

Course: AG 225-Agricultural Systems/Electricity & Hydraulics

Unit	Objective	CAERT Lesson Plan Library	Unit	Problem Area	Lesson
A. Safety	1. Identify safety equipment necessary for agricultural power technology	Ag Mechanics and Technology	A	6	4
	2. Apply basic laboratory safety instruction	Ag Mechanics and Technology	A	1	3
	3. Describe safety practices necessary when using electrical equipment	Ag Mechanics and Technology	A	4	1
	4. Apply safety practices when using tools and equipment	Ag Mechanics and Technology	A	1	3
B. Electrical Tools and Equipment	1. Identify, adjust, maintain and properly use the following tools:				
	a. Volt meter	Ag Mechanics and Technology	A	4	3
	b. Amp meter	Ag Mechanics and Technology	A	4	3
	c. Ohm meter	Ag Mechanics and Technology	A	4	3
	d. Portable GFCI				
	e. Wire stripper	Ag Mechanics and Technology	A	4	4
	f. Circuit tester	Ag Mechanics and Technology	A	4	3
	g. Continuity tester	Ag Mechanics and Technology	A	4	3
	h. Linesman pliers	Ag Mechanics and Technology	A	4	4
	i. Conduit bender				
	j. Fish-tape	Ag Mechanics and Technology	A	4	4
	k. Deburring tool				
	l. Growler				
C. Electricity and Wiring	1. Describe electrical energy and how it works	Ag Mechanics and Technology	A	4	1,2
	2. Define common electrical terms and their relationships	Ag Mechanics and Technology	A	4	1--7
	3. Determine the amount of electrical energy used	Ag Mechanics and Technology	A	4	3
	4. Compute the cost of using electrical energy	Ag Mechanics and Technology	A	4	3
	5. Read and interpret wiring plans	Ag Mechanics and Technology	A	4	6
	6. Locate and mark routes for small appliances, general purpose and individual circuits				
	7. Install device boxes and outlet boxes	Ag Mechanics and Technology	A	4	7
	8. Install 120-volt, 120/240-volt circuits	Ag Mechanics and Technology	A	4	7
	9. Connect receptacles, switches and fixtures for each circuit	Ag Mechanics and Technology	A	4	7
	10. Ground the electrical system and equipment	Ag Mechanics and Technology	A	4	7
	11. Determine the type and size of service entrance equipment to install	Ag Mechanics and Technology	A	4	4
	12. Install service entrance equipment using cable or conduit with overhead or underground conductors	Ag Mechanics and Technology	A	4	4
	13. Install ground fault circuit interrupters	Ag Mechanics and Technology	A	4	7
	14. Install conduit	Ag Mechanics and Technology	A	4	4
	15. Estimate wiring costs				

	16. Install wiring for agricultural and other utility buildings				
D. Electrical Controls	1. Describe the function and importance of controls and control circuits in the operation of electric equipment	Ag Mechanics and Technology	A	4	8
	2. Explain the terminology and symbols used in discussing electric control circuits	Ag Mechanics and Technology	A	4	8
	3. Identify the characteristics of automatic and non-automatic control systems	Ag Mechanics and Technology	A	4	8
	4. Identify the characteristics of switches most commonly used in control circuits	Ag Mechanics and Technology	A	4	8
	5. Connect the tumbler switch having a built-in overload protector into a motor circuit				
	6. Explain how the overload protection device protects the motor from short circuit or overload damage				
	7. Identify the function of a limit switch				
	8. Connect a limit switch into a motor circuit				
	9. List the characteristics and types of motor control devices in control circuits				
	10. Connect the relay into a control circuit				
	11. Connect a time-delay relay into a motor control circuit				
	12. Identify the characteristics and types of motor control devices in an electrical circuit				
	13. Connect a commercial type starter switch and stop-start push-button stations into a motor control circuit				
	14. Describe the automatic sensing control devices available and how they might be applied in the control circuits used on the farm and in the home	Ag Mechanics and Technology	A	4	8
	15. Connect automatic sensing control devices into a control circuit				
	16. Explain how the automatic sensing control devices control and electric load				
E. Electric Motors	1. Describe factors needing consideration if electric motors were to be replaced by alternative power sources	Ag Mechanics and Technology	A	4	8
	2. Use nameplate information to describe an electric motor	Ag Mechanics and Technology	A	4	8
	3. Identify electric motors by type	Ag Mechanics and Technology	A	4	8
	4. Match types of electric motors to starting load and duty characteristics	Ag Mechanics and Technology	A	4	8
	5. Identify major construction characteristics of electric motors by type of enclosures, mounts, bearings and lubrication system	Ag Mechanics and Technology	A	4	8
	6. Spot motor ailments by sight, sound and touch				
	7. Use an organized trouble shooting procedure to identify the specific problem				

8. Decide which problems can be corrected in place and which require removal to repair station				
9. Identify possible causes and results of overloading an electrical motor without overload protection				
10. Recognize the modus operandi for overload protection devices				
11. Replace or reset activated overload protection devices				
12. Determine and order proper size of components for drive systems needing replacement				
13. Remove and replace the needed drive systems				
14. Explain how the poles of permanent magnet and electro-magnet attract and repel each other				
15. Describe how the attracting and repelling forces of and electro-magnet can cause a free rotating magnet to turn				
16. Identify a split-phase motor and a shaded-pole motor based on major internal parts and characteristics	Ag Mechanics and Technology	A	4	8
17. Explain the operating principles of a split phase and shaded-pole motor integrating the parts and characteristics identified	Ag Mechanics and Technology	A	4	8
18. List and describe loads requiring low starting torque	Ag Mechanics and Technology	A	4	8
19. Identify capacitor-start motors based on major internal parts and characteristics	Ag Mechanics and Technology	A	4	8
20. Explain the operating principles of the capacitor start motor integrating the parts and characteristics identified	Ag Mechanics and Technology	A	4	8
21. List and describe loads requiring moderate starting torque	Ag Mechanics and Technology	A	4	8
22. Identify repulsion-start and universal motors based on major internal parts and characteristics	Ag Mechanics and Technology	A	4	8
23. Explain the operating principals of a repulsion start and universal motors integrating the parts and characteristics identified	Ag Mechanics and Technology	A	4	8
24. List and describe loads requiring high starting torque	Ag Mechanics and Technology	A	4	8
25. Identify electric motors that are reversible and are dual-voltage based on operating principles, nameplate information and wiring diagrams	Ag Mechanics and Technology	A	4	8
26. Identify the leads to the starting and running windings of electric motors				
27. Explain the operating principles involved when changing rotation and/or voltage of electric motors				
28. Change the rotation and voltage of electric motors				
29. Use the following terms in analyzing electric motors:				
a. Torque				
b. Starting current	Ag Mechanics and Technology	A	4	8

c. Horsepower	Ag Mechanics and Technology	A	4	8
d. Voltage drop				
e. Efficiency	Ag Mechanics and Technology	A	4	8
f. Power factor				
g. Apparent power				
h. Real power				
30. Use a prony break, watt meter, volt meter, amp meter and appropriate formula to collect data on various motors				
31. Analyze the data and draw appropriate conclusion				
32. Select an electric motor for a particular work situation according to the following variables:				
a. Power requirement of the load	Ag Mechanics and Technology	A	4	8
b. Capacity of the electric service entrance				
c. Speed requirements of the load	Ag Mechanics and Technology	A	4	8
d. Duty time required				
e. Starting torque required	Ag Mechanics and Technology	A	4	8
f. Direction of rotation				
g. Cost				
33. Select the type of motor enclosure needed for a particular environment	Ag Mechanics and Technology	A	4	8
34. Select the type of bearings and lubrications system needed based on the method and frequency of lubrication and the mounting position				
35. Use a manufacturer's catalog and order the motor most nearly matching specifications given	Ag Mechanics and Technology	A	4	8
36. Select the correct size of wire for the electric motor used				
37. Order or purchase materials for installation of a motor				
38. Evaluate hypothetical or real motor installations				
F. Agricultural Hydraulic Systems				
1. Identify the applications of hydraulics in agriculture	Ag Mechanics and Technology	A	6	7
2. Identify the components of a hydraulics system	Ag Mechanics and Technology	A	6	7
3. Define terminology associated with hydraulic systems	Ag Mechanics and Technology	A	6	7
4. Describe operating principles of hydraulic systems	Ag Mechanics and Technology	A	6	7
5. List the advantages and disadvantages of utilizing hydraulics in agriculture	Ag Mechanics and Technology	A	6	7
6. Read and interpret basic hydraulic schematic diagrams				
7. Select the proper hydraulic fluid for a specific hydraulic system and operating condition				
8. Drain, flush and refill hydraulic systems on agricultural equipment				
9. Service and maintain hydraulic seals and packings				

10. Select hydraulic tubing, pipe and remove hoses to fill specific pressure, volume and exposure requirements				
11. Service, maintain and/or operate hydraulic fittings and couplers				
12. Service and maintain hydraulic fluid filters				
13. Trouble-shoot hydraulic motor operating problems				
14. Select hydraulic motors to fit specific applications on agriculture equipment and power units				
15. Determine relief valve pressure setting by the T-test method				