

# STRANDS AND STANDARDS

## ASE ENGINE - MLR



### Course Description

This course is part of a sequence that prepares individuals to engage in the servicing and maintenance of all types of automobiles. Instruction includes training in safety and the diagnosis of malfunctions of engine performance. This course is based on the Automotive Service Excellence (ASE) task list. Work ethics and productivity are an integral part of the classroom and lab activities of this course. The most current information can be found at the AST Task List at the following address: <https://www.aseeducationfoundation.org/resources>

<b>Intended Grade Level</b>	11-12
Units of Credit	0.5
Core Code	40.09.00.00.026
Concurrent Enrollment Core Code	40.09.00.13.026
Prerequisite	Automotive Introduction
Skill Certification Test Number	
Test Weight	1.0
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive
Endorsement 2	N/A
Endorsement 3	N/A

## STRAND 1

Students will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

### Standard 1

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

### Standard 2

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team.

### Standard 3

Student will use critical thinking and problem-solving skills.

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

### Standard 4

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

### Standard 5

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

### Standard 6

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

## STRAND 2

Students will participate in work-place readiness activities.

### Standard 1

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.
- Complete a job application.
- Participate in an actual or simulated job interview.

**Standard 2**

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

**STRAND 3**

**Students will understand and demonstrate general shop safety.**

**Standard 1**

Learn safe working habits and procedures. Pass a safety test with 100 percent.

- Personal safety.
- Tool and equipment safety.
- Workplace safety.
- Personal protective equipment (PPE).

**Standard 2**

Comply with safety rules for working with automotive chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) for each chemical they produce.
- Identify the location of and navigate through the SDS for critical information.
- Store and dispose of chemicals in properly labeled containers.

**Standard 3**

Identify the gasses encountered in the automotive field and the hazards they present.

- Water, oxygen, nitrogen, carbon dioxide (CO<sub>2</sub>), hydrocarbons (HC), oxides of nitrogen (NO<sub>x</sub>), and carbon monoxide (CO).
- HC, NO<sub>x</sub>, and CO can pose health and environmental problems if they are not controlled.

**Standard 4**

Identify the hazards and control of asbestos dust.

- Asbestos is a carcinogen – a substance that causes cancer.
- Never use compressed air to clean brake assemblies.
- Understand approved methods such as a brake vacuum or brake washer machine.
- Because some exposure might be unavoidable, wear an approved filter mask.

**Performance Skills**

Understand general shop safety.

- Pass a safety test with 100 percent.
- Comply with safety rules for working with automotive chemicals.
- Identify the gasses encountered in the automotive field and the hazards they present.
- Identify the hazards and control of asbestos dust.

**STRAND 4**

**Students will understand, inspect, diagnose, and service the basics of engine repair.**

**Standard 1**

Students will conduct general research and inspection.

- 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).

- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Verify operation of the instrument panel engine warning indicators.
- Inspect engine assembly for fuel, oil, coolant, and other leaks.
- Install engine covers using gaskets, seals, and sealers as required.
- Demonstrate understanding of the procedure for verifying engine mechanical timing.
- Inspect engine mounts.
- Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.

### **Standard 2**

Students will identify and inspect Cylinder Head and Valve Train.

- Identify cylinder head and valve train components and configurations.

### **Standard 3**

Students will identify and inspect Block Assembly.

- Identify engine block assembly components and configurations.

### **Standard 4**

- Identify lubrication and cooling system components and configurations.
- Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.
- 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.
- Identify causes of engine overheating.
- Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
- 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.
- Identify type of water pumps (belt driven, chain driven, and electric).
- Remove, inspect, and replace thermostat and gasket/seal.

## **Performance Skills**

Understand general shop safety.

- Students will conduct general research and inspection.
- Students will identify and inspect Cylinder Head and Valve Train.
- Students will identify and inspect Block Assembly.
- Students will identify and inspect Lubrication and Cooling Systems.

## **STRAND 5**

**Students will understand, inspect, diagnose, and service the Electrical/Electronic Systems.**

### **Standard 1**

Students will conduct general research and inspection.

- 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).
- Identify electrical/electronic system components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.

- Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.
- Use fused jumper wires to check operation of electrical circuits per service information.
- Use wiring diagrams to trace electrical/electronic circuits.
- Measure key-off battery drain (parasitic draw).
- Inspect and test fusible links, circuit breakers, and fuses.
- Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).

### **Standard 2**

Students will inspect and test the Batteries (Conventional 12-Volt).

- Perform battery state-of-charge test; determine needed action.
- Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.
- Maintain or restore electronic memory functions as recommended by manufacturer.
- Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.
- Perform battery charging according to manufacturer's recommendations.
- Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.

### **Standard 3**

Students will inspect and test the Starting System.

- Perform starter current draw test.
- 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.
- Demonstrate knowledge of an automatic idle-stop/start-stop system.

### **Standard 4**

Students will inspect and test the Charging System.

- Perform charging system output test.
- Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
- Remove, inspect, and/or replace generator (alternator).
- Perform charging circuit voltage drop tests.

### **Standard 5**

Students will inspect and test the Lighting System.

- Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- Aim headlights.

**Standard 6**

Students will inspect and test the Instrument Cluster and Driver Information Systems.

- Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.

**Standard 7**

Students will inspect and test the Body Electrical System.

- Demonstrate understanding of vehicle comfort, convenience, access, safety, and related systems operation.
- Remove and reinstall door panel.
- Describe the operation of keyless entry/remote-start systems.
- Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.
- Verify windshield wiper and washer operation; replace wiper blades.

**Performance Skills**

- Students will conduct general research and inspection.
- Students will inspect and test the Batteries (Conventional 12-Volt).
- Students will inspect and test the Starting System.
- Students will inspect and test the Charging System.
- Students will inspect and test the Lighting System.
- Students will inspect and test the Instrument Cluster and Driver Information Systems.
- Students will inspect and test the Body Electrical System.

**STRAND 6**

**Students will understand, inspect, diagnose, and service the HVAC System.**

**Standard 1**

Students will conduct general research and service.

- 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).
- Identify heating, ventilation, and air conditioning (HVAC) components and configurations.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Identify steps of an A/C performance test.
- Identify abnormal operating noises in the A/C system.
- Visually inspect A/C system for signs of leaks.
- Identify and interpret heating and air conditioning problems.

**Standard 2**

Students will inspect the HVAC Refrigeration System Components.

- Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners.
- Inspect for proper A/C condenser airflow.
- Inspect evaporator housing condensation drain.

**Standard 3**

Students will inspect the HVAC Heating, Ventilation, and Engine Cooling Systems.

- Inspect engine cooling and heater systems hoses and pipes.

**Standard 4**

Students will inspect the HVAC Operating Systems and Related Controls.

- Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets.
- Identify the source of HVAC system odors.

**Standard 5**

Students will understand HVAC Refrigerant Recovery, Recycling, and Handling.

- Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.

**Performance Skills**

- Students will conduct general research and service.
- Students will inspect the HVAC Refrigeration System Components.
- Students will inspect the HVAC Heating, Ventilation, and Engine Cooling Systems.
- Students will inspect the HVAC Operating Systems and Related Controls.
- Students will understand HVAC Refrigerant Recovery, Recycling, and Handling.

**STRAND 7**

**Students will understand, inspect, diagnose, and service the Engine Performance Systems.**

**Standard 1**

Students will conduct general research and inspection.

- 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).
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Demonstrate understanding of proper engine cooling system operation.
- Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems.

**Standard 2**

- Identify computerized control system components and configurations.

**Standard 3**

- Identify ignition system components and configurations.
- Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

**Standard 4**

Students will inspect and service the Fuel, Air Induction, and Exhaust Systems.

- Identify fuel, air induction, and exhaust system components and configurations.
- Replace fuel filter(s) where applicable.
- Inspect, service, or replace air filters, filter housings, and intake duct work.

- Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.
- Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.
- Check and refill diesel exhaust fluid (DEF).

### **Standard 5**

Students will inspect and service the Emissions Control Systems.

- Identify emission control system components and configurations.
- Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses.

### **Performance Skills**

- Students will conduct general research and inspection.
- Students will identify Computerized Controls.
- Students will identify and service Ignition Systems.
- Students will inspect and service the Fuel, Air Induction, and Exhaust Systems.
- Students will inspect and service the Emissions Control Systems.