

# 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 Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive Services
Endorsement 2	Small Engine Technician
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**

Comply with safety rules when working with chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) 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)

**STRAND 3**

**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 Safety Data Sheets (SDS) 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 Skills**

- 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 4**

**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 Skills**

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 5**

**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 parts (needle, float, bowl), 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 replace 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 Skills**

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 6**

**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 (needle, bowl, and float)
- Fuel tank/filter
- Fuel lines/pumps
- Air filter/box
- Color of exhaust
  - White = coolant
  - Blue = oil
  - Black = fuel

**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
- Top Dead Center (TDC)
- Bottom Dead Center (BDC)

**Standard 4**

Troubleshoot compression problems.

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

**Standard 5**

Troubleshoot lubrication system.

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

**Performance Skills**

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 7**

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

**Standard 1**

Identify major small gas engine components and parts.

- |   |                                   |
|---|-----------------------------------|
| • Cylinder block                            | • Valve spring and valve retainer |
| • Side cover                                | • Camshaft                        |
| • Cylinder                                  | • Cylinder head                   |
| • Crankshaft and crank gear                 | • Head gasket                     |
| • Connecting rod                            | • Reed valve (2-stroke)           |
| • Connecting rod journal                    | • Power Take Off (PTO)            |
| • Bearing                                   | • Counterweight                   |
| • Piston                                    | • Flywheel                        |
| • Piston-pin (wrist-pin)                    | • Flywheel journal                |
| • Rings (compression ring/oil control ring) | • Push rod                        |
| • Tappets/lifters                           | • Rocker arm                      |
| • Valves (intake/exhaust)                   |                                   |

**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 (plastigage)

- 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 Skills**

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 8**

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

#### **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 ratio-to-proportion problems.

- Fuel/air mixture
- Oil/gas mixture

## Performance Skills

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 ratio-to-proportion problems.

## Skill Certification 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	9	10		