



G-E-T High School Curriculum
Align, Explore, Empower
Scope and Sequence
Small Engines and Electricity

Unit 1 - (Engine Theory and Safety)

(Length of Unit - 1 week)

Students will learn about the 4 strokes - intake, compression, power, exhaust. Students will work in small groups and complete several activities teaching them the importance of fuel, air, spark and compression. Students will use a compression tester and leak down tester to understand failure of compression. Students will discuss and implement safety at all times around small engines.

In this unit, students will ...

Recognize gas engines need fuel/air, spark and compression - through 4 distinct events (intake, compression, power and exhaust).

Students will be able to explain and understand the 3 things needed for a gas engine to run: fuel/air, spark and compression.

Students will be able to problem-solve and check carb conditions, spark plug functions, and compression.

Recognize safety techniques around small engines (4 wheelers, lawnmowers, chainsaws, etc.)

Students will demonstrate all p.t.o. accessories removal (chain, blade, pulley, etc.).

Students will demonstrate proper work on small engines (cold engine, power off, electricity off, etc.).

Standards for (Small Engines and Electricity)

PE1.a.15.h: Assess how power systems must have a source of energy, a process and loads.

PE1.b.11.h: Demonstrate and follow proper safety procedures for tools and machines used in power and energy systems.

PE1.c.11.h: Demonstrate efficient use of energy in a related project or lab.

PE1.c.12.h: Develop and perform tasks related to responsible use of energy systems and/or resources.

ENG5.a.6.h: Diagnose a system that is malfunctioning and use tools, materials or machines to repair it.

TR1.c.11.h: Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation vehicles.

Unit 2 - (Tools)

(Length of Unit - 3 days/ongoing)

Students will use the shop tools to learn their location and names of the tools. Moreover the students will partner up and complete multiple scavenger hunts to aid in the understanding of tools. In addition, the students will be able to explain what the tools are used for and when they should use them.

In this unit, students will ...

Identify and properly use many hand tools and power tools.

Students will know how to identify and properly maintain ratchets, wrenches, drivers, hammers, extensions, sockets, pliers, and more.

Students will know how to identify and demonstrate proper usage of the air drill, air hammer, impact, air shears, die grinder, digital multimeter, butterfly impact, bench grinder, and more.

Standards for (Small Engines and Electricity)

TR1.c.11.h: Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation vehicles.

PE1.b.11.h: Demonstrate and follow proper safety procedures for tools and machines used in power and energy

PE1.c.13.h: Demonstrate efficient use of energy resources related to power and energy technology.

PE1.d.10.h: Explain and apply skills using new technology and tools to solve energy problems.

Unit 3 - (Precision Measuring)

(Length of Unit - 2 days/ongoing)

Students will learn how to use a micrometer and dial caliper as an entire class using a guided ppt and training from the instructor. Students will get many opportunities to practice using and applying their measurements to engine specifications. Students will work independently on the worksheets and with a partner on the measuring activities.

In this unit, students will ...

Properly use precision measuring tools.

Students will be able to read and demonstrate how to properly use inch-based micrometers, feeler gauges, dial calipers, dial indicators and more.

Students will be able to identify and understand different assisting precision measuring tools – telescoping gauge, small-hole gauge, plasti-gauge, and more.

Standards for (Small Engines and Electricity)

TR1.c.11.h: Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation

vehicles.

ENG5.b.7.h: Operate systems so that they function in a way they were designed.

ENG5.b.9.h: Troubleshoot, analyze and maintain systems to ensure proper function, accuracy and precision.

PE1.b.11.h: Demonstrate and follow proper safety procedures for tools and machines used in power and energy

PE1.c.13.h: Demonstrate efficient use of energy resources related to power and energy technology.

PE1.d.10.h: Explain and apply skills using new technology and tools to solve energy problems.

Unit 4 - (Engine Basics)

(Length of Unit - 1.5 weeks)

Students will disassemble a single cylinder engine to identify all the major parts of an engine. Also, the students will create a video explaining major bottom end parts, top end parts and miscellaneous parts. Students have the option to work by themselves or with a partner. Moreover, students will receive PPT information and show-n-tell part discussions of various Briggs and Stratton engines.

In this unit, students will ...

Identify and explain all major engine parts and their functions.

Students will be able to identify and show all major engine parts: crankshaft, camshaft, valves, springs, retainers, seats, guides, block, lifters, head, flywheel, sump, magnetos, rocker arms, push rods, connecting rods, piston, piston pin, rings, and more.

Students will be able to explain the functions of the major parts of the engine. (Example) crankshaft—converts up and down motion into rotary motion, camshaft—open the valves, springs – close the valves, etc.

Standards for (Small Engines and Electricity)

PE1.c.13.h: Demonstrate efficient use of energy resources related to power and energy technology.

PE1.d.9.h: Demonstrate the application of the design process to solve a problem related to technology, power and energy systems.

TR1.b.7.h: Interpret preventive maintenance schedules and recommended service intervals for vehicles.

Unit 5 - (Engine Servicing and Overhauling)

(Length of Unit - 1.5 weeks)

Students will receive demonstrations on the valve grinder, seat cutter, lapping tools, cylinder honing and valve guide equipment. Following those demonstrations, students will get hands-on experience completing those activities on their own engines. In addition, students will understand when various fluids and filters should be changed. However, various manufacturers have their own interval hours and students need to recognize how to find that information.

In this unit, students will ...

Identify and describe all major engine servicing processes.

Students will demonstrate honing, grinding valve faces and stems, cutting valve seats, lapping valves and cleaning valve guides.

Students will be able to describe the major engine servicing processes and the importance for engine rebuilding. (Example) Honing – removing any imperfection on the cylinder wall and placing the desired crosshatch to ensure ring placement.

Students will be able to recognize when to change oil, oil filter, spark plugs, air filter, belts, batteries, fuel filters, etc.

Standards for **(Small Engines and Electricity)**

PE1.b.11.h: Demonstrate and follow proper safety procedures to tools and machines used in power and energy systems.

PE1.c.12.h: Develop and perform tasks related to responsible use of energy systems and/or resources.

PE1.d.10.h: Explain and apply skills using new technology and tools to solve energy problems.

TR1.b.9.h: Explain that all systems demand specific repair procedures in order to achieve highest performance and efficiency.

TR1.c.11.h: Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation vehicles.

Unit 6 - **(Lubrication, Cooling, Ignition and Fuel Systems)**

(Length of Unit - 2 weeks)

Students will work in small groups identifying the major parts of each system using disassemble small engines and complete several worksheets highlighting their knowledge. Each sub category will have a PPT and note taking guide to acquire the important information.

In this unit, students will ...

Identify and explain the major functions and parts of lubrication, cooling, ignition and fuel systems in small engines.

Students will be able to highlight that the lubrication system cools cleans and seal. It is usually done by an oil slinger, oil dipper or oil pump. Students will list major parts - oil, plug, dipstick, oil filter, crankcase breather, oil rings, oil seals, etc.

Students will be able to highlight that the cooling system removes unwanted engine heat, It reaches operating temp quickly and maintains that temp. It is usually done by liquid or air. Major parts include shrouding, fan, cooling fins, coolant, water pump, thermostat, radiator, etc.

Students will be able to highlight that the ignition system creates and distributes the high voltage spark for the power stroke. It is usually done by an magneton. Students will list major parts - spark plug, magents, armature, air gap, coil, ignition switch, battery, level switches, etc.

Students will be able to highlight that the fuel system mixes air and fuel at the correct ratio based on throttle position. It is usually done by the carburetor but is transitioning to EFI. Students will list major parts - tank, cap, lines, clamps, filter, carburetor, venturi, throttle, governor, linkage, high mixture jet, low mixture jet, etc.

Standards for (Small Engines and Electricity)

TR1.a.7.h: Identify how government regulations and technological trade-offs might influence the transportation modes used to move people and goods from place to place.

TR1.b.9.h: Explain that all systems demand specific repair procedures in order to achieve highest performance and efficiency.

TR1.c.10.h: Students will perform tasks related directly to current national standards per transportation (NATEF).

TR1.c.11.h: Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation vehicles.

BB1.e.6.h: Select and perform an appropriate maintenance is the process in order for the product or system to continue functioning properly and to extend its life.

Unit 7 - (2 Cycle vs. 4 Cycle / Gas vs. Diesel)

(Length of Unit - 3 days)

Students will use multiple 2 cycle engine cut-aways to understand the differences from their 4 cycle disassembled engines. Students will discuss the engine theory differences and look at the moving parts of each engine type. Students will also get a better understanding of how a diesel engine works. They will work in small groups working on several activities to better understand how diesel fuel ignites at high temperatures.

In this unit, students will ...

Compare 2 cycle single cylinder engines to 4 cycle single cylinder engines.

Students will be able to compare 2 vs. 4 cycle engines and recognize the different cost, weight, life expectancy, design, benefits, emissions, engine positions, and more.

Students will be able to explain how a 2 cycle engine works.

Compare gas engines to diesel engines.

Students will be able to compare gas vs. diesel engines and recognize the different cost, weight, life expectancy, emissions, starting differences, etc.

Students will be able to explain how a diesel engine works based on the 4 strokes.

Standards for (Small Engines and Electricity)

PE1.c.14.h: Research and demonstrate how new and emerging technology will be developed for efficient use of energy resources.

TR1.a.8.h: Relate how the current and future design of advanced transportation systems depends on many innovative materials and processes.

Unit 8 - **(Electrical Basics and Systems)**

(Length of Unit - 1.5 week)

Students will get many opportunities to get hands-on experiences wiring circuits and testing them with a multimeter. Students will be required to apply their multimeter knowledge to diagnostic activities. Students will work in small groups to enhance their multimeter knowledge working on testing various electrical parts on small engines.

In this unit, students will ...

Wire and test four types of circuits - series, parallel, complex and single wire (small engines and automotive).

Students will be able to identify and demonstrate wiring circuits in series, parallel, combination, and single wire. Students will be able to illustrate measuring voltage and resistance of each type of circuit using a multimeter.

Standards for **(Small Engines and Electricity)**

PE1.b.12.h: Demonstrate the practical and theoretical applications of test equipment to identify voltage, current and resistance in energy systems.

EL7.a.6.h: Demonstrate the safe usage of appropriate tools, procedures and operation of equipment.

EL2.a.10.h: Demonstrate multimeter and usage.

EL2.b.6.h: Calculate an unknown current, voltage or resistance in a series circuit, using Ohm's Law.

ENG5.b.7.h: Operate systems so that they function in the way they were designed.