



219 North Main Street, Suite 402  
Barre, VT 05641 (p) 802-479-1030 | (f) 802-479-1835

## Agricultural Mechanics

**01.0201**

**Career Cluster: Agriculture, Food & Natural Resources**

**Pathway: Power Structure and Technical Systems**

**Last Update: 2002**

**Title: Agricultural Mechanization, General.**

**Definition:**

A program that generally prepares individuals to sell, select, and service agricultural or agribusiness technical equipment and facilities, including computers, specialized software, power units, machinery, equipment structures, and utilities. Includes instruction in agricultural power systems, planning and selecting materials for the construction of support facilities, mechanical practices associated with irrigation and water conservation, erosion control, and agricultural data processing systems.

**DIRECTIONS**

Evaluate the student by checking the appropriate box to indicate the degree of Competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

**Rating Scale:**

**0 No exposure**

- 1 Introduced-** the student has been exposed through non participatory instruction (e.g. lecture, demonstration, field trip, and video).
- 2 Practiced-** the student can perform the task with direct supervision.
- 3 Entry-Level Competency-** the student can perform the task with limited supervision and/or does not perform the task to standard (a typical entry-level performance expectation).
- 4 Competency-** the student consistently performs task to standard with no supervision (on at least two occasions or at instructor's option).

**AGRICULTURE MECHANICS**

- 0 1 2 3 4      A.      Perform Administrative and Business Skills  
(Vermont Standards: 1.3, 1.7, 1.8, 1.10, 1.18, 1.21, 2.1, 3.11)
  
- 0 1 2 3 4      B.      Perform Work Place Safety Skills  
(Vermont Standards: 2.1, 3.3, 3.5, 7.18)

- 0 1 2 3 4 C. Perform Computer Technology Applications  
(Vermont Standards: 1.20, 1.21, 7.17)
- 0 1 2 3 4 D. Perform General Shop Skills  
(Vermont Standards: 3.10, 7.6, 7.18)
- 0 1 2 3 4 E. Perform Oxy-fuel and Arc Welding Skills  
(Vermont Standards: 1.15, 1.22, 3.5, 3.10, 7.7, 7.11)

A school may offer one or more of the following program areas of specialization: Equipment Operation, Agricultural Power Mechanics, Power Train Systems, Hydraulic Systems, Small Engines, Electrical/Electronic Systems.

### **EQUIPMENT OPERATION SPECIALIZATION**

- 0 1 2 3 4 A. Operate and Adjust Powered Equipment  
(Vermont Standards: 2.1, 2.2, 7.6, 7.8, 7.10, 7.12)
- 0 1 2 3 4 B. Assemble Agricultural Equipment  
(Vermont Standards: 1.2, 2.1, 2.2, 7.7, 7.11, 7.18)

### **AGRICULTURAL POWER MECHANICS SPECIALIZATION**

- 0 1 2 3 4 A. Service/Repair Gasoline and Diesel Engines  
(Vermont Standards: 1.2, 1.8, 1.14, 2.1, 2.2, 2.3, 2.6, 3.10, 7.3, 7.7, 7.11, 7.12)
- 0 1 2 3 4 B. Service/Repair Gasoline/Diesel/LP Fuel Systems  
(Vermont Standards: 1.2, 1.13, 2.1, 2.2, 2.3, 2.6, 7.6, 7.8, 7.11, 7.12)
- 0 1 2 3 4 C. Service/Repair Exhausts and Engine Emissions Systems  
(Vermont Standards: 1.2, 1.14, 2.1, 2.2, 2.3, 2.6, 7.7, 7.10)
- 0 1 2 3 4 D. Service/Repair Cooling and Lubrication Systems  
(Vermont Standards: 2.1, 2.2, 7.6, 7.8, 7.11, 7.12)

### **POWER TRAIN SYSTEMS SPECIALIZATION**

- 0 1 2 3 4 A. Service/Repair Transmissions/Power Drive Systems  
(Vermont Standards: 1.2, 1.8, 2.1, 2.2, 2.3, 2.6, 3.10, 7.3, 7.11, 7.12)
- 0 1 2 3 4 B. Service Power Transfer Systems  
(Vermont Standards: 2.3, 2.6)
- 0 1 2 3 4 C. Service Tires and Tracks  
(Vermont Standards: 2.3, 2.14, 3.10, 7.18)

- 0 1 2 3 4 D. Service/Repair Brake Systems  
(Vermont Standards: 2.1, 2.2, 2.3, 7.3, 7.10, 7.16)

### **HYDRAULIC SYSTEMS SPECIALIZATION**

- 0 1 2 3 4 A. Service/Repair Hydraulic Systems  
(Vermont Standards: 1.2, 1.8, 2.1, 2.2, 2.6, 3.10, 7.3, 7.6, 7.7, 7.11)

### **SMALL ENGINE SPECIALIZATION**

- 0 1 2 3 4 A. Service/Repair Small Engine Power Mechanics  
(Vermont Standards: 1.2, 1.8, 1.14, 2.1, 2.2, 2.3, 2.6, 3.10, 7.6, 7.9, 7.18, 7.19)

### **ELECTRICAL/ELECTRONIC SYSTEM SPECIALIZATION**

- 0 1 2 3 4 A. Service/Repair Electrical and Electronic System  
(Vermont Standards: 1.2, 2.2, 2.6, 3.10, 7.11)
- 0 1 2 3 4 B. Service/Repair Electrical/Electronic Controls and Sensing Devices  
(Vermont Standards: 2.2, 2.3, 2.6, 7.7)

## **AGRICULTURAL MECHANICS**

### **GENERAL SKILLS**

- 0 1 2 3 4 A. Perform Administrative and Business Skills
- A.001 Interview customer to obtain description of problem.
  - A.002 Enter service data on work order/invoice/service records.
  - A.003 Prepare written cost estimate of service.
  - A.004 Locate repair parts, using catalogs, microfiche, and computers.
  - A.005 Select and maintain agricultural mechanics business records.
  - A.006 Process incoming and outgoing telephone calls.
  - A.007 Use effective interpersonal relationships in dealing with customers.
- 0 1 2 3 4 B. Perform Workplace Safety Skills
- B.001 Use proper clothing, safety glasses, aprons, shield, ear protection, and other safety equipment.
  - B.002 Recognize and report unsafe working conditions and practices.

- B.003 Demonstrate knowledge of proper hazardous material handling, in accordance with state and federal rules and regulations (“Right to Know” regulations).
- B.004 Maintain a clean, safe work station.
- B.005 Demonstrate knowledge of appropriate fire and emergency practices and procedures.
- B.006 Demonstrate knowledge of appropriate first aid/CPR procedures.
- B.007 Comply with shop and equipment safety rules.

- 0 1 2 3 4      C.      Perform Computer Technology Applications
- C.001 Select and use appropriate computer applications.
  - C.002 Use a parts inventory system.
  - C.003 Enter information on computer.
  - C.004 Prepare a report with a word processor.

- 0 1 2 3 4      D.      Perform General Shop Skills
- D.001 Use metric and English units in measurements.
  - D.002 Select fasteners appropriate for specific jobs.
  - D.003 Cut threads.
  - D.004 Use a stationary portable grinder.
  - D.005 Interpret schematics and diagrams.
  - D.006 Use pneumatic tools.
  - D.007 Layout and drill holes with a drill press/portable electric drill.
  - D.008 Repair damaged threads.
  - D.009 Use torque wrenches, feeler gauges, and micrometers.

- 0 1 2 3 4      E.      Perform Oxy-fuel and Arc Welding Skills
- E.001 Set up, adjust, operate, and shut down oxy-fuel cutting, welding, and brazing equipment for a given job.
  - E.002 Layout and prepare metal for welding or cutting.
  - E.003 Cut and pierce metal with oxy-fuel equipment.
  - E.004 Weld with oxy-fuel equipment (corner, edge, lap, and butt welds).
  - E.005 Braze with oxy-fuel equipment (ferrous and nonferrous metal).
  - E.006 Heat metal parts to assist in removal.
  - E.007 Change cylinders and adjust the oxy-fuel manifold.

- E.008 Set up, adjust, operate, and shut down arc welding equipment for a given job.
- E.009 Weld lap, butt, and tee joints.
- E.010 Identify metal by spark test.
- E.011 Test welds for quality and strength.
- E.012 Weld high carbon steel and cast iron.
- E.013 Interpret drawings and welding symbols.

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### **EQUIPMENT OPERATION SPECIALIZATION**

- 0 1 2 3 4      A.      Operate and Adjust Powered Equipment
- A.001 Start and stop unit safely, following safety procedures.
  - A.002 Perform daily pre-operational checklist, according to manufacturer's operating instructions.
  - A.003 Safely operate unit under field conditions.
- 0 1 2 3 4      B.      Assemble Agricultural Equipment
- B.001 Assemble and adjust agricultural equipment, following manufacturer's direction.

### **AGRICULTURAL POWER MECHANICS SPECIALIZATION**

- 0 1 2 3 4      A.      Service/Repair Gasoline and Diesel Engines
- A.001 Demonstrate understanding of gasoline and diesel engine systems.
  - A.002 Diagnose and determine need to disassemble engine.
  - A.003 Remove and replace pistons and rings.
  - A.004 Remove and replace crankshaft and/or bearings.
  - A.005 Install engine seals.
  - A.006 Install timing chains, belts, or gears.
  - A.007 Check cylinder head for warpage.
  - A.008 Adjust valves.
  - A.009 Replace cylinder head.
  - A.010 Recondition valves and valve seats.
  - A.011 Remove cylinder ridge.
  - A.012 Troubleshoot engine problems.

- 0 1 2 3 4      B.    Service/Repair Gasoline/Diesel/LP Gas Fuel Systems
- B.001    Locate and identify the components of diesel, gasoline, or LP fuel systems and trace fuel and air-flow through systems.
  - B.002    Bleed a diesel fuel system.
  - B.003    Install diesel fuel filters.
  - B.004    Diagnose and repair fuel injection system problems.
  - B.005    Replace fuel injector/injector nozzles.
  - B.006    Perform internal and external adjustments of a carburetor.
  - B.007    Check and adjust timing on diesel fuel injection pump.
  - B.008    Diagnose and repair fuel pump problems.
  - B.009    Determine type of fuel required for a power unit.
  - B.010    Replace diesel injection pump.
  - B.011    Adjust, repair or replace governors.
  - B.012    Diagnose and repair turbocharger problems.
- 0 1 2 3 4      C.    Service/Repair Exhausts and Engine Emissions Systems
- C.001    Diagnose an exhaust problem and repair or replace necessary exhaust system components.
  - C.002    Diagnose and repair emission control system components to the manufacturer's standards.
- 0 1 2 3 4      D.    Service/Repair Cooling and Lubrication Systems
- D.001    Demonstrate knowledge of theories of engine cooling systems.
  - D.002    Test coolant.
  - D.003    Select lubricants that meet manufacturers specifications.
  - D.004    Flush and clean a liquid cooling system.
  - D.005    Pressure test cooling system.
  - D.006    Test/replace a thermostat.
  - D.007    Replace oil, filters, and lubricants in an engine, according to specifications.
  - D.008    Diagnose engine overheating problems.
  - D.009    Diagnose and repair water pump problems.
  - D.010    Service cooling system fans, belts, and hoses.

## **POWER TRAIN SYSTEMS SPECIALIZATION**

- 0 1 2 3 4      A.    Service/Repair Transmissions/Power Drive Systems

- A.001 Identify the functions, parts, and operating principles of clutches and transmissions.
- A.002 Remove, adjust, and/or replace clutch components.
- A.003 Perform basic maintenance on torque converters.
- A.004 Check and adjust the shift linkage in accordance with manufacturer's specifications.
- A.005 Remove and replace universal joints and constant velocity joints.
- A.006 Demonstrate how a hydrostatic transmission works.

- 0 1 2 3 4      B.      Service Power Transfer Systems
- B.001 Adjust and repair chains.
  - B.002 Adjust and replace belts.
  - B.003 Align chains and sprockets.
  - B.004 Check and inspect safety shields.

- 0 1 2 3 4      C.      Service Tires and Tracks
- C.001 Check tires for air pressure, wear, defects, and valve damage.
  - C.002 Repair tire tube puncture.
  - C.003 Repair tubeless tire puncture.
  - C.004 Inspect tracks for wear.
  - C.005 Lubricate and adjust tracks.

- 0 1 2 3 4      D.      Service/Repair Brake Systems
- D.001 Identify the function and operating principles of brake systems (disc, air, hydraulic, air/hydraulic...).
  - D.002 Troubleshoot brake systems.
  - D.003 Adjust and/or service parking brakes.
  - D.004 Replace brake shoes, pads, lines, and hoses.

### **HYDRAULIC SYSTEMS SPECIALIZATION**

- 0 1 2 3 4      A.      Service/Repair Hydraulic Systems
- A.001 Identify parts and functions of hydraulic systems (open and closed centered systems).
  - A.002 Understand basic hydraulic motor operation.
  - A.003 Select hydraulic fluids that meet industry standards.
  - A.004 Adjust pressure control/relief valves.

- A.005 Bleed air from hydraulic system.
- A.006 Measure pressure within hydraulic system.
- A.007 Measure flow within hydraulic system.
- A.008 Diagnose hydraulic failure.
- A.009 Replace packing.

### **SMALL ENGINE SPECIALIZATION**

- 0 1 2 3 4      A.      Service/Repair Small Engine Power Mechanics
- A.001 Identify operating principles to two-stroke cycle and four-stroke cycle engines.
  - A.002 Explain the function and operating principles of the fuel, lubrication, governor, cooling, and ignition systems.
  - A.003 Select fuels and lubricants.
  - A.004 Evaluate engine performance under load and no-load operation.
  - A.005 Make adjustment to small engines according to specifications in operator's manual.
  - A.006 Use engine overhaul equipment, including valve, cylinder, piston, seal and bearing tools.
  - A.007 Use measuring tools and test instruments, such as the micrometer, thickness gauge, telescoping and small hole gauge, dial indicator, compression tester, torque wrench, tachometer, coil condenser tester, VOA-meter, and dynamometer.
  - A.008 Service the air cleaner and lubrication system.
  - A.009 Assemble and adjust ignition and fuel systems.
  - A.010 Operate the engine and adjust or check ignition timing, engine speed, and carburetor.
  - A.011 Troubleshoot, evaluate, and replace valves, ignition, governor, and carburetor parts.

### **ELECTRICAL/ELECTRONIC SYSTEMS SPECIALIZATION**

- 0 1 2 3 4      A.      Service/Repair Electrical and Electronic Systems
- A.001 Determine circuit polarity.
  - A.002 Use instruments to measure Ohms, amps, and volts.
  - A.003 Understand basic alternator/generator theory.
  - A.004 Test charging, lighting, warning, and cranking systems.
  - A.005 Test electrical and electronic sensing devices.



- A.006 Read a circuit diagram to troubleshoot an electrical problem.
- A.007 Replace alternator regulator.
- A.008 Replace amperage gauge.
- A.009 Gap plugs and points.
- A.010 Change plugs and points.
- A.011 Demonstrate knowledge of basic DC electrical theory (OHM's law).
- A.012 Test and replace distributor points and condenser.
- A.013 Test and replace starter armature shaft bushing.
- A.014 Test and replace starter brushes.
- A.015 Test and replace starter drive assembly.
- A.016 Test and replace starter motor.
- A.017 Test and replace starter motor solenoid.
- A.018 Set break point dwell.
- A.019 Set ignition timing.
- A.020 Troubleshoot electrical system.
- A.021 Activate and charge battery.
- A.022 Clean battery terminals.
- A.023 Change battery.
- A.024 Test and replace alternator bearings.
- A.025 Test and replace ignition distributor.
- A.026 Use an armature growler.
- A.027 Understand basic electrical and electronic instrumentation and control theory.
- A.028 Understand basic transformer applications.
- A.029 Replace generator brushes.

0 1 2 3 4      B.      Electric Controls and Sensing Devices

- B.001 Identify and describe basic principles of controls, including transistorized regulators, electronic ignition circuit, thermostats, humidistats, photo electric cells, magnetic relays, programmable controllers, proximity switches and sensors, ultrasonics, timers, pressure switches, and time delay equipment.
- B.002 Select electrical controls.