

# STRANDS AND STANDARDS

## ASE ENGINE PERFORMANCE



### Course Description

This course is a follow up course to the ASE Engine and Chassis MLR courses and is in a sequence that prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of automotive vehicles. Instruction covers training in the following areas: safety and automotive engine performance. Work ethics and productivity are an integral part of the classroom and lab activities of these courses. This course is based on the ASE 2022 Task Lists which can be found at <https://www.aseeducationfoundation.org/resources>

<b>Intended Grade Level</b>	10-12
Units of Credit	0.5
Core Code	40-09-00-00-025
Concurrent Enrollment Core Code	40-09-00-13-025
Prerequisite	ASE ENGINE-MLR, ASE CHASSIS-MLR
Skill Certification Test Number	
Test Weight	
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive
Endorsement 2	
Endorsement 3	

## 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 inspect Engine Performance Systems.**

**Standard 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).

**Standard 2**

Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.

**Standard 3**

Verify proper engine cooling system operation; determine needed action.

**Standard 4**

Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems; determine needed action.

**Standard 5**

Identify and interpret engine performance concerns; determine needed action.

**Standard 6**

Diagnose abnormal engine noises or vibration concerns; determine needed action.

**Standard 7**

Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.

**Standard 8**

Perform engine manifold pressure tests (vacuum/boost); determine needed action.

**Standard 9**

Perform cylinder power balance test; determine needed action.

**Standard 10**

Perform cylinder cranking and running compression tests; determine needed action.

**Standard 11**

Perform cylinder leakage test; determine needed action.

**Standard 12**

Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.

**Performance Skills**

- Research applicable vehicle and service information.
- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Verify proper engine cooling system operation.
- Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems.
- Identify and interpret engine performance concerns.
- Diagnose abnormal engine noises or vibration concerns.
- Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound.
- Perform engine manifold pressure tests (vacuum/boost).
- Perform cylinder power balance test.
- Perform cylinder cranking and running compression tests.

- Perform cylinder leakage test.
- Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns.

## STRAND 5

**Students will inspect Computerized Controls.**

### Standard 1

Identify computerized control system components and configurations.

### Standard 2

Access and use service information to perform step-by-step (troubleshooting) diagnosis.

### Standard 3

Perform active tests of actuators using a scan tool; determine needed action.

### Standard 4

Describe the use of OBD monitors for repair verification.

### Standard 5

Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action.

### Standard 6

Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).

## Performance Skills

- Identify computerized control system components and configurations.
- Access and use service information to perform step-by-step (troubleshooting) diagnosis.
- Perform active tests of actuators using a scan tool
- Describe the use of OBD monitors for repair verification.
- Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool.
- Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).

## STRAND 6

**Students will inspect the Ignition System.**

### Standard 1

Identify ignition system components and configurations.

### Standard 2

Remove and replace spark plugs; inspect secondary ignition components for wear and damage; determine needed action.

**Standard 3**

Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.

**Standard 4**

Inspect and test crankshaft and camshaft position sensor(s); determine needed action.

**Standard 5**

Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed.

**Performance Skills**

- Identify ignition system components and configurations.
- Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
- Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns.
- Inspect and test crankshaft and camshaft position sensor(s).
- Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed.

**STRAND 7**

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

**Standard 1**

Identify fuel, air induction, and exhaust system components and configurations.

**Standard 2**

Replace fuel filter(s) where applicable.

**Standard 3**

Inspect, service, or replace air filters, filter housings, and intake duct work.

**Standard 4**

Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine needed action.

**Standard 5**

Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.

**Standard 6**

Check and refill diesel exhaust fluid (DEF).

**Standard 7**

Check fuel for quality, composition, and contamination; determine needed action.

**Standard 8**

Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action.

**Standard 9**

Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action.

**Standard 10**

Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.

**Standard 11**

Verify proper idle speed; determine needed action.

**Standard 12**

Perform exhaust system back-pressure test; determine needed action.

**Performance Skills**

- 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).
- Check fuel for quality, composition, and contamination.
- Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume.
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
- Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.
- Verify proper idle speed.
- Perform exhaust system back-pressure test.

**STRAND 8**

**Students will inspect Emission Control Systems.**

**Standard 1**

Identify emission control system components and configurations.

**Standard 2**

Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action.

**Standard 3**

Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.

**Standard 4**

Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system; determine needed action.

**Standard 5**

Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action.

**Standard 6**

Diagnose emissions and drivability concerns caused by catalytic converter system; determine needed action.

**Standard 7**

Diagnose emissions and drivability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.

**Standard 8**

Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.

**Performance Skills**

- Identify emission control system components and configurations.
- Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses.
- Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system.
- Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system.
- Inspect and test electrical/electronically operated components and circuits of secondary air injection systems.
- Diagnose emissions and drivability concerns caused by catalytic converter system.
- Diagnose emissions and drivability concerns caused by the evaporative emissions control (EVAP) system.
- Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems.