SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Introduction to Small Engine Repair	**Length of Course:** 15 cycles
Grade Level(s): 10-12	**Periods Per Cycle:** 6
Units of Credit: 0.5	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 64.5 hours

Course Description

In this course students will be exposed to the mechanics of small engines. Students will learn the science of a small engine in addition to troubleshooting, maintaining, and repairing small engines. This course could offer a service to the Spring Grove community. Regardless of their postsecondary plans, any student considering a career field related to STEM will be encouraged to take the course to enhance problem solving skills. All students will receive an emphasis on learning skills for home maintenance projects. Students will also gain the ability to work on necessary soft skills needed in the workplace as they manage their client's needs for their small engine machine.

Instructional Strategies, Learning Practices, Activities, and Experiences

Critical Thinking Guided Practice Warm-Up/Closures	Class Discussions Flexible Groups Best Practices Strategies	Teacher Demonstrations Project Examples Hands on Projects

Assessments

Application Projects/Exercises	Written Tests	Verbal Discussions

Materials/Resources

Teacher Generated Materials Small Engines	Textbooks/Workbooks Standard and Specialized Tools	Online Resources Personal Safety Protection

Adopted: 5/24/21
Revised:

CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Internal Combustion Engines Engine Classification Ignition Number of Strokes Cylinder Design Shaft Orientation Cooling System History Heat Force Pressure Torque Work Power	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Safety and Tools Operation Safety Flammable Liquids Carbon Monoxide Personal Protective Equipment Protective Clothing Eye Protection Ear Protection Respiratory Protection Hand Protection Foot Protection Back Protection Parts Cleaning Hazardous Materials Disposal Hand Tools Power Tools Test Tools	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Engine Operation Engine Components Engine Block Cylinder Head Crankshaft Piston and Piston Rings Connecting Rod Bearings Flywheel Valve Train 4-Stroke Cycle Engines Intake Compression Ignition Power Exhaust Valve Overlap 4-Stroke Cycle Engine Valving System 2-Stroke Cycle Engine Valving System	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Compression System Compression Valves Piston Piston Rings Cylinder Bore	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Fuel System Fuel Engine Emissions Octane Carburetor Operation Principles Carburetor Operation Emulsion Tube and Jets Fuel Filter	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Governor System Governor System Operation Principles Governor System Components	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2**. Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Electrical System Electrical Principles Voltage, Current, Resistance Magnetron Ignition System Starting System	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Cooling and Lubrication Systems Engine Heat Engine Materials and Characteristics Air-Cooled Engine Cooling Systems Lubrication Lubrication Systems	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Failure Analysis Engine Failure	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2**. Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

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Engine Application and Selection	**3.4.10.A2.** Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3.** Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.12.A3.** Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. **3.4.10.B3.** Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. **3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2.** Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.10.D2.** Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.10.E3.** Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. **3.4.12.E6.** Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world. **3.4.12.E7.** Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.10.E7.** Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.