Small Gas Engine Repair instructs students with theory and hands-on instruction in small gas engines. This course includes instruction on small engines, (2 cycle and 4 cycle) gasoline and diesels along with hands-on overhaul and repair instructions. Students electing this course will be instructed in overhaul procedures, engine testing and ordering of engine parts.

### Grade Level Summary

**Unit 1: Shop Equipment, Supplies, and Safety**

Students will learn about the safety in the shop setting. Safety in the shop includes personal protection safety, safety of equipment, and safety features of the shop. They will also learn about the tools and measuring instruments in the shop to work on small gas engines. These tools will be properly identified and their proper uses. Students will look at the different types of fasteners, sealants and gaskets they will encounter while working will small engines. This unit will also introduce the fundamentals of electricity, magnetism, and electronics for small gas engines.

### Unit Essential Questions:
1. How do I ensure that both I and my classmates are using safety precautions and practices while working in the shop?
2. Why is important to know the proper names of tools in a shop and their proper uses?

### Key Understandings:
1. Safety practices within a shop setting.
2. Tool identification and use
3. Measuring instruments
4. Different types of fasteners used on small gas engines.
5. Importance and use of sealants and gaskets
6. Fundamentals of electricity, magnetism, and electronics

### Focus Standards Addressed in the Unit:

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST.02.02.02.b</td>
<td>Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural and technology systems.</td>
</tr>
<tr>
<td>PST.02.02.02.c</td>
<td>Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.</td>
</tr>
<tr>
<td>PST.03.02.01a</td>
<td>Compare and contrast the basic units of electricity and the principles that describe their relationship.</td>
</tr>
</tbody>
</table>
Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

Important Standards Addressed in the Unit:

| CS.03.01. | Identify and explain the implications of required regulations to maintain and improve safety, health, and environmental management systems. |
| CS.03.03. | Apply health and safety practices to AFNR workplaces. |

**Misconceptions:**

| 1. Safety glasses are only needed if you are the one working. |
| 2. Long sleeves can be used for personal gear protection against flames, welding, or sparks. |
| 3. There is only one type of threads on bolts and nuts. |

**Proper Conceptions:**

| 1. Safety glasses are needed as long as you are in the shop and working is being performed by anyone. |
| 2. Flame retardant clothing must be worn while welding, grinding or using a torch. |
| 3. There are different size taps and dies for making threads and there are coarse and fine threads for each of those sizes. |

<table>
<thead>
<tr>
<th>Knowledge &amp; Concepts</th>
<th>Skills &amp; Competencies</th>
<th>Dispositions &amp; Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>● dangers in an agricultural mechanics shop and work place.</td>
<td></td>
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</tr>
<tr>
<td>● safety colors used on signs and icons in the agriculture industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● safety rules and regulations</td>
<td></td>
<td></td>
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<tr>
<td>● first aid methods and procedures using supplies in a first aid kit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● various gauges and testers used in agricultural power equipment</td>
<td></td>
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</tr>
<tr>
<td>● maintain and safely use electrical powered shop equipment.</td>
<td></td>
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<tr>
<td>● proper and safe use of air operated equipment</td>
<td></td>
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<tr>
<td>● Identify specialized tools for small engines such as wheel pullers, cylinder honing tools and micrometers.</td>
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</tr>
<tr>
<td>● List safety procedures that promote avoidance of shop hazards and accident reduction.</td>
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<tr>
<td>● Identify and demonstrate wearing of personal protective equipment</td>
<td></td>
<td></td>
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<tr>
<td>● Identify and use proper firefighting equipment</td>
<td></td>
<td></td>
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<tr>
<td>● Demonstrate positive safety attitudes and responsibilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Describe regulations, safety and consumer protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Identify, select, adjust, maintain and safely use common hand tools and power tools.</td>
<td></td>
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</tr>
<tr>
<td>● Demonstrate accurate use of measurement devices and techniques for calculating measurement including the metric system</td>
<td></td>
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</tr>
<tr>
<td>● Demonstrate the use of specialized tools for small engines such as wheel pullers, cylinder honing tools, and micrometers</td>
<td></td>
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<tr>
<td>● Self-control</td>
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<tr>
<td>● Ethical behavior</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Academic Vocabulary:**

- Carbon Monoxide
- Dead man switch
- Earplugs
- Eyewash station
- Face shield
- Adjustable wrench
- Allen wrench
- Box-end wrench
- Combination slip-joint pliers
- Combination wrench
- Acorn nuts
- Anaerobic sealants
- Antiseize compounds
- Bolt grades
- Bolt head size
<table>
<thead>
<tr>
<th>Fire extinguisher</th>
<th>Compression testers</th>
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</thead>
<tbody>
<tr>
<td>Flashpoint</td>
<td>Cylinder hones</td>
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<tr>
<td>Hazardous wastes</td>
<td>Diagonal side cutting pliers</td>
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<td>Headphone-type protectors</td>
<td>Drift punch</td>
</tr>
<tr>
<td>Hydrogen gas</td>
<td>Feeler gauge</td>
</tr>
<tr>
<td>Occupational Safety and Health Administration (OHSA)</td>
<td>Files</td>
</tr>
<tr>
<td>Respirators</td>
<td>Glaze breakers</td>
</tr>
<tr>
<td>Safety data sheets</td>
<td>Hacksaw</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>Lapping sticks</td>
</tr>
<tr>
<td>Safety goggles</td>
<td>Needle nose pliers</td>
</tr>
<tr>
<td>Safety shoes</td>
<td>Offset screwdriver</td>
</tr>
<tr>
<td>Ring compressor</td>
<td>Open end wrench</td>
</tr>
<tr>
<td>Ring expander</td>
<td>Phillips screwdriver</td>
</tr>
<tr>
<td>Ring spreader</td>
<td>Pin punch</td>
</tr>
<tr>
<td>Safe files</td>
<td>Reamer</td>
</tr>
<tr>
<td>Socket sets</td>
<td>Ridge reamer</td>
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<tr>
<td>Spark tester</td>
<td>Tapping</td>
</tr>
<tr>
<td>Tachometer</td>
<td>Tensile strength</td>
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<td>Torque</td>
<td>Thread</td>
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<td>Torque wrench</td>
<td>Thread length</td>
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<tr>
<td>Tubing wrench</td>
<td>Thread pitch</td>
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<td>Valve spring compressor</td>
<td>Through hole</td>
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<tr>
<td>Vise-grips</td>
<td>Tapped washers</td>
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<tr>
<td>Alternating current</td>
<td>Unified national coarse (UNC) series</td>
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<tr>
<td>Ammeters</td>
<td>Unified National Fine (UNF) series</td>
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<td>Ampere</td>
<td>Wide bearing lock washers</td>
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<td>Atom</td>
<td>Wing nut</td>
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<td>Base</td>
<td>Neutrons</td>
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<tr>
<td>Bound electrons</td>
<td>Ohms</td>
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<td>Ohm’s law</td>
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<td>Parallel circuits</td>
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<td>Conductor</td>
<td>Peak inverse voltage</td>
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<td>Direct current</td>
<td>Protons</td>
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<tr>
<td>Semiconductor material</td>
<td>Relay</td>
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<tr>
<td>Series circuit</td>
<td>Reverse biased</td>
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<tr>
<td>Series-parallel circuits</td>
<td>Semiconductor diode</td>
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<tr>
<td>Silicon-controlled rectifier</td>
<td>Switch</td>
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<td>Test light</td>
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<td>transformer</td>
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<td>Form-in place sealant</td>
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<td>Free electrons</td>
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<td>Jumper wires</td>
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<td>Magnetic field</td>
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</tbody>
</table>

**Assessments:**

- Quizzes
- Test
- Projects
- Class participation and practices

**Differentiation:**

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
Interdisciplinary Connections:
- This unit connects to math and science course when measurements and fractions are talked about. Students use fractions and decimals to measure. They use science when talking about the electricity and magnetism. This unit is also a unit that could be utilized in the real world when talking about safety and using safe practices with tools and equipment. Students will need to problem solve to determine the best tool for the job after knowing what its uses are.

Additional Resources:
- Video clips
- Articles
- Personal Accounts
- OSHA data sheets
- MSDS
- Small Gas Engines textbook and workbook

Created By:
Troy Summey
## Grade Level Summary

Small Gas Engine Repair instructs students with theory and hands-on instruction in small gas engines. This course includes instruction on small engines, (2 cycle and 4 cycle) gasoline and diesels along with hands-on overhaul and repair instructions. Students electing this course will be instructed in overhaul procedures, engine testing and ordering of engine parts.

## Grade Level Units

<table>
<thead>
<tr>
<th>Unit Title</th>
<th>Unit 2 Basics of Engine Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Summary</td>
<td>The unit looks that difference between 2 stroke and 4 stroke engines. It breaks down the engine operation and all the components of the engine. This unit will also look at measuring an engine’s performance.</td>
</tr>
</tbody>
</table>

### Unit Essential Questions:

1. What are several advantages and disadvantages of both 4 stroke and 2 stroke engines?

### Key Understandings:

1. Components of an engine
2. Measuring engine performance
3. Principles of engine operation, two and four-stroke engines

### Focus Standards Addressed in the Unit:

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST.03.01.01.a</td>
<td>Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems</td>
</tr>
<tr>
<td>PST.03.01.01.b</td>
<td>Analyze and explain how the components of internal combustion engines interrelate during operation</td>
</tr>
<tr>
<td>PST.03.01.02.a</td>
<td>Distinguish the characteristics of spark-and-compression internal combustion engines used in AFNR power, structural and technical systems.</td>
</tr>
</tbody>
</table>

### Important Standards Addressed in the Unit:
### Misconceptions:
1. All small gas engines are 2 strokes.
2. Students will struggle with the formulas and plugging numbers in the correct spot in the formula.

### Proper Conceptions:
1. Many small gas engines are 2 stroke, however in recent years 4 strokes have become more prevalent and have better emissions.

### Knowledge & Concepts
- Mechanical power, work, torque, and horsepower.
- The purpose of gears, bearings and seals
- The operation of two-and four-stroke engines
- Operation for spark and compression ignition engines
- The components and function of engine parts

### Skills & Competencies
- Demonstrate accurate use of measurement devices and techniques for calculating measurement including the metric system
- Demonstrate the use of measuring and calibration devices
- List and identify the components and function of engine parts

### Dispositions & Practices
- Curiosity
- Learning to learn

### Academic Vocabulary:
- Atomization
- Bottom dead center
- Compression ratio
- Compression stroke
- Four-stroke engine
- Intake stroke
- Internal combustion engine
- Power stroke
- Scavenging loss
- 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
- Wrist pin
- Flywheel
- Friction bearings
- Lands
- Oil control rings
- Overhead cam
- Overhead valve
- Pin boss
- Pinned rings
- Piston
- Piston rings
- Piston pin
- Piston skirt
- Poppet valve
- Pushrod
- Rewind starter assembly
- Ring tension
- Rocker arms
- Side clearance
- Slap
- Snap rings
- Sump
- Thrust surfaces
- Valve guide
- Valve lifter
- Valve spring
- Valve train
- Valve in block
- Brake horsepower
- Corrected horsepower
- Crank offset
- Dynamometer
- Engine bore
- Frictional horsepower
- Horsepower
- Indicated horsepower
- Mean effective pressure
- Mechanical efficiency
- Over square
- Performance
- Power
- Practical efficiency
- Pressure
- Prony brake
- Rated horsepower
- Square
- Tensile stress
- Thermal efficiency
- Under square
Assessments:
- Quizzes
- Test
- Participation

Differentiation:
- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

Additional Resources:
- Video clips
- Articles
- Personal Accounts
- OSHA data sheets
- MSDS
- Small Gas Engines text book and work book

Created By:
Troy Summey
Course/Subject: Small Gas Engine  | Grade: 9-12  | Unit 3: Engine Systems  | Suggested Timeline: 4-5 weeks

**Grade Level Summary**
Small Gas Engine Repair instructs students with theory and hands-on instruction in small gas engines. This course includes instruction on small engines, (2 cycle and 4 cycle) gasoline and diesels along with hands-on overhaul and repair instructions. Students electing this course will be instructed in overhaul procedures, engine testing and ordering of engine parts.

**Grade Level Units**
Unit 1: Shop Equipment, Supplies, and Safety  
Unit 2: Basics of Engine Operation  
Unit 3: Engine systems  
Unit 4: Engine Service  
Unit 5: Applications and Careers

**Unit Title**
Unit 3 Engine Systems

**Unit Summary**
The Engine Systems Unit deals with all the systems on an engine that make it operate. Such systems include the fuel supply, air induction and emissions, ignition, and lubrications systems. Each component has its own system to combine with the entire engine to make it run.

**Unit Essential Questions:**
1. What is the purpose of each system on an engine (fuel, air, ignition, lubrication, cooling)? If one system fails does it cause the entire engine system to fail?

**Key Understandings:**
1. Fuel supply, air induction, and emissions  
2. Carburetion and fuel injection  
3. Ignition systems  
4. Lubrication systems  
5. Cooling systems

**Focus Standards Addressed in the Unit:**

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST.02.01.02.a</td>
<td>Examine operator’s manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery and power units used in AFNR power, structural and technical systems.</td>
</tr>
<tr>
<td>PST.2.01.02.b</td>
<td>Service filtration systems and maintain fluid levels on equipment, machinery and power units in accordance with operator’s manuals.</td>
</tr>
</tbody>
</table>

**Important Standards Addressed in the Unit:**
### Misconceptions:

1. Heat and cooling shrouds are not important to the engine.
2. Any oil can be put in an engine.

### Proper Conceptions:

1. Shrouds play important roles on the engine to direct air in or out of the engine.
2. Engines are designed to run with oils of certain viscosities so the oil lubricates properly.

<table>
<thead>
<tr>
<th>Knowledge &amp; Concepts</th>
<th>Skills &amp; Competencies</th>
<th>Dispositions &amp; Practices</th>
</tr>
</thead>
</table>
| ● operation for spark and compression ignition engines  
● engine coolants, lubricants, fuels, engine additives, electrical components and drive systems needed for various applications  
● Identify and understand how the ignition, lubrication, and cooling systems work  
● Identify various types of carburetion and fuel systems | ● Identify the components and describe their function in a small gas engine  
● Identify components of each system  
● Diagnose issues within the systems  
● Maintenance the various systems within a small gas engine | ● Learning to learn  
● Problem solving |

### Academic Vocabulary:

- Diesel fuel
- Dry-type air cleaners
- Dual-element air cleaners
- Environmental Protection Agency (EPA)
- Fuel pick up line
- Fuel pump
- Muffler
- Octane number
- Oil-wetted air cleaner
- Oxygenates
- Phase separation
- Alnico
- Capacitive discharge ignition system
- Center electrode
- Condenser
- Dry-charge batteries
- DWell
- Electronic switching devices
- Flashover
- Heat ranges
- Ignition advance system
- Ignition coil
- Insulator
- Magneto systems
- Mechanical breaker point ignition system
- Mechanical break points
- Reach

- Absolute vacuum
- Acceleration well
- Air-fuel mixture
- Air vane governors
- Anti-afterfire solenoid
- Atmospheric pressure
- Bernoulli principle
- Carburetor
- Centrifugal governor
- Choke
- Closed-loop EFI system
- Downdraft carburetors
- Dry bulb primers
- Economizer circuit
- Electronic fuel injection
- Electronic governor
- Engine control unit
- Flash
- Fuel injector
- Hunting
- Idling circuit
- Load adjusting needle
- Natural draft carburetor
- Open loop EFI system
- Sensitivity
- Stability
- Throttle
- Updraft carburetors
- Vacuum

- 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 oil
- Multiviscosity oil
- Oil slinger
- Positive displacement oil pumps
- Pressurized lubrication system
- Shunt filter system
- Splash lubrication system
- Viscosity
- Viscosity index
- Centrifugal force
- Conduction
<table>
<thead>
<tr>
<th>Spark plug</th>
<th>Vacuum carburetors</th>
<th>Convection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug wire</td>
<td>Venture</td>
<td>Coolant</td>
</tr>
<tr>
<td>Transistor-controlled ignition switch</td>
<td>Wet bulb primers</td>
<td>Cooling fins</td>
</tr>
<tr>
<td>Rotor-type pump</td>
<td>Radiator cap</td>
<td>Plunger pump</td>
</tr>
<tr>
<td>Sliding vane pump</td>
<td>Radiator core</td>
<td>Pressure-vacuum water flow system</td>
</tr>
<tr>
<td>Thermostat</td>
<td>Water jackets</td>
<td>Pressurized cooling system</td>
</tr>
<tr>
<td>Vari-volume pumps</td>
<td>Water pump</td>
<td>radiator</td>
</tr>
</tbody>
</table>

**Assessments:**
- Hands on assembly and disassembly
- Quizzes
- Participation
- Test

**Differentiation:**
- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

**Interdisciplinary Connections:**
- This unit talks about systems and how they work. In Technology Education and Science course processes are used. There is an input, work and an output. Students can use this to understand how proper steps must be followed to make something work in a process.

**Additional Resources:**
- Video clips
- Articles
- Personal Accounts
- OSHA data sheets
- MSDS
- Small Gas Engines textbook and workbook

**Created By:**
Troy Summey
**Small Gas Engine**  
*Grades 9-12*  
**Unit #4**

<table>
<thead>
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<th>Course/Subject:</th>
<th>Grade:</th>
<th>Unit 4: Engine Service</th>
<th>Suggested Timeline:</th>
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</thead>
<tbody>
<tr>
<td>Small Gas Engine</td>
<td>9-12</td>
<td></td>
<td>4-5 weeks</td>
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</tbody>
</table>

**Grade Level Summary**  
Small Gas Engine Repair instructs students with theory and hands-on instruction in small gas engines. This course includes instruction on small engines, (2 cycle and 4 cycle) gasoline and diesels along with hands-on overhaul and repair instructions. Students electing this course will be instructed in overhaul procedures, engine testing and ordering of engine parts.

**Grade Level Units**  
- Unit 1: Shop Equipment, Supplies, and Safety  
- Unit 2: Basics of Engine Operation  
- Unit 3: Engine systems  
- Unit 4: Engine Service  
- Unit 5: Applications and Careers

<table>
<thead>
<tr>
<th>Unit Title</th>
<th>Unit 4 Engine Service</th>
</tr>
</thead>
</table>

| Unit Summary | In this Unit students will maintain and troubleshoot small gas engines. They will use knowledge from previous units to diagnose problems that causing engine failure. Students will disassemble and reassemble engines to examine all components. |

**Unit Essential Questions:**  
1. How does knowing how a system works, help you in diagnosing and repairing the engine?  
2. Why is it best to start with the easiest systems and diagnostics first? What would those systems and diagnostics be in order?  

**Key Understandings:**  
1. Customer service  
2. Maintain repair records  
3. Preventative maintenance and troubleshooting  
4. Fuel system service  
5. Ignition and electrical system service  
6. Engine disassembly and inspection  
7. Cylinder, crankshaft, and piston service  
8. Camshaft and valve train service  
9. Engine reassembly and break in

**Focus Standards Addressed in the Unit:**

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST.03.01.01.c</td>
<td>Evaluate service and repair needs for internal combustion engines using a variety of performance tests</td>
</tr>
<tr>
<td>PST.03.01.02.b</td>
<td>Utilize technical manuals and diagnostic tools to determine service and repair needs of spark-and-compression internal combustion engines used in AFNR power, structural and technical systems.</td>
</tr>
</tbody>
</table>

**Important Standards Addressed in the Unit:**
<table>
<thead>
<tr>
<th>Misconceptions:</th>
<th>Proper Conceptions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Only a professional can work on small gas engine.</td>
<td>1. Anyone can work on a small gas engine and make repairs to it as needed.</td>
</tr>
<tr>
<td>2. Parts and their clearances only need to be close.</td>
<td>2. Parts are designed to fit to within a specific tolerance. Failure to meet the tolerances can cause malfunctions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge &amp; Concepts</th>
<th>Skills &amp; Competencies</th>
<th>Dispositions &amp; Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identify the components of a diesel engine</td>
<td>• Read work order, instructions, formulas or processing charts</td>
<td>• Problem solving</td>
</tr>
<tr>
<td>• List the engine diesel systems and their components</td>
<td>• Maintain repair records</td>
<td>• Critical thinking</td>
</tr>
<tr>
<td>• Specialized tools for small engines such as wheel pullers, cylinder honing tools and micrometers.</td>
<td>• Record details of repairs made and parts used</td>
<td></td>
</tr>
<tr>
<td>• Customer service</td>
<td>• Calculate bills according to record of repairs made, labor time and parts used</td>
<td></td>
</tr>
<tr>
<td>• Business operations</td>
<td>• Disassemble and reassemble an engine using all diagnostic tools</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Troubleshoot an engine and return it to working order</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Disassemble and reassemble a diesel engine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use computers to enter, access or retrieve data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Prepare a technical report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use telephone communication techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fill out business or government forms</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic Vocabulary:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Carburetor kits</td>
<td>• Compression gauge</td>
</tr>
<tr>
<td>• Diagnostic trouble code</td>
<td>• Compression test</td>
</tr>
<tr>
<td>• Flooded engine</td>
<td>• Coolant hydrometer</td>
</tr>
<tr>
<td>• Lean mixture</td>
<td>• Differential pressure test</td>
</tr>
<tr>
<td>• Overhaul</td>
<td>• Digital tachometer</td>
</tr>
<tr>
<td>• Rich mixture</td>
<td>• Filler plug</td>
</tr>
<tr>
<td>• Vapor lock</td>
<td>• Hot spots</td>
</tr>
<tr>
<td>• Vented</td>
<td>• Loaded oil</td>
</tr>
<tr>
<td>• Welch plugs</td>
<td>• Optical tachometer</td>
</tr>
<tr>
<td>• Preignition</td>
<td>• Owner’s manual</td>
</tr>
<tr>
<td>• Service manual</td>
<td>• Preventive maintenance</td>
</tr>
<tr>
<td>• Starter clutch wrench</td>
<td>• Reverse flushing</td>
</tr>
<tr>
<td>• Boring machine</td>
<td>• Service manual</td>
</tr>
<tr>
<td>• Cylinder taper</td>
<td>• Systematic troubleshooting</td>
</tr>
<tr>
<td>• Inside micrometer</td>
<td>• Thread chaser</td>
</tr>
</tbody>
</table>

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- Out-of-roundness
- Reboring
- Telescoping gauge
- Bearing spread

- Interference angle
- Peening
- Poppet valves
- Bearing crush

- Valve seat width
- Break in
- Damping coils
- Assembly lube

Assessments:
- Worksheets
- Participation
- Bench marks

Differentiation:
- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:
- 

Additional Resources:
- Video clips
- Articles
- Personal Accounts
- OSHA data sheets
- MSDS
- Small Gas Engines textbook and workbook

Created By:
Troy Summey
Small Gas Engine Repair instructs students with theory and hands-on instruction in small gas engines. This course includes instruction on small engines, (2 cycle and 4 cycle) gasoline and diesels along with hands-on overhaul and repair instructions. Students electing this course will be instructed in overhaul procedures, engine testing and ordering of engine parts.

<table>
<thead>
<tr>
<th>Grade Level Units</th>
<th>Unit 1: Shop Equipment, Supplies, and Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit 2: Basics of Engine Operation</td>
</tr>
<tr>
<td></td>
<td>Unit 3: Engine systems</td>
</tr>
<tr>
<td></td>
<td>Unit 4: Engine Service</td>
</tr>
<tr>
<td></td>
<td>Unit 5: Applications and Careers</td>
</tr>
</tbody>
</table>

This unit will look at the different uses for small gas engines and their capabilities. Such equipment would include landscape equipment, snow throwers, and personal transportation vehicles. This unit will also look into the career opportunities and certifications that are available to someone interested in the world of small gas engines.

<table>
<thead>
<tr>
<th>Unit Essential Questions:</th>
<th>Key Understandings:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do small gas engines affect your everyday life?</td>
<td>1. Lawn and brush equipment</td>
</tr>
<tr>
<td>2. Why would it be important to know how to service small gas engines for your personal use?</td>
<td>2. Lawn and Garden tractors</td>
</tr>
<tr>
<td>3. What career opportunities exist within this field?</td>
<td>3. Snow throwers</td>
</tr>
<tr>
<td></td>
<td>4. Personal watercraft</td>
</tr>
<tr>
<td></td>
<td>5. Career opportunities and Certifications</td>
</tr>
</tbody>
</table>

Focus Standards Addressed in the Unit:

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST.02.01</td>
<td>Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings</td>
</tr>
<tr>
<td>PST.02.02</td>
<td>Operate machinery and equipment while observing all safety precautions in AFNR settings.</td>
</tr>
</tbody>
</table>

Important Standards Addressed in the Unit:

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP.10.01</td>
<td>Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.</td>
</tr>
<tr>
<td>CRP.10.02</td>
<td>Examine career advancement requirements and create goals for continuous growth in a chosen career.</td>
</tr>
</tbody>
</table>
### Misconceptions:
1. Landscape equipment can just be put away and pulled out when needed.
2. Safety equipment is not needed if the job does not seem dangerous.
3. All resumes are the same.
4. Career certifications do not mean anything.

### Proper Conceptions:
1. Landscape equipment must be maintained and serviced.
2. Safety equipment must be worn and in place before operating any piece of equipment.
3. Resumes can be made different to stand out in a job application.
4. Career certifications can set you apart from others in job interviews and earn you more money.

<table>
<thead>
<tr>
<th>Knowledge &amp; Concepts</th>
<th>Skills &amp; Competencies</th>
<th>Dispositions &amp; Practices</th>
</tr>
</thead>
</table>
| - Customer and sales trends  
- Conduct training in product use  
- Provide Customer service needs  
- emerging technologies and their potential impact  
- methods of changing appropriate technology for various applications  
- Product familiarity (i.e.; lawn tractors, push mowers, garden tillers, etc.)  
- Career opportunities  
- Certifications | - Analyze sales activities or trends  
- Prepare a list of prospective customers  
- Use product knowledge and customer's need to solicite an order from established or new customers  
- Access media advertising services  
- Conduct a sales presentation  
- Demonstrate goods or services  
- Use sales techniques based on the customer  
- Compute financial data  
- Identify steps to arrange for trial installations of equipment.  
- Negotiate terms of sale or services with customer  
- Identify steps to arrange a delivery schedule  
- Job applications  
- Interview processes  
- Tech certifications | - Problem solving skills  
- Communication skills |

### Academic Vocabulary:
- Bail
- Blade guard
- Brushcutters
- Chain guard
- Electric starter
- Extended rope starter
- Discharge chute
- Kickback
- Pushmower
- Reel-type mower
- Rotary mower
- Self-propelled mower
- Spark arrestor
- String trimmer
- Auger
- Fuel stabilizer
- American National Standards Institute
- Ball piston pump
- Cavitation
- Chassis
- Compost
- Differential gears
- Four-wheel steering
- Grease fittings
- Movable sheave
- Mulching
- Multi-tester
- Operator presence switch
- Power-take-off
- Reservoir
- Reverse safety switch
- Abilities
- Apprenticeship
- Aptitude
- Critical thinking skills
- Engine service technician
- Engineer
- Entrepreneurs
- Equipment and engine training council
- Ethical behavior
- General manager
- Internship
- Job application form
- Job interview
- Job shadowing
- Leadership
- Operation presence controls
- Rubber tracks
- Scraper bar
- Shear bolt
- Shear pin
- Skid shoes
- Bilage
- Bow line
- Drain plug
- Fuel vent check valve
- Identification numbers
- Jet pump
- Jet pump intake grate
- Jet pump outlet nozzle

- Single stage snow thrower
- Speed ranges
- Spontaneous combustion
- Spring loaded deck valves
- Swash plate
- Traxaxles
- Two stage snow blower
- Personal watercraft
- Pitch
- Pop-off pressure
- Reverse bucket
- Ride plate
- Sediment bowl
- Stator vanes
- Water inlet screen

Assessments:
- Projects
- Quizzes
- Progress check offs
- Participation

Differentiation:
- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:
- This Unit on Applications and Careers can be used for everyday life and other courses. The applications part of this unit teaches students to be problem solvers and following steps. Outside of school students will likely use different pieces of landscape equipment to maintain their own properties. The Career portion of this unit encompasses many aspects of English and Business courses. Students will use writing skills to write resumes and speaking skills during job interviews. Students will use the business skills to help land jobs or run their own business.

Additional Resources:
- Video clips
- Articles
- Personal Accounts
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