AGRICULTURAL MECHANICS TECHNOLOGY I

#01043

Description

Agricultural Mechanics courses are designed to reinforce and extend students' understanding of applied mechanical applications by associating scientific principles and concepts with relevant applications in mechanics-related fields. Students will be exposed to mechanical, fluid, electrical, and thermal power that is related to the field of agriculture. The course sequence is designed to provide students with applied activities, including metal fusion (welding), structures, surveying, electrical wiring principles, agricultural power and equipment, plumbing, electric motors and controls, CNC, robotics, CADD, Lasers, GIS, and GPS systems. Leadership development and supervised agricultural experiences are integral to these courses.

½ to 1 credit
Max credit=1
Grades 9-12

Standard 10		***POWER, STRUCTURAL, AND TECHNICAL SYSTEMS***
Topic 10.2	**Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.**	
	Student Competencies	
	10.2.1	Compare and contrast applications of simple machines in AFNR related mechanical systems.
	10.2.2	Identify the tools, machines, and equipment needed to construct, fabricate, and/or repair projects in AFNR.
	10.2.3	Identify the types of safety hazards associated with different mechanical systems used in AFNR using appropriate sources (e.g., owner's manuals, Safety Data Sheet (SDS), chemical labels, pesticide labels, safety color codes, etc.).
Topic 10.3	**Apply physical science and engineering principles to metal fabrication using a variety of welding and cutting processes and equipment (e.g., SMAW, GMAW, GTAW, Oxy-fuel, CNC, and plasma arc torch, etc.).**	
	Student Competencies	
	10.3.1	Compare and contrast the principles and procedures of different welding and cutting processes and equipment (e.g., SMAW, GMAW, GTAW, Oxy-fuel, CNC, and plasma arc torch, etc.).
	10.3.2	Compare and contrast the properties of different metals used in AFNR power, structural, and technical systems (e.g., malleability, conductivity, visual properties, chemical composition, etc.).
Topic 10.4	**Perform preventative maintenance and scheduled service to maintain equipment, machinery, and power units used in AFNR settings.**	
	Student Competencies	
	10.4.1	Identify the importance of cleanliness and appearance of equipment, machinery, and power units used in AFNR power, structural and technical systems to ensure proper functionality.
	10.4.2	Identify procedures for servicing mechanical systems and maintaining fluid levels on equipment, machinery, and power units.
	10.4.3	Perform preventative maintenance for equipment, machinery, and power units used in AFNR power, structural and technical systems.
	10.4.4	Perform service procedures for mechanical systems on equipment, machinery, and power units in accordance with manufacturer's manuals.
Topic 10.5	**Operate machinery and equipment while observing all safety precautions in AFNR settings.**	
	Student Competencies	
	10.5.1	Summarize the safe use of equipment, machinery, and power units.
	10.5.2	Identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems (e.g., caution, warning, danger, etc.).

Topic 10.6	**Troubleshoot, service, and repair components of internal combustion engines using manufacturers' guidelines.**	
	Student Competencies	
	10.6.1	Identify components of internal combustion engines.
	10.6.2	Describe the characteristics of internal combustion engines.
	10.6.3	Demonstrate how the components of internal combustion engines work together during operation.
Topic 10.7	**Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.**	
	Student Competencies	
	10.7.1	Compare and contrast basic units of electricity (e.g., volts, amps, watts, and ohms) and the principles that describe their relationship (e.g., Ohm's Law, Power Law, etc.).
	10.7.2	Contrast the characteristics of electronic components (e.g., battery, resistor, diode, transistor, capacitor, etc.).
	10.7.3	Classify the uses of electrical sensors and controls.
	10.7.4	Perform the measurements of the basic units of electrical circuits (e.g., motors, controls, lighting, etc.) with the appropriate tools.
	10.7.5	Utilize electrical systems, symbols, and diagrams.
	10.7.6	Select materials and tools used in electrical control circuit installation.
Topic 10.8	**Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment, and power source systems (e.g., hydraulic, pneumatic, transmission, steering, powertrain, suspension, etc.).**	
	Student Competencies	
	10.8.1	Summarize the applications of common types of hydraulic and pneumatic systems.
	10.8.2	Compare and contrast operation principles and features of mechanical transmission systems (e.g., belts, chains, gears, bearings, seals, universals, drive shafts, etc.).
	10.8.3	Identify the components of suspension, braking, and steering systems.
	10.8.4	Distinguish between different hydraulic and pneumatic system symbols and diagrams.
Topic 10.9	**Create plans for AFNR structures.**	
	Student Competencies	
	10.9.1	Explain the meaning of symbols used in plans and designs of agricultural structures.
	10.9.2	Interpret the parts and/or views of plans for agricultural structures.
	10.9.3	Apply scale measurement and dimension to develop plans of agricultural structures.
	10.9.4	Construct plans for agricultural structures using current technology (e.g., drafting software, computer-aided design, etc.).
	10.9.5	Create designs, plans, and related bill of materials for an agricultural structure using the design process.
Topic 10.10	**Determine structural requirements, specifications, customer needs, and estimate costs for AFNR structures.**	
	Student Competencies	
	10.10.1	Summarize the information needed to complete a bill of materials for an AFNR structure.

	10.10.2	Identify sources of construction and materials standards and their importance (e.g., American National Standards Institute, ANSI, Underwriters' Laboratories, UL, etc.).
	10.10.3	Analyze a project plan to prepare a bill of materials.
Topic 10.11	**Apply best practices and safety guidelines for use of hand and power tools associated with constructing and maintaining AFNR structures.**	
	Student Competencies	
	10.11.1	Identify tools and equipment necessary for site preparation, surveying, and site layout.
	10.11.2	Identify tools and equipment necessary for wood, metal, plumbing, concrete, electrical, fencing, insulation, and additional construction needs.
	10.11.3	Select appropriate tools and equipment necessary for site preparation, surveying, and site layout.
	10.11.4	Select appropriate tools and equipment necessary for wood, metal, plumbing, concrete, electrical, fencing, insulation, and additional construction needs.
Topic 10.12	**Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, surveying, electrical, plumbing, concrete/masonry, etc.).**	
	Student Competencies	
	10.12.1	Examine the criteria in selecting materials for constructing, maintaining, and/or repairing AFNR structures.
	10.12.3	Contrast the characteristics of wood, masonry, and/or metal products used in AFNR structures.
	10.12.4	Compare and contrast the characteristics of materials used in plumbing and water systems (e.g., copper, PVC, PEX, etc.).
	10.12.8	Analyze samples of materials and/or products for quality and efficiency of workmanship.
	10.12.10	Calculate costs associated with the repair and replacement of wood, masonry, and/or metal components of an AFNR structure.
	10.12.11	Calculate the cost of a water system in an AFNR structure (e.g., copper, PEX, PVC, transportation of materials to jobsite, etc.).
	10.12.15	Select materials for a project based upon an analysis of the project and the quality of the materials.
	10.12.17	Construct AFNR structures using wood, masonry, and/or metal materials.
	10.12.18	Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures.
Topic 10.13	**Apply electrical wiring principles in AFNR structures.**	
	Student Competencies	
	10.13.4	Calculate the cost of operating an electrical component or load (e.g., heater, motor, etc.).
	10.13.6	Install and/or repair electrical circuits (e.g., single pole switch, three-way switch, duplex outlet, etc.).
Topic 10.14	**Apply current and/or identify emerging technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.**	
	Student Competencies	
	10.14.1	List current and emerging technologies used to solve problems and increase efficiency in AFNR systems.

	10.14.2	Summarize the specific application of technologies used to solve problems and increase the efficiency of AFNR systems (e.g., robotics, UAS, microcontrollers, CNC, etc.).
Topic 10.15	**Prepare and/or use electrical drawings to design, install, and troubleshoot electronic control systems in AFNR settings.**	
	Student Competencies	
	10.15.1	Identify electrical control system components used in AFNR systems (e.g., transistors, relays, HVAC, logic controllers, etc.).
	10.15.2	Contrast the purpose of electrical sensors.
	10.15.3	Summarize the importance of programmable logic controllers (PLC), microcontrollers, and/or other computer-based systems.
	10.15.4	Analyze schematic drawings for electrical control systems.
	10.15.5	Select the correct electrical sensor for a given application.
	10.15.6	Assess the functions of programmable logic controllers (PLC), microcontrollers, and other computer-based systems.