

# Girard High School

# Small Engines

Name \_\_\_\_\_ SSN \_\_\_\_-\_\_\_\_-\_\_\_\_\_

Instructor \_\_\_\_\_

**RATING SCALE:** 3: Skilled, works independently  
2: Competent, may need assistance  
1: Received instruction, skill undeveloped  
0: No exposure, instruction or training

**INTEGRATION:** (M) Math (S) Science  
(E) Language Arts (C) Career Development Skill  
(L) Lab Activity

Enrollment Date	Completion Date	Hours completed
____/____/____	____/____/____	_____

I certify that the student received the training in the area indicated.

Student Signature \_\_\_\_\_ Date \_\_\_\_\_

Instructor Signature \_\_\_\_\_ Date \_\_\_\_\_

Administrator Signature \_\_\_\_\_ Date \_\_\_\_\_

## I. FFA/SAE

- 3 2 1 0 1. Relates FFA/CDE to classroom instruction
- 3 2 1 0 2. Select a proficiency area for SAE
- 3 2 1 0 3. Assists in community service work for repairing engines or mowers
- 3 2 1 0 4. Justifies community service work to customers
- 3 2 1 0 5. Prepares a cost analysis to see if project is salvageable (M)
- 3 2 1 0 6. Prepares a proficiency award (E)
- 3 2 1 0 7. Fills out the State FFA degree application (E)

## II. Introduction of Small Engines/Careers

- 3 2 1 0 1. Describes the four strokes of the engine
- 3 2 1 0 2. Explains how a two cycle engine works
- 3 2 1 0 3. Recognizes different types of small engines
- 3 2 1 0 4. Researches the internet for different career opportunities (L)
- 3 2 1 0 5. Performs a sales demonstration (C)
- 3 2 1 0 6. Locates different institutes for higher education in this area (C)

## III. Identification of Engine Parts

- 3 2 1 0 1. Lists 10 parts of an engine
- 3 2 1 0 2. Defines 10 part functions of an engine
- 3 2 1 0 3. Explains how the internal parts of an engine work together

- 3 2 1 0 4. Creates flash cards on engine parts/functions

## IV. Engine Theory

- 3 2 1 0 1. Defines compression
- 3 2 1 0 2. Demonstrates a compression test (L)
- 3 2 1 0 3. Explains compression ratio (S)
- 3 2 1 0 4. Calculates a compression ratio (M,C)
- 3 2 1 0 5. States the definition of horsepower
- 3 2 1 0 6. Estimates horsepower (S)
- 3 2 1 0 7. Calculates piston displacement (M).
- 3 2 1 0 8. Removes and install valves (L)
- 3 2 1 0 9. Laps valves in (L)
- 3 2 1 0 10. Differentiates between top dead center and bottom dead center
- 3 2 1 0 11. Describes the difference between a gas engine and diesel engine upon operation

## V. Ignition

- 3 2 1 0 1. Identifies magnetron versus points and condenser ignition systems (L)
- 3 2 1 0 2. Locates the module on the magnetron system (L)
- 3 2 1 0 3. Checks the spark plug gap (L)
- 3 2 1 0 4. Demonstrates the use of the spark tester (C)
- 3 2 1 0 5. Analyzes what happens when an engine has a sheared flywheel key (S)
- 3 2 1 0 6. Sets the air gap (L)
- 3 2 1 0 7. Disassembles/reassembles the kill switch (L)

## VI. Carburetion

- 3 2 1 0 1. Identifies three different types of carburetors
- 3 2 1 0 2. Locates and set the idle speed valve (L)
- 3 2 1 0 3. Locates and set the needle valve (L)
- 3 2 1 0 4. Identifies the choke and throttle (L)
- 3 2 1 0 5. Explains how a carburetor works
- 3 2 1 0 6. Contrasts the gravity flow and above the tank carburetor (S)
- 3 2 1 0 7. Illustrates other examples in life that work like carburetors (E)
- 3 2 1 0 8. Cleans a carburetor (L)
- 3 2 1 0 9. Assembles and set the float (L)
- 3 2 1 0 10. Installs linkages on the carburetor (L)
- 3 2 1 0 11. Services the air cleaner (L)

## VII. Governors

- 3 2 1 0 1. Compares the mechanical and pneumatic governor (E)
- 3 2 1 0 2. Explains how an air vane governor works
- 3 2 1 0 3. Demonstrates how to adjust the mechanical governor (L)
- 3 2 1 0 4. Predicts what happens to an engine with no governor or not set right (S)
- 3 2 1 0 5. Demonstrates the use of a tachometer (L)

## VIII. Use of Tools

- 3 2 1 0 1. Follows correct procedures in using the torque wrench (L)

- 3 2 1 0 2. Reads the Micrometer for measuring parts (M,C,L)
- 3 2 1 0 3. Reports an accurate reading of the dial caliper (E,C)
- 3 2 1 0 4. Demonstrates safe operating procedures with tools (L)
- 3 2 1 0 5. Practices cleanup on all tools before putting away (L)

#### IX. Specification Chart Reading

- 3 2 1 0 1. Interpret data on the specification chart (M,S,C)
- 3 2 1 0 2. Reads a technical service manual (E,C)
- 3 2 1 0 3. Defends a decision what to do with an engine after interpreting data (E)
- 3 2 1 0 4. Concludes a decision made after troubleshooting

#### X. Parts and Price Listing

- 3 2 1 0 1. Uses the Microfiche to look up parts (EC)
- 3 2 1 0 2. Operates the Microfiche to look up prices (E,C)
- 3 2 1 0 3. Demonstrates the ability to use the internet to look up parts and prices (C)
- 3 2 1 0 4. Assists with the local parts store in ordering parts (E,C)
- 3 2 1 0 5. Generates a parts and price listing data sheet for replacement (E)
- 3 2 1 0 6. Interprets the model, type and code numbers to look up parts (E,M,C)

#### XII. Student Lab/Shop

- 3 2 1 0 1. Disassembles an engine following directions (L)
- 3 2 1 0 2. Assembles an engine following directions (L)
- 3 2 1 0 3. Demonstrates safety practices (L)
- 3 2 1 0 4. Cleans area and organizes work station (L)

#### XII. Batteries/Meter Use

- 3 2 1 0 1. Recognizes the difference between a 6 and 12 volt battery
- 3 2 1 0 2. Supports reasoning of how the chemical reaction works in a battery (S)
- 3 2 1 0 3. Demonstrates how to hook up a battery charger (L)
- 3 2 1 0 4. Connects jumper cables to jump start an engine (L)

- 3 2 1 0 5. Operates a volt meter to measure voltage (C,L)
- 3 2 1 0 6. Reads a meter to test amperage on an alternator (C,L)

#### XIV. Diesel Engines

- 3 2 1 0 1. Compares and contrasts differences between gas and diesel engines (E)
- 3 2 1 0 2. Identifies 10 parts on a diesel engine
- 3 2 1 0 3. Explains 10 part functions of a diesel engine
- 3 2 1 0 4. Shares orally based on research why a diesel or gas engine should be used for a particular job. (E)
- 3 2 1 0 5. Defines torque

#### XV. Fuels/Oils

- 3 2 1 0 1. Explains octane of a fuel
- 3 2 1 0 2. Proposes what the future holds for emissions on engines (S)
- 3 2 1 0 3. Defines cetane
- 3 2 1 0 4. Generalizes how fuels are burned differently between gas and diesel engines (S)
- 3 2 1 0 5. Discusses why LP is used on a limited bases for fuel
- 3 2 1 0 6. Matches oils that would be used for year round
- 3 2 1 0 7. Writes what type of oil is best suited for small engines (E)
- 3 2 1 0 8. Reports what happens to oil at different temperatures (E)
- 3 2 1 0 9. Breaks down advantages and disadvantages between petroleum and synthetic oils

#### XVI. Blade Sharpening

- 3 2 1 0 1. Sharpens a mower blade using different methods (L)
- 3 2 1 0 2. Uses a blade balancer to balance a mower blade (L)
- 3 2 1 0 3. Demonstrates safety while sharpening a blade
- 3 2 1 0 4. Installs a lawn mower blade correctly (L)

#### XVII. 2 Cycle Engines

- 3 2 1 0 1. Concludes why 2 and 4 cycle engines are used in different applications
- 3 2 1 0 2. Describes the operation of the 2 cycle

- 3 2 1 0 3. Lists three differences between 2 cycle and 4 cycle engines
- 3 2 1 0 4. Calculates a proper oil/gas ratio mixture for a 2 cycle engine (M)
- 3 2 1 0 5. Predicts the future for 2 cycle engines as related to emissions (S)

#### XVIII. Bearings

- 3 2 1 0 1. Gives examples of three types of bearings
- 3 2 1 0 2. Reconstructs a bearing
- 3 2 1 0 3. Uses grease to pack a bearing (L)

#### XIX. Tecumseh Engines

- 3 2 1 0 1. Recognizes what a Tecumseh engine looks like
- 3 2 1 0 2. Compares and contrasts the Tecumseh and Briggs and Stratton engine
- 3 2 1 0 3. Dismantles a Tecumseh engine (L)

#### XX. Careers Automotive Industry

- 3 2 1 0 1. Paraphrases the difference between a technician and a mechanic (E)
- 3 2 1 0 2. Discusses future trends for careers in the automotive industry
- 3 2 1 0 3. Outlines education needed for employment in the Automotive Industry (E)

#### XXI. Career Development Skills

- 3 2 1 0 1. Listens for steps or actions to be performed
- 3 2 1 0 2. Gives oral directions
- 3 2 1 0 3. Constructs and interprets tables, charts, maps and/or graphs
- 3 2 1 0 4. Compiles and maintains records, logs, lab notebooks, and other documents
- 3 2 1 0 5. Accesses, navigates, and use on-line services
- 3 2 1 0 6. Demonstrate characteristics of a positive self concept
- 3 2 1 0 7. Applies the steps in the decision making process
- 3 2 1 0 8. Participate in a team task of working together
- 3 2 1 0 9. Identifies influences on use of time management
- 3 2 1 0 10. Interprets standard workplace policies as

related to safety

3 2 1 0 11. Participates in a career exploration activities

## XXII. Life Knowledge Skills

3 2 1 0 1. Visions personal success (HS 18)

3 2 1 0 2. Understands responsibility and accountability (HS 13)

3 2 1 0 3. Researches careers (Preparing for the trip) (HS 125)

3 2 1 0 4. Identifies seven roads to success (career pathways) (HS 124)

## Small Engines Content Outline

**Course:** Small Engines

**Teacher:** Mr. Alan Boultinghouse

**Credits:** 1 credit for the full year.

**Clock Hours:** 182 days

**Grade Level:** 11-12

**Prerequisites:** none

**Teaching Resources:** Textbook: Small Engines, Author: R. Bruce Radcliff authorized by Briggs and Stratton Corporation, Copyright 1997; Briggs and Stratton Repair Manual Copyright 2000

**Course Description:** Small Engines is a year long course designed to teach theory, operation and hands on experience of Small Gas Engines. The first quarter will be spent in the classroom learning the fundamentals and operations of how engines work. The Briggs and Stratton manual will be used along with the Small Engine textbook as references for this instruction. Students will learn how to look up parts on for their engines on the Microfiche and will be able to call in replacement parts.

The students will spend the second nine weeks in the Shop lab working on engines. Students will have the opportunity to work with a partner on an engine provided by the school. Students will be exposed to all the tools and equipment necessary to work on the demonstrator engine. After completion of the demonstrator engine, students will have the opportunity to bring in engines from home upon approval by the instructor. The third and fourth nine weeks will be lab and classroom mixed as information on careers and related areas will be covered in the classroom. Students will be required to have safety glasses and proper clothing to work out in shop.

## Small Engines Curriculum Outline

<b>Areas of Instruction/ Topic Headings</b>	<b>Weeks/Quarter</b>
I. FFA/SAE	1-1st Quarter
A. Introduction of upcoming FFA events	
B. Check on SAE programs	
C. Student Activities: Participation of FFA magazine sales	
II. Introduction of Small Engines/Careers	.5-1st Quarter
A. How an engine works	
B. Kinds of small engines	
C. Career opportunities today	
D. Student Activities: Group Activity explaining how an engine works.	
-Look on the web site for types of training and education required for careers	
III. Identification of Parts of the Engine	2-1st Quarter
A. Power point pictures of parts and functions	
B. Student Activities: Identify parts of an engine upon demonstration	
IV. Engine Theory	1-1st Quarter
A. What is compression	
B. Piston displacement and how it works	
C. Horsepower calculations	
D. Student Activities: Removal and installation of valves, calculate piston displacement and horsepower	
V. Ignition	1-1st Quarter
A. Types of ignition systems used on engines	
B. Identifying ignition components	
C. Student Activities: Use an ignition tester to test spark	
VI. Carburetion	1-1st Quarter
A. Types of carburetors	
B. How carburetors work	
C. Student Activities: Disassemble/Reassemble a carburetor	
VII. Governors	.5-1st Quarter
A. Types of governors	
B. Function of a governor	
C. Student Activities: Disassemble/Reassemble a mechanical governor	
VIII. Use of Tools	1-2nd Quarter
A. Torque wrench	
B. Micrometer reading	
C. Dial Caliper reading	
D. Student Activities: Measure objects with the micrometer/dial caliper.	
X. Specification Chart Reading	.5-1st/ 2nd Quarter
A. Interpret data on the specification chart	
B. Student Activities: Conduct measurements on an engine and	

diagnose/troubleshoot the engine to see if matches the chart

- X. Computer-Price Listing .5-2nd Quarter
  - A. Use of a Microfiche and parts manual
  - B. Calling in replacement parts
  - C. Student Activities: Use the Microfiche machine to look up parts  
Guest Speaker from local small engine dealer to outline how to order parts
- XI. Demonstrations in Lab 2-2nd Quarter
  - A. Valve removal and installation
  - B. Checking ignition
  - C. Disassembly/Assembly of carburetors
  - D. Use of tools: micrometers and dial calipers
  - E. Shop safety
  - F. Disassembly/Assembly of an engine
  - G. Student Activities: Participation with instructor with all demonstrations
- XII. Student Lab/Shop 9-2/3rd Quarter
  - A. Student Activities: Disassemble/Assemble demonstrator engine
- XIII. Batteries/Meter use 1-3rd Quarter
  - A. Differences in batteries 6/12 volts
  - B. Composition of a battery
  - C. Student Activities: Measure voltage on a battery using a meter
- XIV. Diesel Engines 1-3rd Quarter
  - A. Differences between gas/diesel engines
  - B. Parts and functions of diesel engines
  - C. Student Activities: Using the web, students look up information and do a research project on why gas or diesel should be used for their vehicle
- XV. Fuels/Oils 1-3rd Quarter
  - A. Different types of fuels and their uses
  - B. Different types of oil and their uses
  - C. Student Activities: Student perform a demonstration with oil at different temperatures.
- XVI. Blade Sharpening 1-3rd Quarter
  - A. How to sharpen a blade with different methods
  - B. Balancing a blade
  - C. Student Activities: Sharpen and balance a lawn mower blade
- XVII. 2 Cycle Engines 1-3rd Quarter
  - A. Differences between 2 and 4 Cycle engines
  - B. Operation of a 2 cycle engine
  - C. Student Activities: Calculate a proper oil/gas ratio mixture for a 2 cycle engine.
- XVIII. Bearings .5-3rd Quarter
  - A. Types of bearings
  - B. Functions of bearings

C. Student Activities: Pack a bearing with grease

XIX. Tecumseh Engines 1-3rd Quarter

A. Differences between Tecumseh and Briggs Engines

B. Student Activities: Perform adjustments on a Tecumseh engine

XX. Careers Automotive Industry .5-3rd Quarter

A. Differences between a technician and a mechanic

B. Training necessary for future technicians

C. Student Activities: Guest Speaker from Pitt State Automotive  
Dept./Tour of Technology Dept. and John Deere Training Center

XXI. Student Lab 11-3rd/4th Quarter

A. Student Activities: Diagnose/troubleshoot on various types of small  
engines in the lab/Look up and order parts and necessary to complete the  
engine the student is working on