# Agricultural and Environmental Systems Career Field

## Power Sports

**Subject Code: 010240**

**Outcome & Competency Descriptions**

**Course Description:**

Students will perform maintenance and repair of powersport vehicles. Students will learn engine theory, components, lubrication and cooling in order to troubleshoot, service, and repair. Topics also include the maintenance of electrical, fuel, air, exhaust, suspension, transmission, and braking systems. Students will maintain site and personal safety and develop understanding of business principles throughout the course.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome: 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, resumé writing, interviewing skills, portfolio development).

1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.

1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.

**Outcome: 1.2. Leadership and Communications**

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.

1.2.4. Use negotiation and conflict-resolution skills to reach solutions.

1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.

1.2.12. Use technical writing skills to complete forms and create reports.

**Outcome: 1.3. Business Ethics and Law**

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

**Competencies**

1.3.1. Analyze how regulatory compliance (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], United States Department of Interior [USDI], Ohio Livestock Care Standards, water quality standards, local water regulations, building codes) affects business operations and organizational performance.

1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.

1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.

1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

**Outcome: 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).

1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure and monitor business records.

1.4.6. Use an electronic database to access and create business and technical information.

**Outcome: 1.6. Business Literacy**

Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

**Competencies**

1.6.1. Identify business opportunities.

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

1.6.6. Identify the target market served by the organization, the niche that the organization fills and an outlook of the industry.

1.6.7. Identify the effect of supply and demand on products and services.

1.6.8. Identify the features and benefits that make an organization’s product or service competitive

1.6.9. Explain how the performance of an employee, a department and an organization is assessed.

**Outcome: 1.8. Operations Management**

Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

**Competencies**

1.8.5. Use inventory and control systems to purchase materials, supplies and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).

1.8.6. Identify the advantages and disadvantages of carrying cost and Just-in-Time (JIT) production systems and the effects of maintaining inventory (e.g., perishable, shrinkage, insurance) on profitability.

1.8.8. Identify routine activities for maintaining business facilities and equipment.

**Outcome: 1.10. Sales and Marketing**

Manage pricing, place, promotion, packaging, positioning and public relations to improve quality customer service.

**Competencies**

1.10.1. Identify how the roles of sales, advertising and public relations contribute to a company’s brand.

1.10.2. Determine the customer's needs and identify solutions.

1.10.3. Communicate features, benefits and warranties of a product or service to the customer.

1.10.4. Identify the company policies and procedures for initiating product and service improvements.

1.10.5. Monitor customer expectations and determine product/service satisfaction by using measurement tools.

**Outcome: 1.12. Site and Personal Safety Procedures**

Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

**Competencies**

1.12.1. Use Occupational Safety and Health Administration (OSHA) defined procedures for identifying employer and employee responsibilities, working in confined spaces, managing worker safety programs, using ground fault circuit interrupters (GFCIs), maintaining clearance and boundaries and labeling.

1.12.2. Interpret safety signs and symbols.

1.12.4. Describe how working under the influence of drugs and alcohol increases the risk of accident, lowers productivity, raises insurance costs and reduces profits.

1.12.5. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.

1.12.6. Identify procedures for the handling, storage and disposal of hazardous materials.

1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.

1.12.8. Identify safety hazards and take corrective measures.

1.12.9. Identify, inspect and use safety equipment appropriate for the task.

1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

1.12.15. Select and operate fire extinguishers based on the class of fire.

**Strand 4. Power Systems**

Learners apply principles of tool use, power transmission, hydraulics, pneumatics, two- and four-stroke cycle combustion, exhaust, ignition, fuel, starting and charging, steering, HVAC, and lubrication systems to operate, to maintain and repair equipment.

**Outcome: 4.1. Tool, Stationary and Mobile Equipment Maintenance**

Inspect, clean, maintain and perform planned preventative maintenance on equipment.

**Competencies**

4.1.1. Inspect, clean, maintain and perform preventative maintenance on equipment

4.1.7. Inspect fluid leakage, fluid levels and the condition of fluids.

4.1.8. Inspect, clean, lubricate, and adjust equipment for safe operation.

4.1.9. Select fluids, maintain fluid levels and replace system filters per OEM (original equipment manufacturer) specification.

**Outcome: 4.2. Equipment Operations**

Operate and maintain mechanical equipment and power systems.

**Competencies**

4.2.4. Perform appropriate start-up, operating and shut-down procedures.

**Outcome: 4.3. Engines**

Apply concepts to service components of both small and large internal combustion engines per the Original Equipment Manufacturer (OEM) operator’s manual.

**Competencies**

4.3.1. Assess the physical and mechanical principles of engine operation, including motion, friction and thermodynamics.

4.3.2. Retrieve and record stored on-board diagnostics (OBD) trouble codes and clear codes were applicable.

4.3.3. Locate the data plate and determine engine specifications.

4.3.4. Analyze, evaluate, and troubleshoot an engine.

4.3.5. Compare and contrast two-cycle and four-cycle engines and their operating principles.

4.3.6. Evaluate engine head and engine block components to determine serviceability per the OEM (original equipment manufacturer) specification.

4.3.7. Remove and replace components comprising the engine block and engine head.

4.3.8. Perform the requirements of engine servicing per the OEM (original equipment manufacturer) specification to maintain emission requirements.

**Outcome: 4.4. Lubrication and Cooling Systems**

Inspect lubrication and cooling systems operation.

**Competencies**

4.4.1. Explain principles of engine lubrication and cooling.

4.4.2. Perform pressure and sensor test on lubrication and cooling systems.

4.4.3. Understand the purpose fluid sampling, perform fluid sampling procedures and interpret sample reporting.

4.4.4. Inspect the oil pump gears or rotors, housing, pressure relief devices and pump drive.

4.4.5. Inspect, test and replace the radiator, pressure cap, coolant recovery tank.

4.4.6. Inspect and replace engine system hoses and belts.

4.4.7. Inspect, test and replace the thermostat and gasket per original equipment manufacturer (OEM) specification.

4.4.8. Test, drain, flush and refill coolant and bleed the cooling system per original equipment manufacturer (OEM) specification.

4.4.9. Inspect, remove and replace the water pump per original equipment manufacturer (OEM) specification.

4.4.10. Inspect and test mechanical and electrical fans, fan clutches, fan shrouds and air dams.

**Outcome: 4.5. Fuel, Air Induction and Exhaust System**

Diagnose and repair fuel, air induction and exhaust systems and aftertreatment devices (ATD).

**Competencies**

4.5.1. Explain principles of exhaust, intake, aftertreatment, and turbocharger on designs and operations.

4.5.2. Identify and understand starting and drivability issues or concerns.

4.5.3. Understand and interpret fuel sampling report for contaminants and quality.

4.5.4. Inspect and test fuel pumps and pump control systems for pressure, regulation and volume.

4.5.5. Inspect and test the cold start system.

4.5.6. Inspect the air induction system, intake manifold and gaskets for vacuum leaks and unmetered air.

4.5.7. Inspect and service governor systems.

4.5.8. Explain fuel injection theory.

4.5.9. Inspect and test fuel injectors per original equipment manufacturer (OEM) specification.

4.5.10. Inspect the integrity of the exhaust system and after-treatment components.

4.5.11. Identify, remove and replace positive crankcase ventilation system components.

4.5.12. Identify the parts and describe the functions of evaporative emission control systems.

4.5.13. Check and refill the diesel exhaust fluid and service the diesel particulate filter per original equipment manufacturer (OEM) specification.

4.5.14. Identify and describe alternative power systems.

**Outcome: 4.6. Ignition System**

Perform ignition system diagnostics and repair.

**Competencies**

4.6.1. Explain basic ignition system theory.

4.6.2. Use wiring diagrams and schematics to troubleshoot and repair ignition system components.

4.6.3. Diagnose and repair ignition system problems for drivability.

4.6.4. Inspect, test, and replace ignition system circuit wiring and components.

4.6.5. Identify, describe, adjust ignition system timing, timing advance and retard.

**Outcome: 4.7. Transmission of Power**

Diagnose and service power transmission components.

**Competencies**

4.7.1. Identify and describe the features, benefits and applications of power transmission components.

4.7.2. Identify and describe the physical and mechanical principles of mechanical, hydraulic, pneumatic and electrical power transfer.

4.7.3. Perform calculations involving speed, torque and power.

4.7.4. Remove, replace, and adjust hydrostatic transmissions.

4.7.5. Remove, replace, and adjust clutches and brakes.

4.7.6. Test, diagnose, remove, and replace electronic power train control systems components.

4.7.7. Test, remove and replace pneumatic components.

4.7.8. Remove, replace, and adjust damaged and non-functioning power train components.

**Outcome: 4.8. Starting and Charging Systems**

Identify, inspect and repair starting and charging system components.

**Competencies**

4.8.1. Identify and differentiate between electrical and engine problems that cause a slow crank or no crank condition.

4.8.2. Use wiring diagrams and schematics to troubleshoot and repair starting and charging system components.

4.8.3. Inspect, test, and replace fuses, relays, circuit breakers, and solenoids.

4.8.4. Perform charging system output tests.

4.8.5. Inspect, remove, replace, and adjust alternator drive belts, pulleys, and tensioners and check pulley and belt alignment.

4.8.6. Remove, inspect and install an alternator and starter per original equipment manufacturer (OEM) specification.

4.8.7. Measure and diagnose the causes of excessive key-off battery drain (parasitic draw).

4.8.8. Identify the high voltage circuit of electric or hybrid electric vehicles and related safety precautions.

**Outcome: 4.9. Steering, Suspension and Traction**

Diagnose and repair steering, suspension and traction systems.

**Competencies**

4.9.2. Evaluate and formulate solutions for vehicle stability to include automatic leveling devices, center of gravity, roll-over potential and wheelbase dimensions.

4.9.3. Remove, inspect, repair or replace steering systems components.

4.9.4. Align steering components, including tires and tracks.

4.9.5. Interpret tire and track wear patterns and consider product construction to evaluate replacement needs per original equipment manufacturer (OEM) specification.

4.9.6. Identify and differentiate bearing noise, vehicle pull, and wheel vibration, shimmy and noise.

4.9.7. Measure wheel, tire, axle and hub runout to evaluate replacement needs.

4.9.8. Remove, inspect, repair/replace and reinstall the tire and wheel or track assembly per original equipment manufacturer (OEM) specification.

**Outcome: 4.11. Hydraulic Systems**

Diagnose, repair and rebuild hydraulic systems.

**Competencies**

4.11.1. Interpret symbols and schematic drawings related to hydraulic system design.

4.11.2. Describe the physical and mechanical principles of hydraulics.

4.11.3. Identify and describe the features, benefits and applications of the different types of hydraulic and hydrostatic systems.

4.11.5. Inspect, test, diagnose, and repair hydraulic systems and components.

4.11.6. Test and diagnose electronic controls for hydraulic systems.

4.11.7. Identify and describe the purpose fluid sampling, perform fluid sampling procedures and interpret sample reporting.

4.11.8. Identify and describe hydraulic fitting types and sizes per international standard organization (ISO).

4.11.9. Measure flow rate, pressure and temperature.

**Outcome: 4.12. Brakes**

Identify, inspect and replace components of braking systems.

**Competencies**

4.12.1. Identify and locate components of braking systems.

4.12.3. Identify poor stopping, pulling, noise, vibration, premature wear or dragging.

4.12.4. Remove and replace a master cylinder per original equipment manufacturer (OEM) specification.

4.12.5. Inspect and install lines and fittings per original equipment manufacturer (OEM) specification.

4.12.6. Remove, inspect and replace brake components and inspect for leaks.

4.12.7. Inspect the condition of the parking brake, and service or replace as needed.