

# STRANDS AND STANDARDS

## ASE ENGINE PERFORMANCE



### 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 for the engines 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 these courses. The most current information can be found at the AST Task List at the following address: <https://www.asealliance.org/natef-accreditation/program-standards>.



<b>Intended Grade Level</b>	11-12
Units of Credit	0.5
Core Code	40.09.00.00.025
Concurrent Enrollment Core Code	40.09.00.13.025
Prerequisite	Introduction to Automotive
Skill Certification Test Number	Industry test 958
Test Weight	1.0
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive Service
Endorsement 2	N/A
Endorsement 3	N/A

## STRAND 1

**Students will be able to understand, identify, and properly diagnose general engine systems.**

### Standard 1

Interpret and verify complaint; determine needed repairs.

### Standard 2

Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed repairs.

### Standard 3

Diagnose the cause of unusual engine noise or vibration problems; determine needed repairs.

### Standard 4

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

### Standard 5

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

### Standard 6

Perform cylinder power balance test; determine needed action.

### Standard 7

Perform cylinder compression test; determine needed action.

### Standard 8

Perform cylinder leakage test; determine needed action.

### Standard 9

Diagnose engine mechanical problems with an ignition oscilloscope and engine analyzer; determine needed action.

- Diagnose engine electrical/electronic problems with an ignition oscilloscope and engine analyzer; determine needed action.
- Diagnose engine fuel problems with an ignition oscilloscope and engine analyzer; determine needed action.
- Diagnose engine fuel problems with an ignition oscilloscope and engine analyzer; determine needed action.

### Standard 10

Prepare and inspect vehicle and four-gas analyzer; obtain exhaust readings.

### Performance Skill

Understand, identify, and properly diagnose general engine systems.

- Interpret and verify complaint; determine needed repairs.
- Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed repairs.
- Diagnose the cause of unusual engine noise or vibration problems; determine needed repairs.
- Diagnose the cause of unusual exhaust color, odor, and sound; determine needed action.
- Perform engine absolute (vacuum/boost) manifold pressure tests; determine needed repairs.
- Perform cylinder power balance test; determine needed action.
- Perform cylinder compression test; determine needed action.
- Perform cylinder leakage test; determine needed action.
- Diagnose engine mechanical problems with an ignition oscilloscope and engine analyzer; determine needed action.

## STRAND 2

**Students will be able to understand, identify, and properly diagnose and repair computerized engine controls.**

### Standard 1

Diagnose the causes of emission problems resulting from failure of computerized engine controls.

### Standard 2

Perform analytic/diagnostic procedures on vehicles with onboard diagnostic computer systems; determine needed action.

### Standard 3

Inspect and test sensors, controls, and actuator components and circuits of computerized engine control systems; adjust or replace as needed.

### Standard 4

Obtain and interpret digital multimeter (DMM) readings.

### Standard 5

Read and interpret technical information.

### Standard 6

Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).

### Standard 7

Inspect and test power and ground circuits and connections; service or replace as needed.

### Standard 8

Practice recommended precautions when handling static sensitive devices.

### Performance Skill

Understand, identify, and properly diagnose and repair computerized engine controls.

- Diagnose the causes of emission problems resulting from failure of computerized engine controls.
- Perform analytic/diagnostic procedures on vehicles with onboard diagnostic computer systems; determine needed action.
- Inspect and test sensors, controls, and actuator components and circuits of computerized engine control systems; adjust or replace as needed.
- Obtain and interpret digital multimeter (DMM) readings.
- Read and interpret technical information.
- Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
- Inspect and test power and ground circuits and connections; service or replace as needed.
- Practice recommended precautions when handling static sensitive devices.

## STRAND 3

**Students will be able to understand, identify, and properly diagnose and repair an ignition system.**

### Standard 1

Diagnose no starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emission problems on vehicles with electronic (distributorless) systems; determine needed repairs.

- Diagnose no starting on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose hard starting problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose engine misfire problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose poor drivability problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose spark knock problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose power loss problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose poor mileage problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.
- Diagnose emission problems on vehicles with electronic ignition (distributorless) systems; determine needed repairs.

### Standard 2

Diagnose no starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emission problems on vehicles with electronic distributor ignition systems; determine needed repairs.

- Diagnose no starting problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose hard starting problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine misfire problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine poor drivability problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine spark knock problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine power loss problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine poor mileage problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Diagnose engine emission problems on vehicles with electronic distributor ignition systems; determine needed repairs.

### Standard 3

Test ignition primary circuit wiring and components; repair or replace as needed.

### Standard 4

Inspect and test distributor and service as needed.

### Standard 5

Inspect and test ignition system secondary circuit wiring and components; replace as needed.

### Standard 6

Inspect and test ignition coil(s); replace as needed.

### Standard 7

Check and adjust (where applicable) ignition system timing and timing advance/retard.

### Standard 8

Inspect and test ignition wiring harness and connectors; replace as needed.

### Standard 9

Inspect and test ignition system pickup sensor or triggering devices; replace as needed.

### Standard 10

Inspect and test ignition control module and replace as needed.

### Performance Skill

Understand, identify, and properly diagnose and repair an ignition system.

- Diagnose no starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emission problems on vehicles with electronic (distributorless) systems; determine needed repairs.
- Diagnose no starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emission problems on vehicles with electronic distributor ignition systems; determine needed repairs.
- Test ignition primary circuit wiring and components; repair or replace as needed.
- Inspect and test distributor and service as needed.
- Inspect and test ignition system secondary circuit wiring and components; replace as needed.
- Inspect and test ignition coil(s); replace as needed.
- Check and adjust (where applicable) ignition system timing and timing advance/retard.
- Inspect and test ignition wiring harness and connectors; replace as needed.
- Inspect and test ignition system pickup sensor or triggering devices; replace as needed.

## STRAND 4

**Students will be able to understand, identify, and properly diagnose and repair fuel, air induction, and exhaust systems.**

### Standard 1

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 emission problems on vehicles with carburetor-type fuel systems; determine needed action.

- Diagnose hot no starting problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose cold no starting problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose hard starting problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose poor drivability problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose incorrect idle speed problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose poor idle problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose flooding problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose hesitation problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose surging problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose engine misfire problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose power loss problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose stalling problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose poor mileage problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose dieseling problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose emission problems on vehicles with carburetor-type fuel systems; determine needed action.

### Standard 2

Diagnose hot or cold no starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine miss-fire, power loss, stalling, poor mileage, dieseling, and emission problems on vehicles with injection-type fuel systems; determine needed action.

- Diagnose hot starting problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose cold starting problems on vehicles with injection-type fuel systems; determine needed action.

- Diagnose hard starting problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose drivability problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose incorrect idle problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose poor idle problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose flooding problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose hesitation problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose surging problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose engine misfire problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose power loss problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose stalling problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose poor mileage problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose dieseling problems on vehicles with injection-type fuel systems; determine needed action.
- Diagnose emission problems on vehicles with injection-type fuel systems; determine needed action.
- Inspect fuel tank and fuel cap; inspect and replace fuel lines, fittings, and hoses.
- Check fuel for contaminants and quality.
- Inspect and test mechanical and electrical fuel pumps and pump control systems; replace as needed.
- Replace fuel filters.
- Inspect and test fuel pressure regulation system and components of injection-type fuel systems; adjust or replace as needed.
- Inspect and test cold enrichment system components; adjust or replace as needed.
- Remove, clean, and reinstall throttle body; adjust related linkages.
- Inspect and test fuel injectors; clean or replace as needed.
- Inspect throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets; clean or replace as needed.
- Check/adjust idle speed and fuel mixture where applicable.
- Remove, inspect, and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
- Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.

### Performance Skill

Understand, identify, and properly diagnose and repair fuel, air induction, and exhaust systems.

- 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 emission problems on vehicles with carburetor-type fuel systems; determine needed action.
- Diagnose hot or cold no starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine miss-fire, power loss, stalling, poor mileage, dieseling, and emission problems on vehicles with injection-type fuel systems; determine needed action.

## STRAND 5

**Students will be able to understand, identify, and properly diagnose and repair emission control systems.**

### Standard 1

Positive crankcase ventilation.

- Diagnose the cause(s) of emission problems resulting from failure of the positive crankcase ventilation system.
- Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.

### Standard 2

Spark timing controls.

- Diagnose the cause(s) of emission problems resulting from failure of the spark timing control system.
- Inspect and test circuits of spark timing control systems; replace as needed.

### Standard 3

Idle and deceleration speed controls.

- Diagnose the cause(s) of emission problems resulting from failure of the idle and deceleration speed control system.
- Inspect and test wiring, hoses, and components of idle speed control systems; adjust or replace as needed.
- Inspect and test electrical components, circuits, vacuum components, and hoses of deceleration controls; adjust or replace as needed.

### Standard 4

Exhaust gas re-circulation.

- Diagnose the cause(s) of emission problems caused by failure of the exhaust gas re-circulation (EGR) system.
- Inspect and test valve, valve manifold, and exhaust passages of exhaust gas re-circulation (EGR) systems; service or replace as needed.

- Inspect and test vacuum/pressure controls, filters, and hoses of exhaust gas re-circulation (EGR) systems; service or replace as needed.
- Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas re-circulation (EGR) systems; repair or replace as needed.

### Standard 5

Exhaust gas treatment.

- Diagnose the cause(s) of emission problems resulting from failure of the air injection or catalytic converter systems.
- Inspect and test mechanical components of air injection systems; service or replace as needed.
- Inspect and test electrical/electronically operated components and circuits of air injection systems; replace as needed.
- Inspect and test components of catalytic converter systems; replace as needed.

### Standard 6

Intake air temperature controls.

- Diagnose the cause(s) of emission problems resulting from failure of the intake air temperature control systems.
- Inspect and test components of intake air temperature control systems; replace as needed.

### Standard 7

Early fuel evaporation (intake manifold temperature).

- Diagnose the cause(s) of emission problems resulting from failure of early fuel evaporation control systems.
- Inspect and test components of early fuel evaporation control systems; service or replace as needed.

### Standard 8

Evaporative emission controls.

- Diagnose the cause(s) of emission problems resulting from failure of evaporative emission control system.
- Inspect and test components and hoses of evaporative emission control systems; replace as needed.

### Performance Skill

Understand, identify, and properly diagnose and repair emission control systems.

- Positive crankcase ventilation.
- Spark timing controls.
- Idle and deceleration speed controls.
- Exhaust gas re-circulation.
- Exhaust gas treatment.
- Intake air temperature controls.

- Early fuel evaporation (intake manifold temperature).
- Evaporative emission controls.

## STRAND 6

**Students will be able to understand, identify, and properly complete an engine-related service.**

### Standard 1

Adjust valves on engines with mechanical or hydraulic lifters.

### Standard 2

Verify correct camshaft timing; determine needed action.

### Standard 3

Verify engine operating temperature; determine needed action.

### Standard 4

Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; service or replace as needed.

### Standard 5

Inspect and test thermostat, by-pass, and housing; replace as needed.

### Standard 6

Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, and fan control devices; service or replace as needed.

### Performance Skill

Understand, identify, and properly complete an engine-related service.

- Adjust valves on engines with mechanical or hydraulic lifters.
- Verify correct camshaft timing; determine needed action.
- Verify engine operating temperature; determine needed action.
- Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; service or replace as needed.
- Inspect and test thermostat, by-pass, and housing; replace as needed.
- Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, and fan control devices; service or replace as needed.

## STRAND 7

**Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 2.**

### Standard 1

Understand and demonstrate reliability.

- Determine individual time management skills.
- Explore what's ethical in the workplace or school.
- Demonstrate awareness of government.
- Demonstrate awareness of professional organizations and trade unions.

### Standard 2

Understand and demonstrate responsiveness.

- Define the customer.
- Recognize benefits of doing a community service project.
- Demonstrate social etiquette.
- Identify customer expectations.

### Standard 3

Understand resiliency.

- Discover self-motivation techniques and establish short-term goals.
- Select characters of a positive image.
- Identify a mentor.

### Standard 4

Understand and demonstrate workplace habits.

- Participate in a shadowing activity.
- Explore workplace ethics: codes of conduct.
- Recognize safety issues.
- Perform a skill demonstration.
- Exercise your right to know.

### Standard 5

Understand and develop initiative.

- Develop personal financial skills.
- Develop a business plan.
- Investigate entrepreneurship opportunities.

### Standard 6

Understand and demonstrate continuous improvement.

- Conduct a worker interview.
- Demonstrate evaluation skills.
- Examine ethics and values in the workplace.

- Develop a working relationship with a mentor.
- Construct a job search network.

## STRAND 8

**Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 3.**

### Standard 1

Understand and develop collaboration skills.

- Develop a working relationship with a mentor.
- Apply supervisory skills.
- Manage a project and evaluate others.

### Standard 2

Understand and demonstrate change management skills.

- Evaluate your career and training goals.
- Identify and apply conflict resolution skills.
- Illustrate an organizational structure.
- Plan and implement a leadership project.

### Standard 3

Understand how customer service applies to the workplace.

- Serve as a volunteer in the community.
- Examine workplace ethics: the role of values in making decisions.
- Understand the cost of customer service.
- Develop customer service skills.
- Maximize customer service skills.

### Standard 4

Understand and demonstrate career readiness.

- Market your career choice.
- Research resume writing.
- Demonstrate interviewing skills.
- Predict employment trends.
- Re-evaluate career goals and establish long-term goals.
- Construct a job search network.
- Evaluate professional competencies.
- Analyze your entry-level job skills.
- Design and present a lesson plan on an aspect of your career choice.
- Write an article for a professional journal in your career area.
- Refine your employment portfolio.