



## Small Engine Mechanics

Career Cluster	Transportation, Distribution & Logistics
Course Code	20110
Prerequisite(s)	None
Credit	0.5 or 1.0
Program of Study and Sequence	Any Foundation course – Small Engine Mechanics – Any pathway course - Capstone
Student Organization	SkillsUSA
Coordinating Work-Based Learning	Job Shadow
Industry Certifications	N/A
Dual Credit or Dual Enrollment	See: <a href="https://sdmylife.com/images/Approved-CTE-Dual-Credit.pdf">https://sdmylife.com/images/Approved-CTE-Dual-Credit.pdf</a>
Teacher Certification	Transportation, Distribution & Logistics Cluster Endorsement; Automotive Technology Pathway Endorsement *Automotive Technology ; *7-12 Technology Education
Resources	N/A

### Course Description

Small Engine Mechanics is an introductory course for students interested in obtaining skills needed to maintain and repair internal combustion engines used in industry, recreation, home and landscape maintenance, or personal settings. Students will study various small engine types, parts identification, and engine operation along with other systems found in small engine vehicles. Students will disassemble, inspect, reassemble and troubleshoot an internal combustion engine and look at other components of vehicles that use those engines. This course covers areas of safety, tools, and electrical theory.

### Program of Study Application

Small Engine Mechanics is a cluster course within the Transportation, Distribution and Logistics career cluster.

## Course Standards

<b>SEM 1: Students will demonstrate shop and tool safety.</b>	
<i>Webb Level</i>	<i>Sub-indicator</i>
One Recall & Reproduction	SEM 1.1 Examine basic shop safety using Occupational Safety Health Administration (OSHA) standards, including: <ul style="list-style-type: none"> <li>● Summarize the proper use of Safety Data Sheets (SDS)</li> <li>● Create a safety portfolio</li> <li>● Locate the fire extinguisher, fire blankets, and emergency exits</li> <li>● Never have an open flame near flammable liquids</li> <li>● Do not refuel engine while in operation</li> <li>● Demonstrate proper start up and shutoff procedures (be aware of surroundings when pull-starting small gas engine (SGE))</li> <li>● Eye and hearing protection</li> <li>● Clothing and shoe protection</li> </ul>
Two Skill/Concept	SEM 1.2 Demonstrate proper use of hand and power tools, including: <ul style="list-style-type: none"> <li>● Perform a general tool test (name and function of tool being used, proper use of each tool, care and storage)</li> <li>● Review Torque wrench settings and usage</li> <li>● Spark test tools (Use appropriate spark tester to check spark)</li> </ul>

### **SEM 2: Students will demonstrate independent and teamwork skills as well as explore career opportunities within the industry.**

<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	SEM 2.1 Participate in student leadership activities.
Four Extended Thinking	SEM 2.2 Utilize career guidance tools to research and report on career opportunities.
Three Strategic Thinking	SEM 2.3 Develop a teamwork project.

### **SEM 3: Students will understand and apply appropriate business practices.**

<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	IVSM 3.1 Demonstrate the importance of, and the procedures for, maintaining accurate work documents and records.
Three Strategic Thinking	IVSM 3.2 Apply concept and application of ethical business practices.
Three Strategic Thinking	IVSM 3.3 Apply excellent customer relations practices.

### **SEM 4: Students will apply communication, mathematics and science knowledge and skills to Small Engine Mechanics.**

<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	SEM 4.1 Determine horsepower of any small engine using $HP=W/(T*33,000)$ . (HP = Horsepower, W = Work, T = Time).

Three Strategic Thinking	SEM 4.2 Demonstrate the principle that fluids cannot be compressed by building a basic hydraulic cylinder/motor device on a test bench.
Three Strategic Thinking	SEM 4.3 Perform mathematical calculations and measurements commonly used in small engines, such as: <ul style="list-style-type: none"> <li>● Calculate displacement of any given engine based on the equation <math>d=c*b*s</math> (c-constant 0.7584, b-bore, s-stroke, d-displacement)</li> <li>● Find the amount of work with the equation <math>w=f*d</math> where w=work in lb./ft (ftlb), f=force in pounds, d=distance</li> </ul>
Three Strategic Thinking	SEM 4.4 Communicate findings related to mathematics and science knowledge and skills to diagnosis problems in small engines.

**SEM 5: Students will troubleshoot an internal combustion engine.**

<i>Webb Level</i>	<i>Sub-indicator</i>
Four Extended Thinking	SEM 5.1 Implement strategic diagnostic procedures, including: <ul style="list-style-type: none"> <li>● Apply small engine trouble shooting procedures</li> <li>● Diagnose and determine needed repair on small engine components</li> <li>● Determine wear on internal engine parts using specialized tools</li> </ul>
Two Skill/Concept	SEM 5.2 Conduct preventative maintenance on an internal combustion engine. <ul style="list-style-type: none"> <li>● Change oil and filter on small engine</li> <li>● Inspect and change air filter</li> <li>● Disassemble, clean, and inspect fuel pump</li> <li>● Disassemble, clean, and inspect carburetor</li> </ul>
Three Strategic Thinking	SEM 5.3 Analyze the functions and operations of a fuel system related to small engine technology. <ul style="list-style-type: none"> <li>● Complete fuel pressure test of system utilizing a fuel pump</li> <li>● Set carburetor float height</li> <li>● Adjust both low and high idle circuits on carburetor engines</li> <li>● Complete fuel injector function test on fuel injected engines</li> </ul>
Three Strategic Thinking	SEM 5.4 Diagnose fuel system problem. <ul style="list-style-type: none"> <li>● Test and determine needed repair on fuel system</li> <li>● Inspect and determine needed repair on air cleaner system</li> </ul>
Three Strategic Thinking	SEM 5.5 Perform fuel system service. <ul style="list-style-type: none"> <li>● Remove and replace the fuel tank, fuel lines and fuel filter system</li> <li>● Service oil-bath or foam type air cleaner</li> <li>● Reassemble and adjust a carburetor</li> <li>● Reassemble and install fuel pump</li> </ul>
Four Extended Thinking	SEM 5.6 Analyze the function and operation of emission systems related to small engines. <ul style="list-style-type: none"> <li>● Research EPA emissions standards and requirements and report on how those laws affect the small engine service industry</li> </ul>
Four Extended Thinking	SEM 5.7 Diagnose emission systems relating to small engine technology. <ul style="list-style-type: none"> <li>● Use an exhaust gas analyzer to determine the amount of HC and NOx emissions contained in the exhaust from a small engine and determine repair strategies</li> <li>● Complete electrical/electronic testing of manifold absolute pressure (MAP) sensor, O<sub>2</sub> (Oxygen) or throttle position sensor and determine whether repair or replacement of parts is needed</li> </ul>

Three Strategic Thinking	SEM 5.8 Perform emission system service on small engine. <ul style="list-style-type: none"> <li>● Replace a MAP sensor</li> <li>● Replace a fuel pressure sensor</li> <li>● Demonstrate or observe a fuel map in electronic format</li> </ul>
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**SEM 6: Students will properly test, diagnose, service, and repair charging and electrical systems related to small engines.**

<i>Webb Level</i>	<i>Sub-indicator</i>
Three Strategic Thinking	SEM 6.1 Illustrate the application of Ohm’s law to charging and electrical systems related to small engines. <ul style="list-style-type: none"> <li>● Complete the start amp draw test on a small engine with an electric start system</li> <li>● Compute amperage use of any circuit by using the equation amps=volts/ohms</li> </ul>
Two Skill/Concept	SEM 6.2 Interpret schematics, diagrams, and reference information used in small engine electrical systems. <ul style="list-style-type: none"> <li>● Troubleshoot the charging circuit using a manufacturer’s guide</li> <li>● Read a multimeter</li> </ul>
Three Strategic Thinking	SEM 6.3 Use strategy-based diagnostics for determining the cause of a fault in an electrical circuit. <ul style="list-style-type: none"> <li>● Test, diagnose, and service batteries and charging systems</li> <li>● Test, diagnose, and service light systems</li> <li>● Demonstrate the use of equipment and tools for electrical testing and diagnosis</li> <li>● Troubleshoot and repair starting circuit</li> </ul>
Two Skill/Concept	SEM 6.4 Inspect and repair battery problems. <ul style="list-style-type: none"> <li>● Perform battery state-of-charge test; determine necessary action</li> <li>● Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action</li> <li>● Maintain or restore electronic memory functions</li> <li>● Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps and hold-downs</li> <li>● Perform battery charge</li> <li>● Start a vehicle using jumper cables and a battery or auxiliary power supply</li> </ul>
Two Skill/Concept	SEM 6.5 Diagnose and repair starter. <ul style="list-style-type: none"> <li>● Perform starter current draw tests; determine necessary action</li> <li>● Perform starter circuit voltage drop tests; determine necessary action</li> <li>● Inspect and test starter relays and solenoids; determine necessary action</li> <li>● Remove and replace starter</li> </ul>
Two Skill/Concept	SEM 6.6 Diagnose and repair charging system. <ul style="list-style-type: none"> <li>● Perform charging system output test; determine necessary action</li> <li>● Remove and replace generator (alternator)</li> <li>● Diagnose the cause of dim or no light operation; determine necessary action</li> <li>● Inspect, replace, and aim headlights and bulbs</li> </ul>