

# Agriscience Power Equipment

This course prepares students for a career in operating, maintaining, and repairing small gasoline engines. The course introduces students to both four-cycle and two-cycle engines commonly used in outdoor power equipment. Emphasis is placed on the development of an understanding of principles and theories of small gasoline engine operations. Special emphasis is placed on troubleshooting and repair including rebuilding of small gasoline engines. Mathematical, critical-thinking, problem-solving, and resource access utilization-skills are reinforced in this course. Work-based learning strategies appropriate for this course include service learning, internships, apprenticeships, and cooperative education. Supervised agricultural experience (SAE) programs and the FFA leadership activities are integral components of the course and provide many opportunities for practical application of instructional competencies. Completion of the one semester course prepares students for the Equipment and Engine Training Council (EETC) exam in four stroke technician. Completion of the full year course prepares students for the EETC certification exams in four stroke technician and two stroke technician. *Italicized objectives are the minimum requirements for the ½ credit course.*

*Prerequisite: Agriscience I or Jr/Sr*

*Credits: ½ or 1*

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## Table of Contents

Louisiana Agricultural Education Related Content Standards	2
Content Guideline	
Introduction to Small Engines	4
Four-Stroke Cycle Engines	4
Two-Stroke Cycle Engines	5
Engine Maintenance	5
Problem Solving Techniques	5
Measuring	5
Inspection of Piston and Rings	5
Fuel System	6
Lubrication Systems	6
Magneto Ignition Systems	6
Governor Controls	6
Starter Repair	6
Troubleshooting	7
Overhaul Small Engines	7
Careers in Small Engines	7
Resources	8
Internet Sites	8

Small Engine (Applications)	Content Guideline														
<p><b>Louisiana Agricultural Education Related Content Standards</b></p>  <p><i>*All benchmarks are not marked for all Agricultural courses.</i></p>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls	Starter Repair	Troubleshooting	Overhaul Small Engines Careers in Small Engines	
<b>STRAND: Agricultural Literacy K-12</b>															
<b>Standard: All students will become aware of the characteristics and components of the food and fiber systems.</b>															
a. Agricultural awareness grades K-4															
b. Agricultural literacy grades 5-8															
c. Agricultural literacy grades 9-12	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>STRAND: Personal Development</b>															
<b>Standard: AgEd/FFA students will develop the necessary interpersonal and communication skills to obtain a job and work effectively and safely in an interactive work environment.</b>															
a. Agricultural communication	•														•
b. Team work in agriculture	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
c. Careers in agriculture	•														•
<b>STRAND: Agribusiness</b>															
<b>Standard: AgEd/FFA students will understand the concept of agricultural marketing, management, finance, and entrepreneurship.</b>															
a. Production systems															
b. Selections from various choices															
c. Factors that make employees successful															•
d. Agricultural marketing sales and services															•
e. Economics of production															
f. Develop a business plan															•

Small Engine (Applications)	Content Guideline														
<p><b>Louisiana Agricultural Education Related Content Standards</b></p>  <p>*All benchmarks are not marked for all Agricultural courses.</p>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls	Starter Repair	Troubleshooting	Overhaul Small Engines	Careers in Small Engines
<b>STRAND: Agriscience Technology</b>															
<b>Standard: AgEd/FFA students will demonstrate technical skills that reflect successful business and industry practices.</b>															
a. Agriculture power and energy	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
b. Energy sources in agriculture	•							•	•						
c. Mathematics in agriscience technology	•			•	•	•							•	•	
d. Agriscience welding technology															
e. Agricultural structures and facilities															

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9-12</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Science as Inquiry</b>											
<b>The Abilities Necessary to Do Scientific Inquiry</b>											
1. Write a testable question or hypothesis when given a topic (SI-H-A1).	•	•	•	•	•	•	•	•	•	•	•
2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2).		•	•	•							
3. Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2).					•			•	•	•	•
5. Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3).	•	•	•	•	•	•	•	•	•	•	•
6. Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3).	•	•	•	•	•	•	•	•	•	•	•
10. Given a description of an experiment, identify appropriate safety measures (SI-H-A7).					•			•	•	•	•
<b>Understanding Scientific Inquiry</b>											
12. Cite evidence that scientific investigations are conducted for many different reasons (SI-H-B2).					•			•	•	•	•
16. Use the following rules of evidence to examine experimental results: (a) Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability? (b) Has the technique or theory been subjected to peer review and publication? (c) What is the known or potential rate of error of the technique or theory when applied? (d) Were standards and controls applied and maintained? (e) Has the technique or theory been generally accepted in the scientific community? (SI-H-B5) (SI-H-B1) (SI-H-B4).					•			•	•	•	•

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9-12</b>	Starter Repair	Troubleshooting	Overhaul Small Engines	Careers in Small Engines							
<b>Science as Inquiry</b>											
<b>The Abilities Necessary to Do Scientific Inquiry</b>											
1. Write a testable question or hypothesis when given a topic (SI-H-A1).	•	•	•	•							
2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2).											
3. Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2).	•	•	•	•							
5. Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3).	•	•	•	•							
6. Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3).	•	•	•	•							
10. Given a description of an experiment, identify appropriate safety measures (SI-H-A7).	•	•	•	•							
<b>Understanding Scientific Inquiry</b>											
12. Cite evidence that scientific investigations are conducted for many different reasons (SI-H-B2).	•	•	•	•							
16. Use the following rules of evidence to examine experimental results: (f) Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability? (g) Has the technique or theory been subjected to peer review and publication? (h) What is the known or potential rate of error of the technique or theory when applied? (i) Were standards and controls applied and maintained? (j) Has the technique or theory been generally accepted in the scientific community? (SI-H-B5) (SI-H-B1) (SI-H-B4).	•	•	•	•							

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Physical Science</b>											
<b>Measurement and Symbolic Representation</b>											
1. Measure the physical properties of different forms of matter in metric system units (e.g., length, mass, volume, temperature) (PS-H-A1).				•	•	•	•	•	•	•	•
2. Gather and organize data in charts, tables, and graphs (PS-H-A1).		•	•	•	•	•	•	•	•	•	•
<b>Chemical Reactions</b>											
22. Identify evidence of chemical changes (PS-H-D1).				•	•		•	•	•		
25. Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation) (PS-H-D4).		•	•		•	•	•	•		•	•
26. Illustrate the laws of conservation of matter and energy through balancing simple chemical reactions (PS-H-D5) (PS-H-D3) (PS-H-D7).		•	•								
27. Distinguish between endothermic and exothermic reactions (PS-H-D6).	•	•	•	•						•	
28. Identify chemical reactions that commonly occur in the home and nature (PS-H-D7).	•	•	•					•	•		
<b>Energy</b>											
36. Measure and calculate the relationships among energy, work, and power (PS-H-F1).	•	•	•								
40. Demonstrate energy transformation and conservation in everyday actions (PS-H-F2).	•	•	•					•	•	•	
<b>Interactions of Energy and Matter</b>											
47. Explain how electricity and magnetism are related (PS-H-G2).										•	
49. Describe the Doppler effect on sound (PS-H-G3).		•	•	•	•	•	•	•	•	•	•
50. Identify positive and negative effects of electromagnetic/mechanical waves on humans and human activities (e.g., sound, ultraviolet rays, X-rays, MRIs, fiber optics) (PS-H-G4) (PS-H-G3).	•	•	•	•	•	•	•	•	•	•	•

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<b>GLEs Grade 9</b>	Starter Repair	Troubleshooting	Overhaul Small Engines	Careers in Small Engines							
<b>Physical Science</b>											
<b>Measurement and Symbolic Representation</b>											
1. Measure the physical properties of different forms of matter in metric system units (e.g., length, mass, volume, temperature) (PS-H-A1).	•	•	•								
2. Gather and organize data in charts, tables, and graphs (PS-H-A1).	•	•	•	•							
<b>Chemical Reactions</b>											
22. Identify evidence of chemical changes (PS-H-D1).	•	•	•	•							
25. Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation) (PS-H-D4).											
26. Illustrate the laws of conservation of matter and energy through balancing simple chemical reactions (PS-H-D5) (PS-H-D3) (PS-H-D7).											
27. Distinguish between endothermic and exothermic reactions (PS-H-D6).											
28. Identify chemical reactions that commonly occur in the home and nature (PS-H-D7).											
<b>Energy</b>											
36. Measure and calculate the relationships among energy, work, and power (PS-H-F1).											
40. Demonstrate energy transformation and conservation in everyday actions (PS-H-F2).											
<b>Interactions of Energy and Matter</b>											
47. Explain how electricity and magnetism are related (PS-H-G2).	•										
49. Describe the Doppler effect on sound (PS-H-G3).	•	•	•								
50. Identify positive and negative effects of electromagnetic/mechanical waves on humans and human activities (e.g., sound, ultraviolet rays, X-rays, MRIs, fiber optics) (PS-H-G4) (PS-H-G3).	•	•	•								

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<b>GLEs Grade 11-12</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Environmental Science</b>											
<b>Environmental Awareness and Protection</b>											
19. Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1).	•	•	•	•					•		
20. Relate environmental quality to quality of life (SE-H-C2).	•	•	•	•					•		
21. Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3).	•	•	•	•					•		
23. Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5).	•	•	•	•					•		
<b>Personal Choices and Responsible Actions</b>											
26. Determine local actions that can affect the global environment (SE-H-D4).				•			•	•	•		
28. Discuss the reduction of combustible engines needed to significantly decrease CO <sub>2</sub> in the troposphere (SE-H-D6).	•	•	•	•					•		
<b>Chemistry</b>											
<b>Physical Science - Measurement and Symbolic Representation</b>											
1. Convert metric system units involving length, mass, volume, and time using dimensional analysis (i.e., factor-label method) (PS-H-A1).		•	•	•		•	•			•	
2. Differentiate between accuracy and precision and evaluate percent error (PS-H-A1).		•	•	•		•	•			•	
3. Determine the significant figures based on precision of measurement for stated quantities (PS-H-A1).		•	•	•		•	•			•	
4. Use scientific notation to express large and small numbers (PS-H-A1).		•	•	•		•	•			•	
<b>Chemical Reactions</b>											
32. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1).		•	•	•				•	•		

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<b>GLEs Grade 11-12</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
46. Give examples of common chemical reactions, including those found in biological systems (PS-H-D7).		•	•	•				•	•		
<b>Interactions of Energy and Matter</b>											
48. Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4).	•	•	•	•			•	•	•		
<b>Physics</b>											
<b>Physical Science - Measurement and Symbolic Representation</b>											
1. Measure and determine the physical quantities of an object or unknown sample using correct prefixes and metric system units (e.g., mass, charge, pressure, volume, temperature, density) (PS-H-A1).		•	•	•		•	•	•	•	•	
2. Determine and record measurements correctly using significant digits and scientific notation (PS-H-A1).		•	•	•		•	•	•	•	•	
3. Determine accuracy and precision of measured data (PS-H-A1).		•	•	•		•	•	•	•	•	
5. Use trigonometric functions to make indirect measurements (PS-H-A1).		•	•	•		•	•	•	•	•	
<b>Forces and Motion</b>											
9. Describe and measure motion in terms of position, displacement time, and the derived quantities of velocity and acceleration (PS-H-E2).		•	•	•		•	•				
10. Determine constant velocity and uniform acceleration mathematically and graphically (PS-H-E2).		•	•	•		•	•				
15. Calculate centripetal force and acceleration in circular motion (PS-H-E3).		•	•	•		•	•				
16. Analyze circular motion to solve problems relating to angular velocity, acceleration, momentum, and torque (PS-H-E3).		•	•	•		•	•				
<b>Energy</b>											
19. Explain quantitatively the conversion between kinetic and potential energy for objects in motion (e.g., roller coaster, pendulum) (PS-H-F1).		•	•					•			
21. Explain and calculate the conversion of one form of energy to another (e.g., chemical to thermal, thermal to mechanical, magnetic to electrical) (PS-H-F1).		•	•					•			

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22. Analyze energy transformations using the law of conservation of energy (PS-H-F2).							•				
<b>Interactions of Energy and Matter</b>											
29. Describe observed electrostatic phenomena, calculate Coulomb's law, and test charge pole, electric field, and magnetic field (PS-H-G2).										•	
31. Describe the relationship of electricity, magnetism, and inductance as aspects of a single electromagnetic force (PS-H-G2).										•	

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 11-12</b>	Starter Repair	Troubleshooting	Overhaul Small Engines	Careers in Small Engines							
<b>Environmental Science</b>											
<b>Environmental Awareness and Protection</b>											
19. Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1).			•								
20. Relate environmental quality to quality of life (SE-H-C2).			•								
21. Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3).			•								
23. Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5).			•								
<b>Personal Choices and Responsible Actions</b>											
26. Determine local actions that can affect the global environment (SE-H-D4).		•	•								
28. Discuss the reduction of combustible engines needed to significantly decrease CO <sub>2</sub> in the troposphere (SE-H-D6).			•								
<b>Chemistry</b>											
<b>Physical Science - Measurement and Symbolic Representation</b>											
1. Convert metric system units involving length, mass, volume, and time using dimensional analysis (i.e., factor-label method) (PS-H-A1).		•	•								
2. Differentiate between accuracy and precision and evaluate percent error (PS-H-A1).		•	•								
3. Determine the significant figures based on precision of measurement for stated quantities (PS-H-A1).			•								
4. Use scientific notation to express large and small numbers (PS-H-A1).			•								
<b>Chemical Reactions</b>											
32. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1).		•	•								

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 11-12</b>	<b>Starter Repair</b>	<b>Troubleshooting</b>	<b>Overhaul Small Engines</b>	<b>Careers in Small Engines</b>							
46. Give examples of common chemical reactions, including those found in biological systems (PS-H-D7).		•	•								
<b>Interactions of Energy and Matter</b>											
48. Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4).			•								
<b>Physics</b>											
<b>Physical Science - Measurement and Symbolic Representation</b>											
1. Measure and determine the physical quantities of an object or unknown sample using correct prefixes and metric system units (e.g., mass, charge, pressure, volume, temperature, density) (PS-H-A1).		•	•								
2. Determine and record measurements correctly using significant digits and scientific notation (PS-H-A1).		•	•								
3. Determine accuracy and precision of measured data (PS-H-A1).		•	•								
5. Use trigonometric functions to make indirect measurements (PS-H-A1).		•	•								
<b>Forces and Motion</b>											
9. Describe and measure motion in terms of position, displacement time, and the derived quantities of velocity and acceleration (PS-H-E2).		•	•								
10. Determine constant velocity and uniform acceleration mathematically and graphically (PS-H-E2).		•	•								
15. Calculate centripetal force and acceleration in circular motion (PS-H-E3).		•	•								
16. Analyze circular motion to solve problems relating to angular velocity, acceleration, momentum, and torque (PS-H-E3).		•	•								
<b>Energy</b>											
19. Explain quantitatively the conversion between kinetic and potential energy for objects in motion (e.g., roller coaster, pendulum) (PS-H-F1).		•	•								
21. Explain and calculate the conversion of one form of energy to another (e.g., chemical to thermal, thermal to mechanical, magnetic to electrical) (PS-H-F1).		•	•								

Louisiana Science Grade Level Expectations	Content Guideline										
<b>GLEs Grade 11-12</b>	<b>Starter Repair</b>	<b>Troubleshooting</b>	<b>Overhaul Small Engines</b>	<b>Careers in Small Engines</b>							
22. Analyze energy transformations using the law of conservation of energy (PS-H-F2).		•									
<b>Interactions of Energy and Matter</b>											
29. Describe observed electrostatic phenomena, calculate Coulomb's law, and test charge pole, electric field, and magnetic field (PS-H-G2).		•	•								
31. Describe the relationship of electricity, magnetism, and inductance as aspects of a single electromagnetic force (PS-H-G2).		•	•								

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Number and Number Relations</b>											
1. Identify and describe differences among natural numbers, whole numbers, integers, rational numbers, and irrational numbers (N-1-H) (N-2-H) (N-3-H).											
3. Apply scientific notation to perform computations, solve problems, and write representations of numbers (N-2-H).											
4. Distinguish between an exact and an approximate answer, and recognize errors introduced by the use of approximate numbers with technology (N-3-H) (N-4-H) (N-7-H).											
5. Demonstrate computational fluency with all rational numbers (e.g., estimation, mental math, technology, paper/pencil) (N-5-H).											
<b>Algebra</b>											
8. Use order of operations to simplify or rewrite variable expressions (A-1-H) (A-2-H).											
9. Model real-life situations using linear expressions, equations, and inequalities (A-1-H) (D-2-H) (P-5-H).											
10. Identify independent and dependent variables in real-life relationships (A-1-H).											
<b>Measurement</b>											
17. Distinguish between precision and accuracy (M-1-H).											
18. Demonstrate and explain how the scale of a measuring instrument determines the precision of that instrument (M-1-H).											
19. Use significant digits in computational problems (M-1-H) (N-2-H).											
20. Demonstrate and explain how relative measurement error is compounded when determining absolute error (M-1-H) (M-2-H) (M-3-H).											
21. Determine appropriate units and scales to use when solving measurement problems (M-2-H) (M-3-H) (M-1-H).											
22. Solve problems using indirect measurement (M-4-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
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<b>Data Analysis, Probability, and Discrete Math</b>											
34. Follow and interpret processes expressed in flow charts (D-8-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9</b>	<b>Starter Repair</b>	<b>Troubleshooting</b>	<b>Overhaul Small Engines</b>	<b>Careers in Small Engines</b>							
<b>Number and Number Relations</b>											
1. Identify and describe differences among natural numbers, whole numbers, integers, rational numbers, and irrational numbers (N-1-H) (N-2-H) (N-3-H).											
3. Apply scientific notation to perform computations, solve problems, and write representations of numbers (N-2-H).											
4. Distinguish between an exact and an approximate answer, and recognize errors introduced by the use of approximate numbers with technology (N-3-H) (N-4-H) (N-7-H).											
5. Demonstrate computational fluency with all rational numbers (e.g., estimation, mental math, technology, paper/pencil) (N-5-H).											
<b>Algebra</b>											
8. Use order of operations to simplify or rewrite variable expressions (A-1-H) (A-2-H).											
9. Model real-life situations using linear expressions, equations, and inequalities (A-1-H) (D-2-H) (P-5-H).											
10. Identify independent and dependent variables in real-life relationships (A-1-H).											
<b>Measurement</b>											
17. Distinguish between precision and accuracy (M-1-H).											
18. Demonstrate and explain how the scale of a measuring instrument determines the precision of that instrument (M-1-H).											
19. Use significant digits in computational problems (M-1-H) (N-2-H).											
20. Demonstrate and explain how relative measurement error is compounded when determining absolute error (M-1-H) (M-2-H) (M-3-H).											
21. Determine appropriate units and scales to use when solving measurement problems (M-2-H) (M-3-H) (M-1-H).											
22. Solve problems using indirect measurement (M-4-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 9</b>	<b>Starter Repair</b>	<b>Troubleshooting</b>	<b>Overhaul Small Engines</b>	<b>Careers in Small Engines</b>							
<b>Data Analysis, Probability, and Discrete Math</b>											
34. Follow and interpret processes expressed in flow charts (D-8-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 10</b>	Introduction to Small Engines	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Measurement</b>											
7. Find volume and surface area of pyramids, spheres, and cones (M-3-H) (M-4-H).											
<b>Geometry</b>											
13. Solve problems and determine measurements involving chords, radii, arcs, angles, secants, and tangents of a circle (G-2-H).											
19. Develop formal and informal proofs (e.g., Pythagorean theorem, flow charts, paragraphs) (G-6-H).											
<b>Data Analysis, Probability, and Discrete Math</b>											
23. Draw and justify conclusions based on the use of logic (e.g., conditional statements, converse, inverse, contrapositive) (D-8-H) (G-6-H) (N-7-H).											
24. Use counting procedures and techniques to solve real-life problems (D-9-H).											
25. Use discrete math to model real life situations (e.g., fair games, elections) (D-9-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
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<b>Measurement</b>											
7. Find volume and surface area of pyramids, spheres, and cones (M-3-H) (M-4-H).											
<b>Geometry</b>											
13. Solve problems and determine measurements involving chords, radii, arcs, angles, secants, and tangents of a circle (G-2-H).											
19. Develop formal and informal proofs (e.g., Pythagorean theorem, flow charts, paragraphs) (G-6-H).											
<b>Data Analysis, Probability, and Discrete Math</b>											
23. Draw and justify conclusions based on the use of logic (e.g., conditional statements, converse, inverse, contrapositive) (D-8-H) (G-6-H) (N-7-H).											
24. Use counting procedures and techniques to solve real-life problems (D-9-H).											
25. Use discrete math to model real life situations (e.g., fair games, elections) (D-9-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 11-12</b>	Introduction to Small	Four-Stroke Cycle Engines	Two-Stroke Cycle Engines	Engine Maintenance	Problem Solving Techniques	Measuring	Inspection of Piston and Rings	Fuel System	Lubrication Systems	Magneto Ignition Systems	Governor Controls
<b>Number and Number Relations</b>											
1. Read, write, and perform basic operations on complex numbers (N-1-H) (N-5-H).											
<b>Measurement</b>											
11. Calculate angle measures in degrees, minutes, and seconds (M-1-H).											
12. Explain the unit circle basis for radian measure and show its relationship to degree measure of angles (M-1-H).											
13. Identify and apply the unit circle definition to trigonometric functions and use this definition to solve real-life problems (M-4-H).											

Louisiana Mathematics Grade Level Expectations	Content Guideline										
<b>GLEs Grade 11-12</b>	<b>Starter Repair</b>	<b>Troubleshooting</b>	<b>Overhaul Small Engines</b>	<b>Careers in Small Engines</b>							
<b>Number and Number Relations</b>											
1. Read, write, and perform basic operations on complex numbers (N-1-H) (N-5-H).											
<b>Measurement</b>											
11. Calculate angle measures in degrees, minutes, and seconds (M-1-H).											
12. Explain the unit circle basis for radian measure and show its relationship to degree measure of angles (M-1-H).											
13. Identify and apply the unit circle definition to trigonometric functions and use this definition to solve real-life problems (M-4-H).											



# Agriscience Power Equipment Content Guideline

(The student will be able to...)

## Unit One

### Introduction to Small Engines

1. *Develop a personal plan.*
  - a. *Career path*
  - b. *FFA participation*
  - c. *SAE*
2. *Distinguish between safe and unsafe practices in repairing and maintaining small gasoline engines.*
3. *Demonstrate basic shop safety practices as related to small engine maintenance and repair.*
  - a. *Selected fire safety equipment*
  - b. *Hand tools*
  - c. *Portable electric tools*
  - d. *Color-code dynamics*
  - e. *Good housekeeping*
4. *Determine potential hazards in the shop and repair area.*
5. *Identify the common tools used for small engine repair.*
6. *Demonstrate skills for safely operating agricultural small engine tools and equipment.*
  - a. *Hand tools*
  - b. *Power tools*
7. *Differentiate between two- and four-cycle engines.*
  - a. *Characteristics of a four-cycle engine and a two-cycle engines*
  - b. *Four-cycle and a two-cycle small engine information forms.*
7. *Discuss the basic principles and design of small engines.*
  - a. *Work, horsepower, torque, and cubic-inch displacement calculations*
  - b. *Horsepower, torque, and engine cubic-inch displacement comparisons*
  - c. *Internal piston and cylinder components*
8. *Identify the parts of the small engine.*
9. *Determine appropriate FFA awards and career development events for small engine related careers.*

## Unit Two

### Four-Stroke Cycle Engines

1. *Identify engine components in a four stroke engine.*
2. *Understand the operation of a four-stroke engine.*
3. *Identify the cooling systems for the four-stroke engine.*
4. *Determine common applications of the four-stroke engine.*

### **Unit Three**

#### **Two-Stroke Cycle Engines**

1. Identify engine components in a two stroke engine.
2. Understand the operation of a two-stroke engine.
3. Identify the cooling mechanisms for the two-stroke engine.
4. Determine common applications of the two-stroke engine.

### **Unit Four**

#### **Engine Maintenance**

1. *Determine the steps for a minor engine tune-up.*
2. *Identify problems that require a major tune up or engine overhaul.*
3. *Identify common practices needed for maintaining operation of a small engine.*
4. *Determine proper steps for seasonal storage of a small engine.*

### **Unit Five**

#### **Problem-Solving Techniques**

1. *Conduct systematic engine checks to identify problems.*
2. *Correctly read a small engines parts manual.*
3. *Correctly identify needed parts for problem solving.*
4. *Tear down an engine for repair.*
5. Write a service order.

### **Unit Six**

#### **Measuring**

1. *Identify the correct measuring device for each application.*
2. *Distinguish between a micrometer, a vernier caliper, and a dial indicator.*
3. *Learn to use, and accurately measure with, each measuring device.*
4. *Demonstrate the ability to identify, read, and use a plain micrometer, a vernier caliper, and dial indicator.*
5. *Determine engine wear.*

### **Unit Seven**

#### **Inspection of Piston and Rings**

1. *Determine faults in pistons and rings.*
2. *Connect the rod and crankshaft.*
3. *Correctly use a torque wrench.*
4. *Measure crankshaft endplay.*
5. *Determining repair alternatives for pistons and rings.*
6. Order necessary engine parts.

## **Unit Eight**

### **Fuel System**

1. *Understand the operation and function of the carburetor.*
2. *Identify the parts of the carburetor.*
3. *Demonstrate the ability to remove, clean, service, and replace the components of the fuel systems for small engines.*

## **Unit Nine**

### **Lubrication Systems**

1. *Analyze the components of various lubrication systems typically found on small engines and the appropriate lubricants used.*
2. *Service the components of various lubrication systems found on small engines.*
3. *Research the functions of engine oils and additives and the appropriate lubricants based on the uses of small engines.*

## **Unit Ten**

### **Magneto Ignition Systems**

1. *Understand the operation and function of magneto ignition systems.*
2. *Identify the parts of the ignition system.*
3. *Test the coil, condenser, armature, flywheel magnets, and contact points.*
4. *Install the magnetron.*
5. *Test the magnetron and troubleshoot ignition problems.*

## **Unit Eleven**

### **Governor Controls**

1. *Service the components of small engine governor systems.*
2. *Examine the functions of the components of the engine governor systems.*
3. *Identify common governor controls used in small engines.*
4. *Demonstrate the ability to correctly inspect, adjust, and repair the components of the engine governor controls.*

## **Unit Twelve**

### **Starter Repair**

1. *Service the different types of starting systems commonly used with small engines.*
2. *Identify the parts of the starter system in small engines.*
  - a. *Mechanical starter component function*
  - b. *Mechanical starter component operation*
3. *Demonstrate the ability to remove, disassemble, test, service, and reassemble a mechanical starter.*
4. *Determine the function and operation of the components found in a DC starter system.*
5. *Demonstrate the ability to test, service, and replace a DC starter system.*

## **Unit Thirteen**

### **Troubleshooting**

1. *Properly assemble the small engine.*
2. *Identify performance problems in small engines.*
  - a. *Troubleshooting charts*
  - b. *Problem diagnosis*
3. *Correctly test crankcase vacuum systems.*
4. *Determine common causes of performance problems.*
5. *Identify causes of failures in small engines.*

## **Unit Fourteen**

### **Overhaul Small Engines**

1. *Demonstrate disassembling, inspecting, servicing and/or repairing, and reassembling a four-stroke cycle engine.*
2. *Overhaul four-stroke engines including the examination of the following:*
  - a. *Parts of the piston*
  - b. *Connecting rod assembly*
  - c. *Crankshaft assembly*
  - d. *Valve train*
3. *Demonstrate disassembling, inspecting, servicing and/or repairing, and reassembling a two-stroke engine.*
4. *Overhaul two-stroke engines including the examination of the following:*
  - a. *Parts of the piston*
  - b. *Connecting rod assembly*
  - c. *Crankshaft assembly*

## **Unit Fifteen**

### **Careers in Small Engines**

1. *Analyze career interests in small engine technology.*
  - a. *Career self-analysis*
2. *Evaluate careers opportunities in agricultural mechanics and related occupations.*
  - a. *Careers in agricultural mechanics and related occupations*
  - b. *Resume building and writing*
  - c. *Occupational outlook*

# Resources

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Schuster, William (1999). *Small Engine Technology*. Stamford, CT: Thomson Learning.

London, Daniel, and Stone, Lynn M. (2003). *Small Engine Care and Repair: A Step-by-Step Guide to Maintaining Your Small Engine*. Wauwatosa, WI: Briggs and Stratton

## Internet Sites

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[www.briggsandstratton.com](http://www.briggsandstratton.com) (2003). Briggs and Stratton.