.2	Describe proper brake pedal height, travel, and feel.
	6.2.3	Check master cylinder for external leaks and proper operation.
	6.2.4	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.
	6.2.5	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.
	6.2.6	Identify components of hydraulic brake warning light system.
	6.2.7	Bleed and/or flush brake system.
	6.2.8	Test brake fluid for contamination.
<b>Topic 6.3</b>	<b>Drum Brakes</b>	
	<b>Student Competencies</b>	
	6.3.1	Remove, clean, and inspect brake drum diameter; measure brake drum diameter; determine serviceability.
	6.3.2	Refinish brake drum and measure final drum diameter; compare with specifications.
	6.3.3	Remove, clean, and/or inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
	6.3.4	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
	6.3.5	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.
<b>Topic 6.4</b>	<b>Disc Brakes</b>	
	<b>Student Competencies</b>	
	6.4.1	Remove and clean caliper assembly; inspect for leaks and damage, and ware.
	6.4.2	Inspect caliper mounting and slides/pins for proper operation, wear, and damage.

	6.4.3	Remove, inspect, and/or replace brake pads and retaining hardware.
	6.4.4	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.
	6.4.5	Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout.
	6.4.6	Remove and reinstall/replace rotor.
	6.4.7	Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
	6.4.8	Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
	6.4.9	Retract and re-adjust caliper piston on an integral parking brake system.
	6.4.10	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
<b>Topic 6.5</b>	<b>Power Assist Units</b>	
	<b>Student Competencies</b>	
	6.5.1	Check brake pedal travel with, and without, engine running to verify proper power booster operation.
	6.5.2	Identify components of the brake power assist system (vacuum and hydraulic).
<b>Topic 6.6</b>	<b>Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)</b>	
	<b>Student Competencies</b>	
	6.6.1	Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings.
	6.6.2	Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.
	6.6.3	Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation.
	6.6.4	Check operation of brake stop light system.
	6.6.5	Inspect and replace wheel studs.
<b>Topic 6.7</b>	<b>Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems</b>	
	<b>Student Competencies</b>	
	6.7.1	Identify electronic brake control system components and describe function (ABS, TCS, ESC).
	6.7.2	Describe the operation of a regenerative braking system.

<b>Standard 7</b>	<b><i>ELECTRICAL/ELECTRONIC SYSTEMS</i></b>	
<b>Topic 7.1</b>	<b>General</b>	
<b>Student Competencies</b>		
	7.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	7.1.2	Identify electrical/electronic system components and configuration.
	7.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	7.1.4	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s Law).
	7.1.5	Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
	7.1.6	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
	7.1.7	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.
	7.1.8	Use fused jumper wires to check operation of electrical circuits per service information.
	7.1.9	Use wiring diagrams to trace electrical/electronic circuits.
	7.1.10	Measure key-off battery drain (parasitic draw).
	7.1.11	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
	7.1.12	Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair)
<b>Topic 7.2</b>	<b>Batteries (Conventional 12-volt)</b>	
<b>Student Competencies</b>		
	7.2.1	Perform battery state-of-charge test; determine needed action.
	7.2.2	Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.
	7.2.3	Maintain or restore electronic memory functions as recommended by manufacturer.
	7.2.4	Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.
	7.2.5	Perform slow/fast battery charge according to manufacturer’s recommendations.
	7.2.6	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
	7.2.7	Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.



<b>Topic 7.3</b>	<b>Starting System</b>	
	<b>Student Competencies</b>	
	7.3.1	Perform starter current draw test.
	7.3.2	Perform starter circuit voltage drop tests.
	7.3.3	Inspect and test starter relays and solenoids.
	7.3.4	Remove and install starter in a vehicle.
	7.3.5	Inspect and test switches, connectors, and wires of starter control circuits.
	7.3.6	Demonstrate knowledge of an automatic idle-stop/start-stop system.
<b>Topic 7.4</b>	<b>Charging System</b>	
	<b>Student Competencies</b>	
	7.4.1	Perform charging system output test.
	7.4.2	Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
	7.4.3	Remove, inspect, and/or replace generator (alternator).
	7.4.4	Perform charging circuit voltage drop tests.
<b>Topic 7.5</b>	<b>Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems</b>	
	<b>Student Competencies</b>	
	7.5.1	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
	7.5.2	Aim headlights.
	7.5.3	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.
	7.5.4	Demonstrate understanding of vehicle comfort, convenience, access, safety, and related systems operation.
	7.5.5	Remove and reinstall door panel.
	7.5.6	Describe the operation of keyless entry/remote-start systems.
	7.5.7	Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.
	7.5.8	Verify windshield wiper and washer operation; replace wiper blades.

<b>Standard 8</b>	<b><i>HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)</i></b>	
<b>Topic 8.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	8.1.1	Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	8.1.2	Identify heating, ventilation, and air conditioning (HVAC) components and configuration.
	8.1.3	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	8.1.4	Identify steps of an A/C performance test.
	8.1.5	Identify abnormal operating noises in the A/C system.
	8.1.6	Visually inspect A/C system for signs of leaks.
	8.1.7	Identify and interpret heating and air conditioning problems.
<b>Topic 8.2</b>	<b>Refrigeration System Components</b>	
	<b>Student Competencies</b>	
	8.2.1	Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners.
	8.2.2	Inspect for proper A/C condenser airflow.
	8.2.3	Inspect evaporator housing condensation drain.
<b>Topic 8.3</b>	<b>Heating, Ventilation, and Engine Cooling Systems</b>	
	<b>Student Competencies</b>	
	8.3.1	Inspect engine cooling and heater systems hoses and pipes.
<b>Topic 8.4</b>	<b>Operating Systems and Related Controls</b>	
	<b>Student Competencies</b>	
	8.4.1	Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets.
	8.4.2	Identify the source of HVAC system odors.
	8.4.3	Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.

<b>Standard 9</b>	<b><i>ENGINE PERFORMANCE</i></b>	
<b>Topic 9.1</b>	<b>General</b>	
	<b>Student Competencies</b>	
	9.1.1	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).
	9.1.2	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
	9.1.3	Demonstrate understanding of proper engine cooling system operation.
	9.1.4	Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems.
<b>Topic 9.2</b>	<b>Computerized Controls</b>	
	<b>Student Competencies</b>	
	9.2.1	Identify computerized control system components and configurations.
<b>Topic 9.3</b>	<b>Ignition System</b>	
	<b>Student Competencies</b>	
	9.3.1	Identify ignition system components and configurations.
	9.3.2	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
<b>Topic 9.4</b>	<b>Fuel, Air Induction, and Exhaust Systems</b>	
	<b>Student Competencies</b>	
	9.4.1	Identify fuel, air induction, and exhaust system components and configurations.
	9.4.2	Replace fuel filter(s) where applicable.
	9.4.3	Inspect, service, or replace air filters, filter housings, and intake duct work.
	9.4.4	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.
	9.4.5	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.
	9.4.6	Check and refill diesel exhaust fluid (DEF).
<b>Topic 9.5</b>	<b>Emissions Control Systems</b>	
	<b>Student Competencies</b>	
	9.5.1	Identify emission control system components and configurations.
	9.5.2	Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses.

# Career Ready Practices

## **1. Act as a Responsible and Contributing Citizen and Employee**

Career-ready individuals understand the obligations and responsibilities of being a member of a community and demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them, think about the near-term and long-term consequences of their actions, and seek to act in ways that contribute to the betterment of their teams, families, community, and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

## **2. Apply Appropriate Academic and Technical Skills**

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications and make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

## **3. Attend to Personal Health and Financial Well-Being**

Career-ready individuals understand the relationship between personal health, workplace performance, and personal well-being; they act on that understanding to regularly practice health diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

## **4. Communicate Clearly, Effectively, and with Reason**

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice and organization and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

## **5. Consider the environmental, social, and economic impacts of decisions**

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organizations and the environment. They are aware of and utilize new technologies, understandings, procedures, materials and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and profitability of the organization.

## **6. Demonstrate creativity and innovation**

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

**7. Employ valid and reliable research strategies**

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices, or inform strategies. They use a reliable research process to search for new information and evaluate the validity of sources when considering the use and adoption of external information or practices. They use an informed process to test new ideas, information, and practices in their workplace situation.

**8. Utilize critical thinking to make sense of problems and persevere in solving them**

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur, quickly take action to address the problem, thoughtfully investigate the root cause of the problem prior to introducing solutions, and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

**9. Model integrity, ethical leadership, and effective management**

Career-ready individuals consistently act in ways that align to personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the direction and actions of a team or organization, and they apply insights into human behavior to change others' actions, attitudes, and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morale, and organizational culture.

**10. Plan education and career path aligned to personal goals**

Career-ready individuals take personal ownership of their own educational and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience, and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the educational and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

**11. Use technology to enhance productivity**

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology, being proficient with ubiquitous technology applications. They understand the inherent risks, personal and organizational, of technology applications, and they take actions to prevent or mitigate these risks.

**12. Work productively in teams while using cultural/global competence**

Career-ready individuals positively contribute to every team whether formal or informal. They apply an awareness of cultural differences to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.