Small Gas Engines & Landscaping

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

During the warmer months of the year, this course includes the basic techniques of landscape design, construction, installation, and maintenance in addition to the study of soils and fertilizers used in sod production. Also included are the skills needed for the establishment and maintenance of turf.

During the cooler months of the year, this course develops skills in the maintenance, repair, adjustment and overhaul of small engines.

Scope And Sequence

Timeframe	Unit	Instructional Topics
11 Day(s)	Equipment, Supplies, & Safety	1. Safety in the Small Gas Engines Shop 2. Tools and Measuring Instruments 3. Fasteners, Sealants, and Gaskets 4. Fundamentals of Electricity, Magnetism, and Electronics
20 Day(s)	Basics of Engine Operation	1. Principles of Engine Operation, Two- and Four-Stroke Engines 2. Engine Components 3. Measuring Engine Performance
20 Day(s)	Engine Systems	1. Fuel Supply, Air Induction, and Emissions 2. Carburation 3. Ignition Systems 4. Lubrication Systems 5. Cooling Systems
40 Day(s)	Engine Service	1. Preventive Maintenance and Troubleshooting 2. Fuel System Service 3. Ignition and Electrical System Service 4. Engine Disassembly and Inspection 5. Cylinder, Crankshaft, and Piston Service 6. Camshaft and Valve Train Service 7. Engine Reassembly and Break-in
4 Period(s)	Applications	1. Lawn and Brush Equipment 2. Lawn and Garden Tractors 3. Snow Throwers 4. Career Opportunities and Certification

Prerequisites

Agricultural Science I. Agriculture Science II is a pre- or co-requisite class.

Course Details

Unit: Equipment, Supplies, & Safety

Duration: 11 Day(s)

Unit Description

This unit covers the basics of safety, tools, consumables, and the fundamentals of electricity used in the small gas engines shop.

Academic Vocabulary

Carbon monoxide
Dead man switch
Earplugs
face shield
fire extinguishers
flashpoint
headphone-type protectors
hydrogen gas
material safety data sheets (MSDS)
Occupational Safety and Health Administration (OSHA)
respirators
safety glasses
safety goggles
safety shoes
adjustable wrench
Allen wrench
box-end wrench
combination slip-joint pliers
combination wrench

compression testers
cylinder hones
diagonal side-cutting pliers
drift punch
feeler gauges
files
glaze breakers
hacksaws
lapping sticks
needle nose pliers
offset screwdriver
open-end wrench
Phillips screwdrivers
pin punches
reamers
ridge reamer
ring compressor
ring expanders
ring spreaders
safe files
socket sets
spark testers
tachometers
torque
torque wrench
tubing wrench
valve spring compressors
vise-grips
acorn nuts
anaerobic sealants
antiseize compounds
bolt grades
bolt head size
bolt length
bolt size
bolts
cap screws
castle nut
die stock
flat washers
form-in-place sealants
gaskets
grip length
hexagon nuts
jam nut
kantlink washer
keys
lock nuts
lock washers
machine screws
metric (M) series
pins
retaining rings
room temperature vulcanizing sealant (RTV)
screws
self-tapping screws
set screws
square nuts
taper tap
tapping
tensile strength
thread
thread pitch
threading
through hole
toothed washers
Unified National Coarse (UNC) series
Unified National Fine (UNF) series

wide bearing lock washer
wing nuts
alternating current (AC)
ammeters
ampere (A)
atom
base
bound electrons
circuit breakers
collector
conductors
direct current (DC)
domains
electronics
electrons
emitter
forward biased
free electrons
fuses
fusible link
insulator
jumper wires
magnetic field
multimeter
neutrons
Ohm's law
ohmmeters
ohms (Ω)
parallel circuits
peak inverse voltage
protons
relay
reverse biased
semiconductor diode
semiconductor material
series circuit
series-parallel circuits
silicon controlled rectifier
solenoid
solid state
switch
test light
transformer
transistor
voltmeters
volts (V)

Summative Assessment

Chapter Quizzes

Materials and Resources (optional)

Text

- Small Gas Engines: Fundamentals, Service, Troubleshooting, Repair, Applications 10th Edition

Workbook

- Review Questions, Job 1, *Shop Safety*

Instructor's Resources

- RM 1-1: *Fire Extinguishers and Fire Classifications*
- RM 1-2*: Hazardous Material Reference Chart*
- Chapter Quiz

Materials

- 3 Micrometer Sets

- Telescoping Gauges
- Various pieces of trash to measure

Topic: Safety in the Small Gas Engines Shop

Duration: 2 Period(s)

Topic Description (short)

You may encounter dangerous situations whenever you work in a small engine shop. Special precautions should be taken when working with small engines. It is important to recognize potential hazards and to take the steps necessary to make sure your work area is safe.

Learning Targets

1. Explain why a clean, well-organized shop is extremely important.
2. List several dangers associated with working in a small engine shop.
3. Explain the importance of maintaining and using tools properly.
4. Describe methods for minimizing the risks involved in working with small engines.
5. Explain the function of OSHA.

Formative Assessment

Paper and pencil quiz.

Materials and Resources

Text

Small Gas Engines: Fundamentals, Service, Troubleshooting, Repair, Applications 10th Edition

Workbook

Review Questions, Job 1, Shop Safety

Instructor's Resources

RM 1-1: Fire Extinguishers and Fire Classifications
RM 1-2: Hazardous Material Reference Chart
Chapter Quiz

Materials

3 Micrometer Sets
Telescoping Gauges
Various pieces of trash to measure

Learning Targets

The students will demonstrate mastery of the topic by scoring 80% or above on the end of chapter exam.

Learning Targets linked to Priority Standard = ✣

Topic: Tools and Measuring Instruments

Duration: 4 Day(s)

Topic Description (short)

This topic will how to use common tools in the small gas engines shop.

Learning Targets

1. Identify common hand tools.
2. Use common hand tools properly.
3. Identify common engine service tools.
4. Identify power tools commonly used for small engine and outdoor power equipment service.
5. Differentiate between common precision measuring instruments.
6. Select and use the appropriate precision measuring instruments and accurately and precisely measure various engine components.

Formative Assessment

Review Questions, Text, p. 52
Chapter 2 Quiz

Materials and Resources

Suggested Activities, Text, p. 52
Workbook, pp. 11–16
Job 2: *Shop Hand Tool Identification and Use*, Workbook, pp. 145-148
Reproducible Master 2-1: *Reading a Standard US Customary Micrometer*
Reproducible Master 2-2: *Reading a Vernier Micrometer*
Reproducible Master 2-3: *Reading a Metric Micrometer*
Reproducible Master 2-4: *Handling a Micrometer*
Lesson Slide 2-1: *Parts of an Outside Micrometer*
Lesson Slide 2-2: Parts of a Dial Caliper
Reading a Micrometer Worksheet

Learning Targets

Students will demonstrate mastery of this subject by scoring 80% on the chapter quiz.

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Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course
Learning Targets linked to Priority Standard = ✠

Topic: Fasteners, Sealants, and Gaskets **Duration:** 3 Day(s)

Topic Description (short)
This topic discusses fasteners used in the assembly of small gas engines.

Learning Targets
1. Identify fasteners used on small gas engines and implements.
2. Remove and install various fasteners correctly.
3. Repair or produce internal and external threads.
4. Properly select and install fasteners.
5. Remove, select, and install gaskets correctly.

Formative Assessment
Chapter 3 quiz.

Materials and Resources
Workbook, pp. 17-22
Reproducible Master 3-1: *General Torque Specifications in Consideration of Fastener Quality*
Reproducible Master 3-2: *Drill Sizes for Machine Screw Threads*
Reproducible Master 3-3: *Tap Drill Sizes for Fractional Size Threads*
Reproducible Master 3-4: *Metric Tap Drill Size*
Lesson Slide 3-1: *Thread Terminology*
Lesson Slide 3-2: *Tapping Tools*
Tap and Die Set
Welding coupons

Learning Targets
Students will demonstrate mastery of this topic by scoring 80% on the chapter quiz and cutting threads on a 1/4"-20 bolt and drilling and tapping the matching female threads.

Learning Targets linked to Priority Standard = ✠

Topic: Fundamentals of Electricity, Magnetism, and Electronics **Duration:** 2 Day(s)

Topic Description (short)
Small gasoline engines rely on a spark produced by the ignition system to ignite a mixture of gasoline and air to provide power. Additionally, many small engine-powered implements contain electrical systems, such as lighting systems, starting systems, and charging systems.

To fully understand how these systems operate, as well as how to troubleshoot and repair them, a basic understanding of the principles of electricity, magnetism, and electronics is necessary. This topic will provide the student with the information needed to understand the material presented later in the course. It will also detail the most common electrical and electronic components encountered in small engine applications and describe the use of common electrical test equipment.

Learning Targets
1. Describe the structure of an atom.
2. Explain the relationship between free electrons and current flow.
3. Summarize the three basic units of electrical measurement.
4. Describe the characteristics of series, parallel, and series-parallel circuits.
5. Recall and apply Ohm's law.
6. Explain the relationships between magnetism and electricity.
7. Explain the construction and operation of diodes, transistors, and silicon controlled rectifiers.

Formative Assessment
Chapter 4 quiz.

Materials and Resources
Workbook, pp. 23-28
Reproducible Master 4-1: *Circuit Types*
Reproducible Master 4-2: *Measuring Voltage, Current, and Resistance*
Lesson Slide 4-1: *Copper Atom*
Lesson Slide 4-2: *Transformer Operation*
Lesson Slide 4-3: *Circuit Protection Devices*

Learning Targets
Students will demonstrate mastery of the topic by scoring 80% or above on the chapter quiz.

Learning Targets linked to Priority Standard = ✠

Unit: Basics of Engine Operation **Duration:** 20 Day(s)

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Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Unit Description

This unit covers the principles of engine operation, two- and four-stroke engines, engine components, and measuring engine performance.

Academic Vocabulary

atomization
bottom dead center (BDC)
compression ratio
compression stroke
cross-scavenged
exhaust stroke
four-stroke engine
intake stroke
antifriction bearings
automatic compression release
camshaft
compression rings
connecting rod
cooling fins
crankcase
crankcase seals
crankshaft
crankshaft throw
cylinder block
engine block
floating rings
flywheel
friction bearings
lands
oil control rings
overhead cam (OHC)
overhead valve (OHV)
pin boss
pinned rings
piston
piston pin
piston skirt
poppet valve
porting
pushrods
reed valve
rewind starter assembly
ring tension
rocker arms
rotary valves
slap
snap rings
sump
thrust surfaces
valve guide
valve lifter
valve spring
valve train
valve-in-block
wrist pin

internal combustion engine
loop-scavenged
power stroke
stroke
top dead center
two-stroke engine
valve overlap
antifriction bearings
automatic compression release
camshaft
compression rings
connecting rod
cooling fins
crankcase

crankcase seals
crankshaft
crankshaft throw
cylinder block
engine block
floating rings
flywheel
friction bearings
lands
oil control rings
overhead cam (OHC)
overhead valve (OHV)
pin boss
pinned rings
piston
piston pin
piston rings
piston skirt
poppet valve
porting
pushrods
reed valve
rewind starter assembly
ring tension
rocker arms
rotary valves
slap
snap rings
sump
thrust surfaces
valve guide
valve lifter
valve spring
valve train
valve-in-block
wrist pin
brake horsepower (bhp)
corrected horsepower
crank offset
dynamometer
engine bore
frictional horsepower (fhp)
horsepower
indicated horsepower (ihp)
inertia
mean effective pressure (mep)
mechanical efficiency
over square
performance
power
practical efficiency
pressure
Prony brake
rated horsepower
reciprocating engines
square
stroke
tensile stress
thermal efficiency
top dead center (TDC)
under square

Topic: Principles of Engine Operation, Two- and Four-Stroke Engines **Duration:** 3 Day(s)

Topic Description (short)

A gasoline-fueled engine is a mechanism designed to transform the chemical energy of burning fuel into mechanical energy. In operation, it controls and applies this energy to mow lawns, cut trees, propel tractors, and perform many other labor saving jobs. This topic explores the basic principles of how internal combustion engines operate.

Learning Targets

1. Explain simple engine operation.
2. Explain why gasoline is atomized in the small engine.
3. Describe four-stroke engine operation and explain the purpose of each stroke.
4. Explain the concept of valve timing.
5. Compare the lubrication system in a four-cycle engine to the system in a two-stroke engine.
6. Describe two-stroke engine operation and explain the principles of two-cycle operation.
7. List the advantages and disadvantages of two-stroke and four-stroke engines.

Formative Assessment

Chapter 5 quiz.

Materials and Resources

Review Questions, Text, p. 107
Workbook, pp. 29-34
Reproducible Master 5-1: *Simple Engine*
Reproducible Master 5-2: *Four-Stroke Operating Cycle*
Reproducible Master 5-3: *Characteristics of Two- and Four-Stroke Engines*
Lesson Slide 5-1: *Four-Stroke Sequence of Events*
Lesson Slide 5-2: Two-Stroke Sequence of Events
YouTube video "Basics of 4-stroke engines"

Learning Targets

Students will demonstrate mastery of this topic by passing the chapter 5 exam with an 80% of higher.

Learning Targets linked to Priority Standard = ✣

Topic: Engine Components

Duration: 6 Period(s)

Topic Description (short)

This topic will discuss the various components used in four- and two-stroke engines.

Learning Targets

After studying this chapter, student will be able to:

1. Identify the basic components of a small engine and describe the function of each component.
2. Describe engine block variations.
3. Describe the construction and operation of the crankshaft.
4. Explain piston design considerations and differentiate between types of piston rings.
5. Describe connecting rod and bearing variations.
6. Identify common valve train configurations.

Formative Assessment

1. Part ID presentation
2. Paper and pencil quiz.

Materials and Resources

Engine parts.

Learning Targets

The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✣

Topic: Measuring Engine Performance

Duration: 4 Period(s)

Topic Description (short)

This topic will introduce students to the concepts of horsepower, torque, and mechanical advantage and teach them how to quantify those performance indicators of a small gas engine.

Learning Targets

After studying this chapter, students will be able to:

1. Define engine performance.
2. Define and compute bore and stroke.
3. Understand the concept of energy and differentiate between kinetic and potential energy.
4. Understand the concepts of force and pressure.
5. Explain the concepts of work, power, and torque.
6. Understand how levers and belt-and-pulley, chain-and-sprocket, and gear systems provide mechanical advantage.
7. Calculate an engine's displacement and compression ratio.
8. Differentiate between the various types of engine horsepower.
9. Define and calculate engine torque.

10. Explain volumetric efficiency, practical efficiency, mechanical efficiency, and thermal efficiency.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
PowerPoint Presentation.
Guided Notes.
Follow-along math.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✙

Unit: Engine Systems
Duration: 20 Day(s)

Unit Description
This unit covers fuel and air supply, carburetion, ignition, lubrication, and cooling systems.

Academic Vocabulary
California Air Resources Board (CARB)
diesel fuel
dry-type air cleaners
dual-element air cleaners
Environmental Protection Agency (EPA)
fuel pick-up line
fuel pumps
muffler
octane number
oil-wetted air cleaner
oxygenerates
premium unleaded super unleaded
absolute vacuum
acceperation well
air-fuel mixture
air vane (pneumatic) governor
atmospheric pressure
carburetor
centrifugal (mechanical) governor
choke
downdraft carburtors
dry bulb primers
economizer circuit
flash
hunting
idling circuit
load adjusting needle
natural draft carburetor
sensitivity
stability
throttle
updraft carburetors
vacuum
vacuum governor
venturi
wet bulb primers
Alnico
auto-transformer-type ignition coil
capactive discharge ignition (CDI) system
center electrode
condenser
dry-charged batteries
dwell (cam angle)
electronic switching devices
flashover
heat ranges
ignition advance system
ignition coil
insulator

magneto systems
mechanical breaker point ignition (MBI) magneto system
mechanical breaker points
reach
spark plug
spark plug wire
transistor-controlled ignition (TCI) system
tungsten
wet-charged batteries
API engine oil service classification symbol
API engine oil service classification system
babbitt
barrel pump system
boundary lubrication
bypass filter system
constant level splash system
detergent/dispersant additives
dipper
ejection pump system
full-flow filter system
hydrodynamic lubrication
low-oil warning devices
lubrication
multigrade
multiviscosity
oil slinger
oils
positive displacement oil pumps
pressurized lubrication system
shunt filter system
splash lubrication system
viscosity
viscosity index (V.I.)
centrifugal force
conduction
convection
coolant
cooling fins
plunger pump
pressure-vacuum water flow system
pressurized cooling system
radiator
radiator cap
radiator core
rotor-type pump
sliding vane pump
thermostat
vari-volume pumps
water jackets
water pump

Topic: Fuel Supply, Air Induction, and Emissions **Duration:** 4 Period(s)

Topic Description (short)
This topic introduces students to the fuel and air supply components of a small gas engine.

Learning Targets
After studying this chapter, students will be able to:

1. Name various types of fuel that can be used in a small engine and list practical applications for each.
2. Explain the importance of proper fuel-oil mixture in a two-cycle engine.
3. Describe the purpose of fuel filters.
4. Explain fuel pump operation.
5. Describe the operation of pressurized fuel system.
6. Describe the purpose of an air cleaner.
7. Explain the importance of emission control.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
PowerPoint
Guided Notes
Engine components

Learning Targets
The student will demonstrate mastery of this learning target by scoring 80% or higher on the topics summative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Carburation
Duration: 4 Period(s)

Topic Description (short)
This topic introduces the theory of carburetion in small gas engines.

Learning Targets
After studying this chapter, students will be able to:

1. List and explain the principles of carburetion.
2. Distinguish between natural draft, updraft, and downdraft carburetors.
3. Explain float-type and carburetor operation.
4. Explain the operation of diaphragm-type carburetors.
5. Explain vacuum carburetor operation.
6. Differentiate between wet-bulb and dry-bulb primers.
7. Explain how manual throttle controls work.
8. List the basic functions of a governor.
9. Explain the operation of air-vane, centrifugal, and vacuum governors.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
PowerPoint
Guided Notes
Engine components.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Ignition Systems
Duration: 4 Period(s)

Topic Description (short)
This topic introduces the principles of ignition systems in small gas engines.

Learning Targets
After studying this chapter, students will be able to:

1. List the primary purposes of the ignition system.
2. Identify the components in a typical magneto system and describe the function of each part.
3. Describe small engine ignition advance systems.
4. List the advantages of a solid state ignition system.
5. Identify the three general classifications of magneto ignition systems and explain the operation of each.
6. Describe the operation of a battery ignition system.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
PowerPoint
Guided Notes
Engine parts.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Lubrication Systems
Duration: 4 Period(s)

Topic Description (short)
This topic teaches the students the basics of lubrication and lubrication systems in a small gas engine.

Learning Targets
After studying this chapter, students will be able to:

1. Define friction and explain how it affects the internal engine components.
2. List the functions of lubricating oil.
3. Differentiate between the lubrication systems in two-cycle engines and our-cycle engines.
4. Explain the operation of ejection pumps, barrel pumps, and positive displacement pumps.
5. Explain the function of oil filter systems and differentiate between the three main types.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
Engine components.
Different types of engine oil.
Guided Notes
PowerPoint.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✚

Topic: Cooling Systems
Duration: 4 Period(s)

Topic Description (short)
This topic introduces students to the basics of small gas engine cooling systems.

Learning Targets
After studying this chapter, you will be able to:

1. Explain how air cooling systems work to lower engine operating temperatures.
2. Describe the basic operation of pressurized liquid cooling systems.
3. Explain the function of a thermostat and a radiator.
4. Describe the basic operation of outboard water circulation systems.
5. Define the basic function of a water pump and give examples of several common types.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
Engine componenets
PowerPoint
Guided notes.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✚

Unit: Engine Service
Duration: 40 Day(s)

Unit Description
This unit covers the basics of preventive maintenance and troubleshooting as well as engine disassembly and inspection.

Academic Vocabulary
compression gauge
compression test
coolant hydrometer
differential pressure test
digital tachometer
filler plug
hot spots
loaded oil
optical tachometer
owner's manual
preventative maintenance
reverse flushing
service manual
systematic troubleshooting
thread chaser

carburetor kits
flooded engine
hunt
lean mixture
overhaul
rich mixture
vapor lock
vented
welch plugs
diode
gapping tool
hydrogen
hydrometer
leaf-type feeler gauges
open-circuit voltage
overcharging
oxygen
spark test
spark tester
specific gravity
specific gravity tests
stator assembly
undercharging
wire-type feeler gauges
preignition
service manual
starter clutch wrench
boring machine
cylinder taper
inside micrometer
out-of-roundness
reboring
telescoping gauge
interference angle
peening
poppet valves
valve seat width
assembly lube
bearing crush
bearing spread
break-in
dampening coils

Summative Assessment

Engine reassembly.

Materials and Resources (optional)

Engines
Powerpoint
Guided Notes

Topic: Preventive Maintenance and Troubleshooting

Duration: 4 Period(s)

Topic Description (short)

This topic covers the importance of preventative maintenance and introduces students to troubleshooting techniques used in small gas engines.

Learning Targets

After studying this chapter, the student will be able to:

1. Perform preventive maintenance on various engine systems, including the crankcase breather, air cleaner, and muffler.
2. Keep engines clean.
3. Change the oil in a four-cycle engine.
4. Prepare an engine for storage.
5. Describe systematic troubleshooting.
6. Use manufacturer's service manuals to determine engine specifications and explain why this information is necessary when servicing a small engine.

Formative Assessment

Paper and pencil quiz.

Materials and Resources
Owner's Manuals
Repair Manuals
Engines
PowerPoint
Guided Notes

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Fuel System Service

Duration: 4 Period(s)

Topic Description (short)
This topic introduces students to the basics of servicing and troubleshooting the fuel system in a small gas engine.

Learning Targets
After studying this topic, students will be able to:

1. Identify and correct common fuel system problems.
2. Summarize basic carburetor adjustments.
3. Explain basic procedures for disassembling, cleaning, inspecting, and reassembling diaphragm and float-type carburetors.
4. Describe the procedure for resetting the wide-open-throttle position on a centrifugal governor.
5. Summarize the various methods used to adjust governor systems.

Formative Assessment
paper and pencil quiz.

Materials and Resources
PowerPoint
Fuel Systems
Guided Notes.

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Ignition and Electrical System Service

Duration: 4 Period(s)

Topic Description (short)
This topic introduces students to the basics of ignition and electrical system service of a small gas engine.

Learning Targets
After studying this topic, students will be able to:

1. Examine spark plug deposits for signs of abnormal combustion.
2. Clean-gap, and install spark plugs correctly.
3. Explain the basic inspections and test used to verify proper ignition system operation.
4. Adjust breaker points, piston height, and ignition spark timing.
5. Explain basic tests for breaker point and solid-state ignition systems.
6. Explain typical service procedures for battery ignition systems.

Formative Assessment
paper and pencil quiz.

Materials and Resources
Spark plugs
Spark plug feeler gauges
PowerPoint
Guided Notes

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.

Learning Targets linked to Priority Standard = ✙

Topic: Engine Disassembly and Inspection

Duration: 4 Period(s)

Topic Description (short)
This topic will have students disassemble and inspect an engine to determine service needs.

Learning Targets
After studying this topic, students will be able to:

1. Inspect engines for problems.
2. Describe the procedure for removing an engine from an implement.
3. List the steps involved in disassembling an engine.
4. Inspect various engine parts for damage and wear.

Formative Assessment
Paper and pencil quiz.
Engine disassembled.

Materials and Resources
Engines.
PowerPoint
Guided notes.
Repair Manual

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✚

Topic: Cylinder, Crankshaft, and Piston Service
Duration: 4 Period(s)

Topic Description (short)
This topic introduces students to the proper servicing of the cylinder, crankshaft, and piston of a small gas engine.

Learning Targets
After studying this topic, students will be able to:

1. Describe how to inspect a cylinder for damage and measure a cylinder for wear, taper, and out-of-roundness.
2. Explain the difference between boring and honing and identify when each process should be used.
3. Summarize the steps in inspecting a crankshaft for damage and measuring it for wear.
4. Describe the steps in main bearing service.
5. Summarize the steps involved in piston, rod, and ring service.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
Engines
Cylinders,
Crankshaft
Pistons
Micrometers
Telescoping gauges
PowerPoint
Guided Notes

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✚

Topic: Camshaft and Valve Train Service
Duration: 4 Period(s)

Topic Description (short)
This topic introduces students to the proper servicing of camshafts and valve trains in a small gas engine.

Learning Targets
After studying this topic, the student will be able to:

1. Explain how to inspect and service the camshaft.
2. Summarize service procedures for in-block and overhead valve assemblies.
3. Describe the steps in inspecting and reconditioning valve seats.
4. Explain how to inspect and recondition valve lifters and valve guides.

Formative Assessment
paper and pencil quiz.

Materials and Resources

Camshafts
Valve Trains
PowerPoint
Guided Notes

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✙

Topic: Engine Reassembly and Break-in **Duration:** 4 Period(s)

Topic Description (short)
This topic will have students reassemble and break-in an engine.

Learning Targets
After studying this chapter, the student will be able to:

1. Summarize the steps in reassembling L-head and overhead valve engines.
2. Explain how crankshafts and camshafts should be reinstalled.
3. Summarize the steps in reassembling a piston and rod assembly and installing rings.
4. Explain the purpose of ring end gap.
5. Describe methods of adjusting crankshaft endplay.
6. Summarize what happens during piston ring wear-in.

Formative Assessment
Paper and pencil quiz.

Materials and Resources
Engines
Repair manuals
Owner manuals
PowerPoint
Guided Notes

Learning Targets
The student will demonstrate mastery of this topic by scoring 80% or higher on the topics formative assessment.
Learning Targets linked to Priority Standard = ✙

Unit: Applications
Duration: 4 Period(s)

Unit Description
This unit will introduce students to the use of lawn and brush equipment, lawn and garden tractors, snow throwers, personal watercraft and career opportunities and certifications.

Academic Vocabulary
bail
blade guard
brushcutters
chain guard (scabbard)
dethatcher blade
edger/trimmers
electric starters
extended rope starter
grass discharge chute guard
kickback
kickout
push mowers
reel-type mower
rotary mowers
self-propelled mowers
spark arrestors
string trimmers
ANSI (American National Standards Institute)
ball piston pump
cavitation
chassis
compost
differential gears
four-wheel steering
grease fitting (zerks)

movable sheave
mulching
multipmeter (continuity tester)
operator presence switch
power-take-off (PTO)
recoil start system
reservoir
reverse safety switches
single-stage snow throwers
speed ranges
spontaneous combusion
spring-loaded check valves
swash plate
transaxles
two-stage snow blowers
augers
operator presence controls
rubber tracks
skid shoes
scraper bar
shear bolt
shear pin
grease (zerk) fittings fuel stabilizer
bilge
bow line
drain plug
fuel vent check valve
identification numbers
jet pump
jet pump intake grate
jet pump outlet nozzle
oil filter screen
personal watercraft
pitch
pop-off pressure
reverse bucket
ride plate
sediment bowl
stator vanes
water inlet screen
critical-thinking skills
engine service technicians
engineers
entrepreneurs
Equipment & Engine Training Council (EETC)
ethical behavior
general manager
leadership
manufacturer's technicians
sales managers
service managers
service representatives.

Summative Assessment

Field work.

Materials and Resources (optional)

Mowers
Snow Blower
Weed eaters
Fertilizer Spreader
Sprayers

Topic: Lawn and Brush Equipment

Duration: Ongoing

Topic Description (short)

This topic introduces students to the use of lawn and brush equipment.

Learning Targets

After studying this topic, students will be able to:

1. List and follow safe work practices.
2. List and features available in different lawn mower designs and their advantages.
3. Summarize basic lawn mower maintenance procedures and safety precautions.
4. Describe the proper method for storing a lawn mower for long periods of time.
5. List the different features available on chain saws, leaf blowers, string trimmers, and edger/trimmers.
6. Summarize the maintenance, safety, and storage procedures for chain saws, string trimmers, brushcutters, and edger/trimmers.
7. Identify a variety of cutting blades for trimmers and brushcutters.

Formative Assessment
Field work.

Materials and Resources
see unit materials.

Learning Targets
Students will learn how to operate lawn and brush equipment.

Learning Targets linked to Priority Standard = ✙

Topic: Lawn and Garden Tractors **Duration:** Ongoing

Topic Description (short)
This topic introduces students to the operation of lawn and garden tractors.

Learning Targets
After studying this topic, students will be able to:

1. Describe guidelines for operating a tractor safely.
2. List different features available in lawn and garden tractors.
3. List the various kinds of work done with lawn and garden tractors.
4. Identify principles of good design for lawn and garden tractors.
5. Describe the kinds of accessories that can be used with lawn and garden tractors.
6. Identify several transmission systems used for lawn and garden tractors.
7. Describe electrical systems and components used on lawn and garden tractors.

Formative Assessment
Field work.

Materials and Resources
See unit materials and resources.

Learning Targets
Students will learn the skills and competencies needed to operate lawn and garden tractors.

Learning Targets linked to Priority Standard = ✙

Topic: Snow Throwers **Duration:** Ongoing

Topic Description (short)
This topic introduces students to the operation of snow throwers.

Learning Targets
After studying this topic, students will be able to:

1. Safely operate and service snow-throwing equipment.
2. List important purchasing considerations for snow throwers.
3. Identify major parts of walk-behind snow throwers.
4. Made adjustments to snow throwers.
5. Properly maintain snow-throwing machines.

Formative Assessment
Field work.

Materials and Resources
See unit materials and resrouces.

Learning Targets
Students will learn the skills and competencies needed to operate a snow thrower.

Learning Targets linked to Priority Standard = ✙

Topic: Career Opportunities and Certification **Duration:** Ongoing

Small Gas Engines & Landscaping

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Topic Description (short)

This unit introduces students to the opportunities associated with a career in the small gas engine industry.

Learning Targets

After studying this topic, students will be able to

1. Identify several career opportunities in the small gas engine field.
2. List the advantages and disadvantages of entrepreneurship.
3. Identify the benefits of EETC certification.
4. List qualities that are essential for anyone pursuing a career in small engines.

Formative Assessment

Field work.

Materials and Resources

See unit materials and resources.

Learning Targets

Students will develop communication, problem-solving, decision-making, and leadership skills needed to prepare for a career in small gas engines.

Learning Targets linked to Priority Standard = ✣