



School District of Marshfield Course Syllabus

Course Name: Outdoor Power Equipment
Length of Course: Year
Credit: 1 Credit

Program Goal:

Empower learners to be college and career ready through standards-based experiences in the classroom and career-based learning experiences with business and industry partners.

Learners will engage through technology in design, building, problem-solving, repair or service, in a collaborative environment through theory and hands-on experiences.

Course Description:

Outdoor Power Equipment is a laboratory-based course. During the first semester, the learners will disassemble and assemble a school owned small gasoline engine and be introduced to some basic electricity. During the second semester, students will learn the theory, operation, and proper maintenance procedures of outdoor power equipment by performing maintenance on various outdoor power equipment products of their own.

| Wisconsin Standards for Technology and Engineering (TE) | |
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| Broad-Based (BB) | |
| BB1: Students will analyze the core concepts of technology. | |
| Analyze and use technological systems BB1.a | 1.a.5.h: Describe how systems can fail because of design flaws, defect parts, poorly matched parts or they were used beyond their design capabilities. 1.a.6.h: Describe how the outputs of one subsystem are the inputs of another subsystem given a prominent energy, power and transportation system. |
| Analyze and use mechanisms BB1.c | 1.c.5.h Given a linear, rotary and/or compound motion mechanism, students will measure and calculate units such as work, power, torque, gear ratios, and mechanical advantage. |
| Analyze and use electricity and electronic systems BB1.d | 1.d.6.h: Perform a voltage drop test and describe the relationship between voltage, current, and resistance with a multimeter. 1.d.7.h: Inspect and test components such as switches, connectors, relays, and solid state devices and conductors and take appropriate action. |
| Analyze, explain, and use control systems BB1.e | 1.e.6.h: Select and perform appropriate maintenance in order for the product or system to continue functioning properly, to extend its life or to upgrade its capability given a flawed product or system. |
| Electronics (EL) | |
| EL1: Students will develop, use, and apply basic electronics and electricity concepts. | |
| Apply electronic theory to practice EL1.a | 1.a.13.h: Calculate current, voltage, or resistance using Ohm’s Law and Kirchoff’s Voltage Law. 1.a.16.h: Demonstrate standard metric conversions. 1.a.17.h: Convert fixed numbers to scientific notation. 1.a.18.h: Explain the difference between conventional current theory and electron current theory. |
| EL2: Students will develop the ability to use symbols, measurements, and schematics to build, test, and troubleshoot electronic circuits and systems. | |
| Construct and measure a basic circuit using electronic components EL2.a | 2.a.8.h: Explain the basic operation of the following electronic components: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries, and Power Supplies. 2.a.9.h: Recognize the following electronic components by constructing simple circuits: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries, and Power Supplies. 2.a.10.h: Demonstrate multimeter and usage. 2.a.12.h: List types of solder and reasons for choosing each. |
| Demonstrate electronic measurement to series, parallel, and combination circuits | 2.b.5.h: Explain how a series circuit is used in DC electronic equipment. |

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| EL2.b | <p>2.b.6.h: Calculate an unknown current, voltage, or resistance in a series circuit using Ohm’s Law.</p> <p>2.b.7.h: Explain how a parallel circuit is used in DC electronic equipment.</p> <p>2.b.8.h: Calculate an unknown current, voltage, or resistance in a parallel circuit using Ohm’s Law.</p> <p>2.b.9.h: Apply Kirchoff’s Current Law to a constructed circuit.</p> <p>2.b.10.h: Explain multimeter construction, components, and usage, and distinguish between digital and analog meters.</p> |
| EL7: Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology. | |
| <p>Demonstrate, apply, and measure electronic safety concepts applied to circuits</p> <p>EL7.a</p> | <p>7.a.6.h: Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.</p> <p>7.a.7.h: Describe personal safety precautions for working with electric and electronic devices electrical shock.</p> <p>7.a.8.h: List various degrees of current the body can tolerate.</p> |
| Power and Energy (PE) | |
| PE1: Students will be able to select and use energy and power technologies. | |
| <p>Discuss, analyze, and use energy systems</p> <p>PE1.a</p> | <p>1.a.12.h: Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</p> <p>1.a.15.h: Assess how power systems must have a source of energy, a process, and loads.</p> |
| <p>Analyze, use, and discuss machine and tool use relating to energy and power systems</p> <p>PE1.b</p> | <p>1.b.9.h: Describe how future trends in new and developing tools used in power and energy systems use innovative design and techniques.</p> <p>1.b.10.h: Demonstrate how the uses of new technology, tools, and machines are necessary for future trends in power and energy systems.</p> <p>1.b.11.h: Demonstrate and follow proper safety procedures for tools and machines used in power and energy systems.</p> <p>1.b.12.h: Demonstrate the practical and theoretical applications of test equipment to identify voltage, current, and resistance in energy systems.</p> |
| Transportation Standards (TR) | |
| TR1: Students will be able to select and use transportation technologies. | |
| <p>Analyze and explain transportation systems</p> <p>TR1.a</p> | <p>1.a.6.h: Summarize how transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety and agriculture.</p> |
| <p>Analyze and explain how transportation vehicles and transportation vehicle systems work</p> <p>TR1.b</p> | <p>1.b.7.h: Interpret preventive maintenance schedules and recommended service intervals for vehicles.</p> <p>1.b.9.h: Explain that all systems demand specific repair procedures in order to achieve the highest performance and efficiency.</p> |

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| <p>Develop the skill set necessary to diagnose, problem solve and repair transportation vehicles TR1.c</p> | <p>1.c.10.h: Students will perform tasks related directly to current national standards per transportation area (i.e., NATEF). 1.c.12.h: Explain career preparation, career pathways and the importance of on-the-job training as well as further education with regard to the transportation field.</p> |
| <p align="center">Wisconsin Common Career Technical Standards (WCCTS)</p> | |
| <p align="center">Creativity, Critical Thinking, Communication and Collaboration (4C)</p> | |
| <p>4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.</p> | |
| <p>Develop original solutions, products, and services to meet a given need 4C1.a</p> | <p>1.a.7.h: Develop original ways to solve a given problem. 1.a.8.h: Design a product or service that could fulfill a human need or desire. 1.a.9.h: Apply past experiences to current problems in developing innovative solutions.</p> |
| <p>Work creatively with others to develop solutions, products, and services 4C1.b</p> | <p>1.b.7.h: Incorporate the skills and experiences of others to develop a new solution to a problem. 1.b.8.h: Work as part of a team to design a product or service that could fulfill a human need or desire. 1.b.9.h: Work as part of a team to improve an existing product or process.</p> |
| <p>4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.</p> | |
| <p>Develop effective resolutions for a given problem, decision or opportunity using available information 4C2.a</p> | <p>2.a.11.h: Determine the information needed to address an identified problem. 2.a.12.h: Contrast the benefits and drawbacks of various proposed resolutions to a given situation. 2.a.13.h: Predict how an action could result in unintended consequences, both positive and negative. 2.a.14.h: Analyze the impact of a decision using a systems thinking model. 2.a.15.h: Determine the best resolution for a problem, decision or opportunity based on given criteria. 2.a.16.h: Defend an action taken or a decision implemented.</p> |
| <p>Develop and implement a resolution for a new situation using personal knowledge and experience 4C2.b</p> | <p>2.b.5.h: Apply past experience to develop a course of action for a new situation. 2.b.6.h: Use existing knowledge to develop a resolution for a new situation, problem, or opportunity.</p> |
| <p>4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.</p> | |
| <p>Communicate thoughts and feelings with others using verbal and non-verbal language 4C3.a</p> | <p>3.a.9.h: Develop a mutually acceptable response to a question or problem. 3.a.11.h: Communicate effectively in the presence of a language barrier. 3.a.12.h: Utilize effective listening skills in creating consensus in a group.</p> |

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| Work collaboratively with others 4C3.b | 3.b.7.h: Participate in group processes to generate consensus. 3.b.8.h: Lead group processes to generate consensus. |
| Use interpersonal skills to resolve conflicts with others in an ethical manner 4C3.c | 3.c.7.h: Resolve conflicts productively with individuals as they arise. 3.c.8.h: Lead a team or group through a conflict resolution process to reach a productive outcome. |
| Career Development (CD) | |
| CD1: Students will consider, analyze and apply an awareness of self, identity and culture to identify skills and talents. | |
| Identify person strengths, aptitudes and passions CD1.a | 1.a.3.h: Evaluate various occupations and career pathways to identify personal, academic and career goals based on personal strengths, aptitudes, and passions. |
| Demonstrate effective decision-making, problem solving and goal setting CD1.b | 1.b.5.h: Use a decision-making and problem-solving model. 1.b.6.h: Develop an action plan to set and achieve realistic goals. |
| CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals. | |
| Assess attitudes and skills that contribute to successful learning in school and across the life span CD2.b | 2.b.8.h: Assess education and training opportunities to acquire new skills necessary for career advancement. |
| CD3: Students will create and manage a flexible and responsive individualized learning plan to meet their career goals. | |
| Examine and evaluate opportunities that could enhance life and career plans and articulate plans to guide decisions and actions CD3.b | 3.b.5.h: Evaluate the relationship between educational achievement and career development. |
| Employ career management strategies to achieve future career success and satisfaction CD3.c | 3.c.6.h: Discuss how adaptability and flexibility, especially when initiating or responding to change, contributes to career success. |
| CD4: Students will identify and apply employability skills. | |
| Demonstrate skills related to seeking and applying for employment to find and obtain a desired job CD4.b | 4.b.6.h: Prepare a resume, cover letter, employment application. |
| Identify and exhibit traits for retaining employment CD4.c | 4.c.4.h: Model behaviors that demonstrate reliability and dependability. 4.c.5.h: Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite. |
| Environment, Health, and Safety (EHS) | |

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| EHS1: Students will identify the importance and interrelationships of health, safety and environmental systems and evaluate the impacts of these systems on organizational performance for continuous improvement. | |
| Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments EHS1.d | 1.d.8.h: Identify different workplace systems that protect and enhance personal and environmental health and safety. |
| Automotive Service Excellence (ASE) | |
| I. Engine Repair | |
| A. General | |
| <ol style="list-style-type: none"> 1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). 3. Verify operation of the instrument panel engine warning indicators. 4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. 5. Install engine covers using gaskets, seals, and sealers as required. 6. Demonstrate understanding of the procedure for verifying engine mechanical timing. | |
| B. Cylinder Head and Valve Train | |
| <ol style="list-style-type: none"> 1. Identify cylinder head and valve train components and configurations. | |
| D. Lubrication and Cooling Systems | |
| <ol style="list-style-type: none"> 1. Identify lubrication and cooling system components and configurations. 2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. | |
| VI. Electrical/ Electronic Systems | |
| A. General | |
| <ol style="list-style-type: none"> 1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). 2. Identify electrical/electronic system components and configurations. 4. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). 5. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. 6. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. 7. Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information. 9. Use wiring diagrams to trace electrical/electronic circuits. 11. Inspect and test fusible links, circuit breakers, and fuses. | |
| B. Batteries (Conventional 12-volt) | |
| <ol style="list-style-type: none"> 1. Perform battery state-of-charge test; determine needed action. 4. Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs. 5. Perform battery charging according to manufacturer's recommendations. | |

| C. Starting System | | | |
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| 1. Perform starter current draw test. | | | |
| 2. Perform starter circuit voltage drop tests. | | | |
| 3. Inspect and test starter relays and solenoids. | | | |
| Key Vocabulary: | | | |
| 2-Stroke Cycle | Cylinder | Magnetism | Series Circuit |
| 4-Stroke Cycle | Diesel | Movement | Stroke |
| Bore | Exhaust | Multimeter | Torque |
| Conductor | Gasoline | Parallel Circuit | Venturi |
| Combination Circuit | Gear Ratio | Power | Viscosity |
| Combustion | Horsepower | Primary Circuit | Voltage |
| Compression | Insulator | Resistance | |
| Current | Intake | Secondary Circuit | |

Topics/Content Outline- Units and Themes:

Quarter 1: Small Engines

- Careers and Professionalism in the Industry
- Small Engine Shop Safety
- Hand Tools and Measuring Instruments
- Fasteners
- Small Engine Identification and Service Information
- Small Engine Construction and Part Names

Quarter 2: Electricity

- Generating Electricity
- Parts of Circuits
- Types of Circuits
- Measurable Electrical Terms (Ohm's Law)
- Digital Multimeter Usage
- Wiring Diagrams

Quarter 3: Maintenance and Systems

- Repair Orders and Repair Manuals
- Preventative Maintenance and Troubleshooting
- General Engine Assembly Inspection
- 2-Stroke and 4-Stroke Cycle
- Lubrication and Cooling Systems

Quarter 4: Maintenance and Systems

- Carburetion Systems
- Combustion
- Ignition Systems
- Pneumatics
- Hydraulics

Primary Resource(s):

Small Engine Care & Repair

Creative Pub Intl

ISBN: 0-86573-180-2

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Small Gas Engine

Goodheart Wilcox

ISBN: 1-59070-183-6

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Single Cylinder "L" Head Repair Manual, Part No. 270962-6

Briggs and Stratton

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