# Agricultural and Environmental Systems Career Field

## Power Trains

**Subject Code: 010230**

**Outcome & Competency Descriptions**

**Course Description:**

Students will learn the physical principles of power trains, the components that transfer and control power, and how power trains are designed to function. Topics include hydraulics, bearings and seals along with belts, chains, and gear drives included in power trains. Students will learn how to remove, replace, adjust and maintain transmissions along with diagnosing power take-off devices and clutches. Throughout the course, site and personal safety procedures along with business principles are emphasized.

**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**

1.1.5. 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.

1.2.11. Write professional correspondence, documents, job applications and resumés.

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**

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

**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**

1.4.2. 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.

**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**

1.12.2. Interpret safety signs and symbols.

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.

1.12.11 Set up for ergonomic workflow.

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, two- and four-stroke cycle combustion, exhaust, ignition, fuel, starting and charging, steering, HVAC and lubrication systems to operate, maintain and repair equipment.

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

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

**Competencies**

4.1.3. Ensure the presence and functionality of safety equipment.

4.1.5. Maintain organization, and cleanliness of facilities, machinery, equipment and tools for safety and appearance.

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

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

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

4.1.10. Inspect and maintain fluid conveyance and storage components.

**Outcome: 4.2. Equipment Operations**

Operate and maintain mechanical equipment and power systems.

**Competencies**

4.2.1. Follow original equipment manufacturer (OEM) recommended operating procedures and adjustment specifications as found in the operator’s manual.

4.2.3. Perform pre- and post-operation inspections and adjustments and report malfunctions.

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

**Outcome: 4.7. Transmission of Power**

Diagnose and service power train components.

**Competencies**

4.7.1. Identify and describe the features, benefits and applications of mechanical 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: 4.10. Drive Axle Universal and Differential**

Identify, inspect and replace drive axle and differential components.

**Competencies**

4.10.1. Identify and inspect drive axle and differential assemblies.

4.10.2. Service and replace the shaft, yokes, boots and joints per original equipment manufacturer (OEM) specification.

4.10.3. Replace drive axle seals, bearings and retainers per original equipment manufacturer (OEM) specification.

4.10.4. Inspect, adjust and replace drive belts and chains per original equipment manufacturer (OEM) specification.

4.10.5. Inspect and replace drive axle housing cover plates, gaskets, sealants, vents, plugs and seals 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.

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

4.11.4 Identify and describe the applications and operations of major hydraulic system components.

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

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