

# STRANDS AND STANDARDS

## SMALL ENGINE REPAIR



### Course Description

This is a course that prepares individuals to apply technical knowledge and skill to maintain and repair small internal-combustion engines used on portable power equipment, such as lawn and garden equipment. Work ethics, productivity, and safety are an integral part of the classroom and laboratory activities of these classes.

<b>Intended Grade Level</b>	10-12
Units of Credit	0.5
Core Code	40.09.00.00.090
Concurrent Enrollment Core Code	N/A
Prerequisite	None
Skill Certification Test Number	501
Test Weight	0.5
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Small Vehicle Technician
Endorsement 2	N/A
Endorsement 3	N/A



## STRAND 1

**Students will be able to understand 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 when working with chemicals.

- Chemical manufacturers provide a Material Safety Data Sheets (MSDS) for each chemical they produce
- Store chemicals in properly labeled containers

### Standard 3

Identify the harmful exhaust gasses encountered in the small engine field and the hazards they present.

- Hydrocarbons (HC) and carbon monoxide (CO)

### Performance Skill

Understand general shop safety.

- Learn safe working habits and procedures. Pass a safety test with 100 percent.
- Comply with safety rules when working with chemicals.
- Identify the harmful exhaust gasses encountered in the small engine field and the hazards they present.

## STRAND 2

**Students will be able to understand basic hand tools, fasteners, and shop equipment.**

### Standard 1

Identify, size, and measure metric and standard fasteners.

- Bolts, nuts, lock washers, keys, cotter pins, and snap rings
- Right-hand and left-hand threads, and course and fine threads

### Standard 2

Correctly identify and use basic hand tools.

- Screwdrivers, wrench, sockets, drive handles, extensions, pliers, hammer, chisels, punches, files, hacksaw, pullers, vises, drill bits, grinding tools
- Describe the use of each of the above tools

### Standard 3

Identify and demonstrate use of basic measuring tools (accurate to 1/32 or 1mm).

- Micrometers, rulers, feeler gauges compression gauges, and digital multi meter (DMM)

### Standard 4

Use reference manuals or information systems to find service procedures and specifications.

- Computer oriented
- Printed manuals
- Owner's manuals

### Performance Skill

Understand basic hand tools, fasteners, and shop equipment.

- Identify, size, and measure metric and standard fasteners.
- Correctly identify and use basic hand tools.
- Identify and demonstrate use of basic measuring tools (accurate to 1/32 or 1mm).
- Use reference manuals or information systems to find service procedures and specifications.

## STRAND 3

**Students will be able to identify and perform basic services on a small engine.**

### Standard 1

Locate and identify basic engine components.

- Identify engine components
  - Block, crankshaft, camshaft, piston, piston rings, cylinder head, connecting rod, valve train, timing components
  - Fuel systems: carburetor, fuel filter, lines, tank
  - Ignition systems: spark plug, magneto, coil
  - Cooling system: cooling fins, shroud, and flywheel
  - Lubrication system: dip stick, oil slinger or pump, oil plug, oil
  - Exhaust system: muffler, exhaust gasket

### Standard 2

Change engine oil and filter on a small engine. Use proper disposal methods for waste oil.

- Check fuel filter
- Check air filter
- Change and gap spark plug
- Remove and sharpen lawn mower blade
- Check oil level
- Perform an oil change

### Standard 3

Understand the four stroke cycle.

- Intake
- Compression
- Power
- Exhaust

### Standard 4

Understand the two stroke cycle.

- Intake/compression
- Power/exhaust
- Explain the differences and similarities between 2-cycle and 4-cycle engines
- Intake and exhaust ports on 2-cycle engines versus valves on 4-cycle engines
- Correctly mix 2-cycle oil and gasoline mixture

### Performance Skill

Identify and perform basic services on a small engine.

- Locate and identify basic engine components.
- Change engine oil and filter on a small engine. Use proper disposal methods for waste oil.
- Understand the four stroke cycle.
- Understand the two stroke cycle.

## STRAND 4

**Students will be able to perform a diagnosis on a small engine.**

### Standard 1

Understand combustion, internal and external, as it relates to the four elements of combustion.

- Fuel
- Air
- Compression
- Spark

### Standard 2

Troubleshoot fuel system problems.

- Carburetor
- Fuel tank/filter
- Fuel lines/pumps
- Air filter/box
- Color of exhaust

### Standard 3

Troubleshoot ignition system problems.

- Perform spark test

- Remove and replace spark plug
- Check and gap spark plug
- Check magneto, air gap, and kill-wire
- Timing

### Standard 4

Troubleshoot compression problems.

- Perform a compression test
- Define a wet test
- Perform a cylinder leak-down test

### Standard 5

Troubleshoot lubrication system.

- Oil specifications
- Burnt oil
- Inspection for the crankcase
- Color of exhaust

### Performance Skill

Perform a diagnosis on a small engine.

- Understand combustion, internal and external, as it relates to the four elements of combustion.
- Troubleshoot fuel system problems.
- Troubleshoot ignition system problems.
- Troubleshoot compression problems.
- Troubleshoot lubrication system.

## STRAND 5

**Students will be able to disassemble and reassemble a small gas engine.**

### Standard 1

Identify major small gas engine components and parts.

- Cylinder block
- Side cover
- Cylinder
- Crankshaft and crank gear
- Connecting rod
- Bearing
- Piston
- Piston-pin (wrist-pin)
- Rings (compression ring/oil control ring)
- Tappets/lifters
- Valves (intake/exhaust)

- Valve spring and valve retainer
- Camshaft
- Cylinder head
- Head gasket
- Reed valve (2-stroke)

### Standard 2

Disassemble a small gas engine.

### Standard 3

Inspect major small gas engine components and parts.

- Cylinder head torque pattern
- Inspect the cylinder
- Ring end gap
- Inspect the piston
- Connecting rod, bearing clearance (plastic gauge)
- Check crankshaft endplay
- Check valve clearance
- Inspect valve and valve seat

### Standard 4

Recondition, repair, or replace components and parts.

### Standard 5

Reassemble a small gas engine.

### Performance Skill

Disassemble and reassemble a small gas engine.

- Identify major small gas engine components and parts.
- Disassemble a small gas engine.
- Inspect major small gas engine components and parts
- Recondition, repair, or replace components and parts.
- Reassemble a small gas engine.

## STRAND 6

**Students will be able to solve basic mathematical equations related to automotive.**

### Standard 1

Solve whole number problems with two- and three-digits.

- Addition
- Subtraction
- Multiplication
- Division

### Standard 2

Solve fraction problems.

- Addition
- Subtraction
- Multiplication
- Division

### Standard 3

Solve decimal problems with two- and three-digits.

- Addition
- Subtraction
- Multiplication
- Division

### Standard 4

Solve basic ration-to-proportion problems.

- Fuel/air mixture
- Oil/gas mixture

### Performance Skill

Solve basic mathematical equations related to automotive.

- Solve whole number problems with two- and three-digits.
- Solve fraction problems.
- Solve decimal problems with two- and three-digits.
- Solve basic ration-to-proportion problems.

## STRAND 7

**Students will be able to understand the importance of employability and work habits.**

### Standard 1

Integrity

### Standard 2

Punctuality

### Standard 3

Staying on task

### Standard 4

Productive team work

### Standard 5

Leadership

## STRAND 8

Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 1.

### Standard 1

Understand and demonstrate the attitude of cooperation.

- Develop awareness of cultural diversity and equality issues.
- Demonstrate effective communication with others.
- Apply team skills to a group project.
- Identify and apply conflict resolution skills.

### Standard 2

Understand and demonstrate the ability of being resourceful and innovative.

- Discover self-motivation techniques and establish short-term goals.
- Measure/modify short-term goals.
- Review a professional journal and develop a three- to five-minute presentation.

### Standard 3

Plan for your future career.

- Complete a self-assessment and identify individual learning styles.
- Define future occupations.
- Identify the components of an employment portfolio.
- List proficiency in program competencies.
- Complete a survey for employment opportunities.
- Create a job application.
- Assemble your employment portfolio.
- Employability skills: evaluate program comprehension.

### Standard 4

Understand and demonstrate the ability to manage a project.

- Apply team skills to a group project.
- Observe and critique a meeting.
- Demonstrate business meeting skills.
- Explore supervisory and management roles in an organization.
- Identify and apply conflict resolution skills.
- Demonstrate evaluation skills.
- Manage a project and evaluate others.

## Skill Certificate Test Points by Strand

Test Name	Test #	Number of Test Points by Strand								Total Points	Total Questions
		1	2	3	4	5	6	7	8		
Small Engine Repair	501	5	14	12	8	6	9	0	0	54	40