School District of Marshfield Course Syllabus

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

Program Goal(s):

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 students 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.

Standards:

Wisconsin Technology & Engineering – Broad Based (BB)

Standard	Learning Priority	Performance Indicators
BB1: Students will analyze the core concepts of technology	BB1.a Analyze and use technological systems	BB1.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

		BB1.a.6.h Describe how the outputs of one subsystem given a prominent energy, power and transportation system
	BB1.c Analyze and use mechanisms.	BB1.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.
	BB1.d Analyze and use electricity and electronic systems.	BB1.d.6.h Perform a voltage drop test and describe the relationship between voltage, current, and resistance with a multimeter. BB1.d.7.h Inspect and test components such as switches, connectors, relays, and solid state devices and conductors and take appropriate action.
	BB1.e Analyze, explain, and use control systems.	BB1.e.6.h Select and perform appropriate maintenance is the process 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.
Wisconsin Technology & Engineering – Electronics (EL)		
Standard	**Learning Priority**	**Performance Indicators**
EL1: Students will develop, use, and apply basic electronics and electricity concepts.	EL1.a Apply electronic theory to practice.	EL1.a.13.h Calculate current, voltage, or resistance using Ohm's Law and Kirchoff's Voltage Law. EL1.a.16.h Demonstrate standard metric conversions. EL1.a.17.h Convert fixed numbers to scientific notation. EL1.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.	EL2.a Construct and measure a basic circuit using electronic components.	EL2.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. EL2.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. EL2.a.10.h Demonstrate multimeter and usage.

		EL2.a.12.h List types of solder and reasons for choosing each.
	EL2.b Demonstrate electronic measurement to series, parallel, and combination circuits.	EL2.b.5.h Explain how a series circuit is used in DC electronic equipment. EL2.b.6.h Calculate an unknown current, voltage, or resistance in a series circuit using Ohm's Law. EL2.b.7.h Explain how a parallel circuit is used in DC electronic equipment. EL2.b.8.h Calculate an unknown current, voltage, or resistance in a parallel circuit using Ohm's Law. EL2.b.9.h Apply Kirchoff's Current Law to a construction circuit. EL2.b.10.h Explain multimeter construction, components, and usage, and distinguish between digital and analog meters.
EL7: Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology.	EL7.a Demonstrate, apply, and measure electronic safety concepts applied to circuits.	EL7.a.6.h Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. EL7.a.7.h Describe personal safety precautions for working with electric and electronic devices electrical shock. EL7.a.8.h List various degrees of current the body can tolerate.
Wisconsin Technology & Engineering – Power and Energy (PE)		
Standard	**Learning Priority**	**Performance Indicators**
PE1: Students will be able to select and use energy and power systems.	PE1.a Discuss, analyze, and use energy systems.	PE1.a.12.h Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, and nuclear. PE1.a.15.h Assess how power systems must have a source of energy, a process, and loads.
	PE1.b Analyze, use, and discuss machine and tool use relating to energy and power systems.	PE1.b.9.h Describe how future trends in new and developing tools used in power and energy systems use innovative design and techniques. PE1.b.10.h Demonstrate how the uses of new technology, tools, and machines are necessary for future trends in power and energy systems. PE1.b.11.h Demonstrate and follow proper safety procedures for tools and machines used in power and energy systems. PE1.b.12.h Demonstrate the practical and theoretical applications of test equipment to identify voltage.

		current, and resistance in energy systems.
TR1: Students will be able to select and use transportation technologies.	TR1.a Analyze and explain transportation systems.	TR1.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.
	TR1.b Analyze and explain how transportation vehicles and transportation vehicle systems work.	TR1.b.7.h Interpret preventive maintenance schedules and recommended service intervals for vehicles. TR1.b.9.h Explain that all systems demand specific repair procedures in order to achieve the highest performance and efficiency.
	TR1.c Develop he skill set necessary to diagnose, problem solve and repair transportation vehicles.	TR1.c.10.h Students will perform tasks related directly to current national standards per transportation area (i.e., NATEF). Tr1.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.
Wisconsin Common Career Technical Standards (WCCTS)-Creativity, Critical Thinking, Communication and Collaboration (C)		
Standard	**Learning Priority**	**Performance Indicators**
Standard: 4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.	4C1.a: Develop original solutions, products and services to meet a given need.	4C1.a.4.m: Analyze elements of a problem to develop creative solutions. 4C1.a.6.m: Describe how past experiences can inform current problem solving. 4C1.a.7.h: Develop original ways to solve a given problem. 4C1.a.8.h: Design a product or service that could fulfill a human need or desire. 4C1.a.9.h: Apply past experiences to current problems in developing innovative solutions.
	4C1.b: Work creatively with others to develop solutions, products and services.	4C1.b.4.m: Explain how multiple people can develop better solutions than an individual. 4C1.b.5.m: Explain how multiple people and perspectives can develop better ideas than an individual. 4C1.b.6.m: Explain how multiple people and perspectives can improve an existing product or process better than an individual. 4C1.b.7.h: Incorporate the skills and experiences of others to develop a new solution to a problem.

		4C1.b.8.h: Work as part of a team to design a product or service that could fulfill a human need or desire. 4C1.b.9.h: Work as part of a team to improve an existing product or process.
Standard: 4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.	4C2.a: Develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.5.m: Analyze symptoms to identify the root cause of a problem. 4C2.a.6.m: Develop multiple resolutions for a given problem, decision or opportunity. 4C2.a.7.m: Identify problems that became worse due to poorly thought out or poorly informed solutions. 4C2.a.8.m: Explain how implementation of a solution or action may affect one or more corresponding systems. 4C2.a.9.m: Explain how different resolutions may be appropriate under different circumstances. 4C2.a.10.m: Explain the process for choosing an action or making a decision. 4C2.a.11.h: Determine the information needed to address an identified problem. 4C2.a.12.h: Contrast the benefits and drawbacks of various proposed resolutions to a given situation. 4C2.a.13.h: Predict how an action could result in unintended consequences, both positive and negative. 4C2.a.14.h: Analyze the impact of a decision using a systems thinking model. 4C2.a.15.h: Determine the best resolution for a problem, decision or opportunity based on given criteria. 4C2.a.16.h: Defend an action taken or a decision implemented.
	4C2.b: Develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.3.m: Analyze problems to determine what past experiences might be related and relevant. 4C2.b.4.m: Analyze a problem to determine how it relates to existing knowledge. 4C2.b.5.h: Apply past experience to develop a course of action for a new situation. 4C2.b.6.h: Use existing knowledge to develop a resolution for a new situation, problem or opportunity.

Standard: 4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.	4C3.a: Communicate thoughts and feelings with others using verbal and non-verbal language.	4C3.a.8.m: Implement effective listening skills in resolving a situation. 4C3.a.9.h: Develop a mutually acceptable response to a question or problem. 4C3.a.11.h: Communicate effectively in the presence of a language barrier. 4C3.a.12.h: Utilize effective listening skills in creating consensus in a group.
	4C3.b: Work collaboratively with others.	4C3.b.4.m: Use idea generating practices as part of a group. 4C3.b.5.m: Describe ways to facilitate group collaboration. 4C3.b.6.m: Demonstrate the use of various tools to communicate effectively with an individual or a group. 4C3.b.7.h: Participate in group processes to generate consensus. 4C3.b.8.h: Lead group processes to generate consensus.
	4C3.c: Use interpersonal skills to resolve conflicts with others in an ethical manner.	4C3.c.5.m: Contribute to resolving conflicts that occur within a team or group. 4C3.c.6.m: Explore the ethical considerations of a current or historical action or decision. 4C3.c.7.h: Resolve conflicts productively with individuals as they arise. 4C3.c.8.h: Lead a team or group through a conflict resolution process to reach a productive outcome.
Wisconsin Common Career Technical Standards (WCCTS) – Career Development (CD)		
Standard	**Learning Priority**	**Performance Indicators**
CD1: Students will consider, analyze and apply an awareness of self, identity and culture to identify skills and talents.	CD1.a: Identify person strengths, aptitudes and passions.	CD1.a.3.h: Evaluate various occupations and career pathways to identify personal, academic and career goals based on personal strengths, aptitudes and passions.
	CD1.b: Demonstrate effective decision-making, problem solving and goal setting.	CD1.b.3.m: Develop effective coping skills for dealing with problems. CD1.b.5.h: Use a decision-making and problem-solving model. CD1.b.6.h: Develop an action plan to set and achieve realistic goals.
	CD1.c: Interact effectively with others in similar and diverse teams.	CD1.c.5.m: Distinguish between appropriate and inappropriate behavior in a team setting.

		CD1.c.7.m: Display cooperative behavior and identify personal strengths and assets in groups.
CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals.	CD2.b: Assess attitudes and skills that contribute to successful learning in school and across the life span.	CD2.b.6.m: Research local and regional labor market and job growth information to analyze career opportunities. CD2.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.	CD3.b: Examine and evaluate opportunities that could enhance life and career plans and articulate plan to guide decisions and actions.	CD3.b.2.m: Describe educational levels (e.g., work-based learning, certificate, two-year, four-year and professional degrees) and performance skills needed to attain personal and career goals. CD3.b.3.m: Demonstrate openness to exploring a wide range of occupations and career pathways. CD3.b.5.h: Evaluate the relationship between educational achievement and career development.
	CD3.c: Employ career management strategies to achieve future career success and satisfaction.	CD3.c.3.m: Identify work values and needs. CD3.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.	CD4.a: Identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.3.m: Demonstrate self-discipline, self-worth, positive attitude and integrity. CD4.a.4.m: Demonstrate flexibility and willingness to learn new knowledge and skills.
	CD4.b: Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.	CD4.b.4.m: Compare and contrast personal attributes with employment needs and trends. CD4.b.6.h: Prepare a resume, cover letter, employment application.
	CD4.c: Identify and exhibit traits for retaining employment.	CD4.c.2.m: Demonstrate the behavior and etiquette appropriate to interactions with adults. CD4.c.3.m: Distinguish between appropriate behaviors in a social vs. professional setting. CD4.c.4.h: Model behaviors that demonstrate reliability and dependability. CD4.c.5.h: Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.

Wisconsin Common Career Technical Standards – Environment, Health, and Safety (EHS)		
Standard	**Learning Priority**	**Performance Indicators**
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.	EHS1.d: Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments.	EHS1.d.5.m: Recognize and use systems in school and in the community that protect and enhance personal, environmental health and safety. EHS1.d.8.h: Identify different workplace systems that protect and enhance personal and environmental health and safety.
National Automotive Technicians Education Foundation (NATEF)		
ASE Area	**Category**	**Task**
I. Engine Repair	A. General	1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. 2. Verify operation of the instrument panel engine warning indicators. 3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. 4. Install engine covers using gaskets, seals, and sealers as required. 5. Verify engine mechanical timing. 6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
	B. Cylinder Head and Valve Train	1. Adjust valves (mechanical or hydraulic lifters). 2. Identify components of the cylinder head and valve train.
	C. Lubrication and Cooling Systems	5. Perform engine oil and filter change; use proper fluid type per manufacturer specifications; reset maintenance reminder as required. 6. Identify components of the lubrication and cooling systems.
VI. Electrical/Electronic Systems	A. General	1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. 2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). 3. Use wiring diagrams to trace electrical/electronic circuits.

		4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. 5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. 6. Use a test light to check operation of electrical circuits. 9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. 11. Identify electrical/electronic system components and configuration.
	B. Battery Service	1. Perform battery state-of-charge test; determine necessary action. 4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. 5. Perform slow/fast battery charge according to manufacturer's recommendations.
	C. Starting System	1. Perform starter current draw test; determine necessary action. 2. Perform starter circuit voltage drop tests; determine necessary action. 3. Inspect and test starter relays and solenoids; determine necessary action.

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
- Measureable 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 © 1998	• **Small Gas Engine** Goodheart Wilcox ISBN: 1-59070-183-6 © 2003
• **Single Cylinder "L" Head Repair Manual, Part No. 270962-6** Briggs and Stratton © 1999	