

Outdoor Power Technology

Subject Code: 010235

Course & Unit Descriptions

Course Description:

The *Outdoor Power Technology* course trains students in technical knowledge and mechanical skills necessary to maintain, troubleshoot and repair small outdoor power equipment used in agriculture, horticulture and natural resource management. Students will learn the theory of power and progresses through aspects of engine, drive train, and ancillary systems that make up modern small engine powered equipment. Students will learn theory, application, and troubleshooting of 2- and 4-stroke engines, electrical systems, fuel systems, power train systems, and other related systems pertaining to outdoor power equipment.

Unit: Shop Safety

Students will demonstrate their knowledge of safety rules and regulations. Students will identify safety signs and signals. Students will describe health and safety practices and demonstrate appropriate responses for major types of hazardous materials disasters.

Benchmark: 3.7 Communication Skills

Level 2: Conduct a business meeting using decision-making techniques

Indicators

3.7.03 Develop and deliver formal and informal presentations

Academic Standards

- English: Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)
- Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)
- Social Studies: Evaluate the reliability and credibility of sources. (Social Studies Skills and Methods A, 9-10)

Benchmark: 3.9 Emotional Intelligence

Level 2: Exhibit techniques to control emotional reactions to people and situations

Indicators

- 3.9.03 Manage personal emotions, behavior and appearance to maintain professionalism
- 3.9.04 Describe and exhibit appropriate ethical behavior
- 3.9.05 Accept and use constructive feedback to improve work habits

Academic Standards

- English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)
- Social Studies: Analyze how issues may be viewed differently by various cultural groups. (People in Societies A, 11-12)

Benchmark: 4.1 Safety Procedures

Level 2: Follow safety procedures in specific situations with specialized tools and equipment, evaluate situation and take corrective action

Indicators

- 4.1.01 Demonstrate knowledge of safety rules and regulations
- 4.1.02 Interpret safety signs and symbols
- 4.1.03 Model safe attitudes and behaviors (e.g., lifting, climbing)
- 4.1.04 Identify safety hazards and take corrective measures
- 4.1.05 Use safety equipment in accordance with established procedures
- 4.1.06 Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary

Academic Standards

English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)

Benchmark: 5.4 Contaminants

Level 2: Assess affected area, determine the source and type of contaminant, and respond appropriately

Indicators

- 5.4.02 Explain and implement programs and policies related to contaminants

Academic Standards

English: Use multiple resources to enhance comprehension of vocabulary. (Vocabulary F, 8-10; Vocabulary E, 11-12)

Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)

Science: Describe how human activities can impact the status of natural systems. (Life Sciences G, 9 -10)

Social Studies: Evaluate the consequences of geographic and environmental changes resulting from governmental policies and human modifications to the physical environment. (Geography B, 11-12)

Benchmark: 5.6 Emergency Response

Level 2: Simulate the appropriate response to an emergency situation

Indicators

- 5.6.03 Identify and implement various emergency response plans

Academic Standards

English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

Unit: Tool and Fastener Identification and Use

Students are introduced to simple metal tools and the techniques used such as hot and cold metal forging, sheet metal forming and fastening. Students are taught the use of simple hand machine tools.

Benchmark: 4.17 Fabricating with Cold Metals

Level 2: Cut, shape, form and join metal stock

Indicators

4.17.06 Fasten metal using a range of hardware (e.g., rivets, screws, bolts)

4.17.07 Process cold metals by tapping, threading, drilling, torquing, smoothing

Academic Standards

Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)

Science: Describe the identifiable physical properties of substances (e.g., color, hardness, conductivity, density, concentration and ductility). Explain how changes in these properties can occur without changing the chemical nature of the substance. (Physical Sciences C, 9-10)

Benchmark: 4.3 Equipment Operation

Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators

4.3.05 Identify, select and exhibit the desired application of hand and power tools

Academic Standards

English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)

Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Unit: Customer Service

Students learn the skills, attitudes, and thinking patterns needed to win customer satisfaction and loyalty. Students demonstrate a heightened awareness of the challenges and opportunities working with the public can bring. Students identify the tools for dealing with unhappy customers by using the power of customer expectations and by creating loyalty.

Benchmark: 3.2 Sales and Customer Service

Level 2: Use sales techniques to close the sale of a product/service and handle complex customer issues

Indicators

3.2.01 Identify key components to organize a sale

3.2.02 Develop sales goals and incentive programs

3.2.03 Forecast sales and delivery times

3.2.04 Prospect for new customers

3.2.05 Discuss and evaluate the appropriateness of different sales techniques/approaches in specific situations

3.2.06 Develop and conduct sales presentation

3.2.07 Utilize suggestive selling and selling up techniques

3.2.08 Build and develop customer relationships

3.2.09 Apply appropriate questioning techniques to determine client needs and wants

3.2.10 Provide product, warranty and maintenance education to the customer

3.2.11 Complete sales transactions and close-out procedures (e.g., handle money, operate cash register, scan bar codes, record sales, write invoices/orders)

3.2.12 Utilize follow-up activities/strategies and provide post-sale service

3.2.13 Handle customer complaints

Academic Standards

- English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)
- Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)

Unit: Engine Theory of Operation

Students learn the theory of operation, components, and the major operating systems of gasoline and diesel engines. Topics include two and four-cycle diesel engine theory, engine components, fuel systems, intake and exhaust systems, lubrication systems, and cooling systems.

Benchmark: 4.4 Engines

Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators

- 4.4.02 Analyze and troubleshoot engine
- 4.4.03 Evaluate engine performance
- 4.4.04 Describe features, benefits and applications of engine types
- 4.4.05 Describe physical and mechanical principles of engine operation (i.e., motion, friction, thermodynamics)
- 4.4.06 Classify and select engine lubricants, cooling agents and fuels
- 4.4.07 Identify and service/repair fuel/air system components
- 4.4.08 Identify and service/repair ignition, starting and charging system components
- 4.4.09 Identify and service/repair cooling system components
- 4.4.10 Identify and service/repair lubrication system components
- 4.4.11 Identify and service/repair electronic control system
- 4.4.12 Evaluate engine components to determine serviceability according to manufacturer's specifications
- 4.4.13 Repair/replace basic internal engine components
- 4.4.14 Repair/replace external engine components
- 4.4.15 Identify requirements for engine servicing to maintain emission requirements

Academic Standards

- English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
- Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
- Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Outdoor Power Equipment Maintenance

Students learn to maintain the different types of agricultural and industrial machinery. Students learn to maintain and repair drive & transmission systems, suspension, starting, charging, and other electrical systems.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance

Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators

- 4.2.01 Perform a machine condition inspection

- 4.2.02 Lubricate machinery and equipment
- 4.2.03 Ensure presence and function of safety systems and hardware
- 4.2.04 Service basic electrical systems (e.g., fuses and bulbs)
- 4.2.05 Perform machine adjustments (e.g., belts, clippers, drive chains)
- 4.2.06 Service filtration systems
- 4.2.07 Identify, select and maintain fluid levels
- 4.2.08 Maintain machinery, equipment, instruments and facility cleanliness, appearance, and safety
- 4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
- 4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures
- 4.2.11 Calibrate metering, monitoring, and sensing equipment
- 4.2.12 Inspect and maintain tooling
- 4.2.13 Maintain lifting equipment (e.g., cranes, chains, slings)

Academic Standards

- English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
- Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation

Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators

- 4.3.01 Follow manufacturer's recommended operating procedures and adjustment specifications
- 4.3.02 Describe function, limitations, and proper use of equipment, equipment controls and instrumentation
- 4.3.03 Perform pre-operation inspection and adjustments
- 4.3.04 Perform appropriate start-up, operating and shut-down procedures
- 4.3.05 Identify, select and exhibit the desired application of hand and power tools
- 4.3.06 Perform post-operating inspection and adjustments

Academic Standards

- English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
- Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines

Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators

- 4.4.01 Locate name plate and determine engine specifications
- 4.4.02 Analyze and troubleshoot engine
- 4.4.03 Evaluate engine performance
- 4.4.04 Describe features, benefits and applications of engine types
- 4.4.05 Describe physical and mechanical principles of engine operation (i.e., motion, friction, thermodynamics)
- 4.4.06 Classify and select engine lubricants, cooling agents and fuels
- 4.4.07 Identify and service/repair fuel/air system components
- 4.4.08 Identify and service/repair ignition, starting and charging system components
- 4.4.09 Identify and service/repair cooling system components
- 4.4.10 Identify and service/repair lubrication system components
- 4.4.11 Identify and service/repair electronic control system

- 4.4.12 Evaluate engine components to determine serviceability according to manufacturer's specifications
- 4.4.13 Repair/replace basic internal engine components
- 4.4.14 Repair/replace external engine components
- 4.4.15 Identify requirements for engine servicing to maintain emission requirements

Academic Standards

- English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
- Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
- Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Electrical Systems

Students are taught the skills needed for repairing and maintaining the mechanical and electrical systems of outdoor power equipment.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance

Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators

- 4.2.04 Service basic electrical systems (e.g., fuses and bulbs)

Academic Standards

- English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
- Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.7 Electrical and Electronic Systems

Level 2: Diagnose and repair electrical systems

Indicators

- 4.7.01 Interpret symbols and wiring diagrams
- 4.7.02 Analyze, diagnose and test electrical systems and components (e.g., charging, starting, lighting, accessories, ignition systems)
- 4.7.04 Utilize electrical testing equipment
- 4.7.06 Remove, inspect and replace/repair electrical system components
- 4.7.07 Describe features, benefits and applications of electrical systems
- 4.7.08 Apply principles of electricity to electrical systems and motors
- 4.7.10 Identify, analyze, diagnose and test electronic control systems, sensors, and actuators
- 4.7.11 Utilize an onboard diagnostic system

Academic Standards

- English: Use multiple resources to enhance comprehension of vocabulary. (Vocabulary F, 8-10; Vocabulary E, 11-12)
- Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)
- Science: Apply principles of forces and motion to mathematically analyze, describe and predict the net effects on objects or systems. (Physical Sciences D, 11-12)

Unit: Diagnose and Repair Electrical Systems Hydraulics

Students will test and diagnose electrical systems by using tools and instruments (e.g. hydrometers, digital multi-meters, ignition analyzers, generator-alternator-regulator tester).

Benchmark: 4.5 Transmission of Power

Level 2: Diagnose and repair power train components

Indicators

4.5.02 Analyze, diagnose and test hydrostatic transmissions

Academic Standards

English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Benchmark: 4.6 Hydraulic Systems

Level 2: Diagnose, repair, and rebuild hydraulic components

Indicators

4.6.01 Describe physical and mechanical principles of hydraulics
4.6.02 Describe features, benefits and applications of types of hydraulic and hydrostatic systems
4.6.04 Describe the application and operation of major components (e.g., pumps, motors, valves, cylinders, accumulators)
4.6.06 Analyze, diagnose, test and repair/replace fluid conveyance components (e.g., hoses, lines, fittings)
4.6.08 Evaluate system cleanliness
4.6.09 Identify hydraulic fittings and ports

Academic Standards

English: Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Vocabulary D, 11-12)
Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Metal Fabrication

Students are taught skills in metal fabrication for outdoor power equipment. Students learn the techniques and fundamentals of pattern development, fabrication, design, proper use of hand and power tools, acetylene welding, acetylene cutting, and metal inert gas welding.

Benchmark: 4.16 Fabricating Metal with Heat

Level 2: Join and cut ferrous metals using oxyfuel, shielded metal arc and gas-shielded metal-arc

Indicators

4.16.01 Compare and contrast metal welding operating characteristics and performance (e.g., oxyfuel, shielded metal arc, gas metal arc, flux core arc welding, gas tungsten arc welding, plasma gas, air carbon arc)
4.16.02 Determine properties, types and uses of metal

- 4.16.03 Classify, select, handle and store electrodes and match to job requirements based on level of penetration desired and heat range
- 4.16.04 Heat treat metals
- 4.16.05 Identify and select the joint design and welding position
- 4.16.06 Compensate for the effects of expansion and contraction forces when joining metals
- 4.16.07 Join ferrous and nonferrous metals with oxyfuel
- 4.16.08 Set up welding equipment (e.g., oxyfuel, shielded metal arc, gas metal arc, flux core arc welding, gas tungsten arc welding, plasma arc, air carbon arc)
- 4.16.09 Solder, braze and braze weld metals
- 4.16.10 Use shielded metal-arc welding to join and wearface metals
- 4.16.11 Use gas shielded metal-arc welding to join metals
- 4.16.12 Cut metals using heat (e.g., plasma arc cutting, air carbon cutting, machine-guided oxyfuel)

Academic Standards

- Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
- Science: Describe the identifiable physical properties of substances (e.g., color, hardness, conductivity, density, concentration and ductility). Explain how changes in these properties can occur without changing the chemical nature of the substance (Physical Sciences C, 9-10)

Unit: Employability/Job Skills

Students learn and demonstrate the skills needed to not only operate their own business, but handle day to day management operations. Students are able to effectively communicate with clients and customers as well as their employees.

Benchmark: 3.2 Sales and Customer Service

Level 2: Use sales techniques to close the sale of a product/service and handle complex customer issues

Indicators

- 3.2.08 Build and develop customer relationships

Academic Standards

- English: Use a variety of strategies to enhance listening comprehension. (Communication A, 8-10; Communication A, 11-12)
- Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)

Benchmark: 3.3 Management

Level 2: Analyze performance of an enterprise and reallocate resources to achieve goals

Indicators

- 3.3.07 Establish business relationships

Academic Standards

- English: Analyze the features and structures of documents and critique them for their effectiveness. (Reading: Informational Text A, 11-12)
- Math: Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number G, 8-10)
- Social Studies: Identify factors which inhibit or spur economic growth and cause expansions or recessions. (Economics B, 11-12)

Benchmark: 3.7 Communication Skills

Level 2: Conduct a business meeting using decision-making techniques

Indicators

- 3.7.01 Apply techniques to participate in/facilitate a group discussion
- 3.7.02 Apply active listening strategies
- 3.7.03 Develop and deliver formal and informal presentations
- 3.7.04 Articulate ideas and impact audience through verbal and nonverbal communication
- 3.7.05 Communicate directions in an organized manner appropriate to the audience
- 3.7.06 Use consensus-building techniques, including parliamentary procedure, to make decisions and compile summary of meeting minutes, conclusions, and next steps
- 3.7.07 Extract relevant, valid information from materials and cite sources of information
- 3.7.08 Develop reports and documents that organize information accurately and use formatting techniques for user friendliness
- 3.7.09 Select and use appropriate channel for workplace communication
- 3.7.10 Practice etiquette when using communication techniques

Academic Standards

- English: Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)
- Math: Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Algebra D, 8-10)
- Social Studies: Evaluate the reliability and credibility of sources. (Social Studies Skills and Methods A, 9-10)