SMALL ENGINES I (501)

DESCRIPTION

This is a course that prepared 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.

Total Test Questions: 40	Levels: Grades 10-12	Units of Credit: .50
Prerequisites: None		

STANDARDS, OBJECTIVES, AND INDICATORS

STANDARD 1 — 9% of Exam Blueprint

- **STUDENTS WILL BE ABLE TO UNDERSTAND GENERAL SHOP SAFETY.**

Objective 1: Learn safe working habits and procedures. Pass a safety test with 100 percent.

- Personal safety
- Tool and equipment safety
- Workplace safety

Objective 2: Comply with safety rules for working with automotive chemicals.

- Chemical manufacturers provide a material safety data sheet (MSDS) for each chemical they produce.
- Store chemicals in properly labeled containers.

Objective 3: Identify the harmful exhaust gasses encountered in the small engine field and the hazards they present.

- Hydrocarbons (HC) and carbon monoxide (CO)

STANDARD 2 — 26% of Exam Blueprint

- **STUDENTS WILL BE ABLE TO UNDERSTAND BASIC HAND TOOLS, FASTENERS, AND SHOP EQUIPMENT.**

Objective 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

Objective 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.

Objective 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).

Objective 4: Use reference manuals or information systems to find service procedures and specifications.

- Computer oriented
- Printed manuals
- Owner's manuals

STANDARD 3 — 22% of Exam Blueprint

STUDENTS WILL BE ABLE TO IDENTIFY AND PERFORM BASIC SERVICES ON A SMALL ENGINE.

Objective 1: Locate and identify basic engine components.

1. 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.

Objective 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.

Objective 3: Understand the four-stroke cycle.

- Intake
- Compression
- Power
- Exhaust

Objective 4: Understand the two stoke 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.

STANDARD 4 — 15% of Exam Blueprint

- **STUDENTS WILL BE ABLE TO PERFORM A DIAGNOSIS ON A SMALL ENGINE.**

Objective 1: Understand combustion, internal and external as it relates to the four elements of combustion.

- Fuel
- Air
- Compression
- Spark

Objective 2: Troubleshoot fuel system problems.

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

Objective 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

Objective 4: Troubleshoot compression problems.

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

Objective 5: Troubleshoot lubrication system.

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

STANDARD 5 — 11% of Exam Blueprint

- **STUDENTS WILL BE ABLE TO DISASSEMBLE AND REASSEMBLE A SMALL GAS ENGINE.**

Objective 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)

Objective 2: Disassemble a small gas engine.

Objective 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.

Objective 4: Recondition, repair, or replace components and parts.

Objective 5: Reassemble a small gas engine.

STANDARD 6 — 17% of Exam Blueprint

STUDENTS WILL BE ABLE TO SOLVE BASIC MATHEMATICAL EQUATIONS RELATED TO SMALL ENGINES.

Objective 1: Solve whole number problems with two- and three-digits.

- Addition
- Subtraction
- Multiplication
- Division

Objective 2: Solve fraction problems.

- Addition
- Subtraction
- Multiplication
- Division

Objective 3: Solve decimal problems with two- and three-digits.

- Addition
- Subtraction
- Multiplication
- Division

Objective 4: Solve basic ratio-to-proportion problems.

- Fuel/air mixture
- Oil/gas mixture

STANDARD 7

STUDENTS WILL BE ABLE TO UNDERSTAND THE IMPORTANCE OF EMPLOYABILITY AND WORK HABITS.

Objective 1: Integrity

Objective 2: Punctuality

Objective 3: Staying on task

Objective 4: Productive team worker

Objective 5: Leadership

STANDARD 8

STUDENTS WILL GAIN AN UNDERSTANDING OF SMALL ENGINE REPAIR AS A PROFESSION AND WILL DEVELOP PROFESSIONAL SKILLS FOR THE WORKPLACE.

Objective 1: As a participating member of the SkillsUSA student organization, complete the SkillsUSA Level 1 Professional Development Program.

- Complete a self-assessment inventory and identify individual learning styles.
- Discover self-motivation techniques and establish short-term goals.
- Determine individual time-management skills.
- Define future occupations.
- Define awareness of cultural diversity and equity issues.
- Recognize the benefits of conducting a community service project.
- Demonstrate effective communication skills with others.
- Participate in a shadowing activity.
- Identify components of an employment portfolio.
- Explore what is ethical in the workplace or school.
- Demonstrate proficiency in program competencies.
- Master a working knowledge of SkillsUSA.
    - State the SkillsUSA motto.
    - State the SkillsUSA creed.
    - Learn the SkillsUSA colors.
    - Describe the official SkillsUSA dress.
    - Describe the procedure for becoming a SkillsUSA officer.

Objective 2: Understand the use of the skills obtained in small engine repair and how they relate to career opportunities.

Objective 3: Display a professional attitude toward the instructor and peers.

*SkillsUSA PDP requirements – recommended