AGRICULTURAL MECHANICS TECHNOLOGY II

#01044

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, which may include 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 10.1	**Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural, and technical systems.**	
	Student Competencies	
	10.1.4	Assess the environmental impacts of renewable and nonrenewable energy sources used in AFNR.
	10.1.5	Calculate the costs of using renewable and nonrenewable energy sources in an AFNR enterprise or business.
	10.1.6	Convert energy utilized in an AFNR structure to an energy utilization index (e.g., convert cubic feet CF, Kilowatt Hours kWh, etc. to British Thermal Units Btu consumption per square foot, etc.).
	10.1.7	Evaluate the efficiency of renewable and nonrenewable energy sources used in AFNR.
	10.1.8	Devise a plan to incorporate the use of selected energy sources in an ANFR enterprise or business.
	10.1.9	Evaluate data to select methods to conserve energy in AFNR structures.
Topic 10.2	**Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.**	
	Student Competencies	
	10.2.4	Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems.
	10.2.5	Calculate the maintenance and purchase cost of tools, machines, and equipment used in AFNR.
	10.2.6	Demonstrate the proper selection, maintenance, and use of tools (including measuring tape), machines, and equipment.
	10.2.7	Design a plan to improve the efficiency of operation of AFNR related mechanical systems.
	10.2.8	Design a process to implement the safe use of AFNR related tools, machinery, and equipment.
	10.2.9	Develop a safety plan for different AFNR related mechanical systems ensuring compliance with industry standards.
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	
	10.3.3	Identify standard welding symbols, specifications, joint configurations, and dimensional callouts used in welding blueprints.
	10.3.4	Determine the best welding and/or cutting process to be used in metal fabrication.
	10.3.5	Select the correct consumables (e.g., electrode, welding wire, gas, etc.) and settings (e.g., amperage, wire feed speed, flow rate, etc.) for use in various welding processes.
	10.3.6	Evaluate and identify weld defects and discontinuities.
	10.3.7	Evaluate the quality of metal fabrication procedures (e.g., SMAW, GMAW, GTAW, Oxy-fuel, CNC, and plasma arc torch, etc.).
	10.3.8	Construct and/or repair structures and/or equipment safely using metal fabrication procedures.

	10.3.9	Recommend solutions to minimize and/or eliminate defects and discontinuities.
Topic 10.4		**Perform preventative maintenance and scheduled service to maintain equipment, machinery, and power units used in AFNR settings.**
	Student Competencies	
	10.4.5	Design a plan to communicate processes and procedures (e.g., lockout/tagout (LOTO), safety harnesses, etc.) for, preventative maintenance and service schedule for equipment, machinery, and power units used in AFNR power, structural and technical systems.
	10.4.6	Assess equipment according to service specifications. (e.g., belts and drives, chains, sprockets, hoses, lines, nozzles, etc.).
Topic 10.5		**Operate machinery and equipment while observing all safety precautions in AFNR settings.**
	Student Competencies	
	10.5.3	Perform pre-operation inspections, start-up, and shut-down procedures on equipment, machinery and power units as specified in manufacturer's manuals.
	10.5.4	Operate equipment, machinery, and power units using safety principles and practices.
	10.5.5	Analyze the efficiency of equipment, machinery, and power units (e.g., theoretical field capacity, actual field capacity, return on investment, etc.).
	10.5.6	Adjust equipment, machinery, and power units for safe and efficient operation.
Topic 10.6		**Troubleshoot, service, and repair components of internal combustion engines using manufacturers' guidelines.**
	Student Competencies	
	10.6.4	Determine service and repair needs of internal combustion engines using technical manuals and diagnostic tools.
	10.6.5	Evaluate service and repair needs for internal combustion engines using a variety of performance tests (e.g., manuals, computer-based diagnostics, etc.).
	10.6.6	Repair internal combustion engines.
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	
	10.7.7	Design electrical circuits using knowledge of the basic units of electricity and code.
	10.7.8	Evaluate malfunctioning electrical components and systems using testing procedures and equipment service/technical manuals.
	10.7.9	Build electrical control circuits to ensure proper operation.
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	
	10.8.5	Calculate efficiency in power transmission systems using speed, torque, and power measurements.
	10.8.6	Analyze vehicle and machinery performance related to suspension, braking, and steering systems.
	10.8.7	Recommend repairs to hydraulic and pneumatic system components.
	10.8.8	Recommend repairs to the components of power transmission systems.

	10.8.9	Recommend repairs to vehicle suspension, braking, and steering systems.
Topic 10.9		**Create plans for AFNR structures.**
		Student Competencies
	10.9.6	Design functional and efficient facilities.
Topic 10.10		**Determine structural requirements, specifications, customer needs, and estimate costs for AFNR structures.**
		Student Competencies
	10.10.4	Examine and use building code requirements for agriculture structures and those tasked with enforcing them.
	10.10.5	Create a project cost estimate, including materials and labor for an AFNR structure.
	10.10.6	Conduct a building functionality and safety assessment on an agricultural structure using knowledge of industry standards and local code.
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
	10.11.5	Utilize tools and equipment necessary for site preparation, surveying, and site layout.
	10.11.6	Utilize 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
	10.12.5	Contrast the characteristics of fencing materials, including government regulations and applicable installation codes for AFNR structures.
	10.12.6	Summarize the characteristics of the components found in concrete.
	10.12.7	Contrast types of insulation materials used in AFNR structures.
	10.12.8	Analyze samples of materials and/or products for quality and efficiency of workmanship.
	10.12.9	Complete a building site analysis checklist to select an appropriate building site.
	10.12.12	Calculate the cost of fencing materials for AFNR structures.
	10.12.13	Calculate volume for concrete projects.
	10.12.14	Calculate heat loss (e.g., Btu) in an AFNR structure.
	10.12.16	Demonstrate procedures for assessing site characteristics, identifying adjustments, and preparing a building site.
	10.12.18	Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures.
	10.12.19	Construct and/or repair fencing, including wood, static wire, electrical wire, and other fencing materials for AFNR structures.
	10.12.20	Construct and/or repair AFNR structures with concrete, brick, stone, or masonry.
	10.12.21	Install properly selected insulation materials to achieve a given thermal efficiency.

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.).
	10.13.5	Install and/or repair loads and control devices following appropriate codes and standards.
	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	
	10.14.3	Analyze data using current and emerging technologies.
	10.14.4	Examine the change in output after using technologies in AFNR systems.
	10.14.5	Solve problems using current and emerging technologies for AFNR systems.
	10.14.6	Create recommendations for the use of technology in AFNR systems.
Topic 10.15	**Prepare and/or use electrical drawings to design, install, and troubleshoot electronic control systems in AFNR settings.**	
	Student Competencies	
	10.15.7	Design schematic drawings for electrical control systems.
	10.15.8	Troubleshoot and install electrical sensors.
	10.15.9	Develop a plan for using programmable logic controllers (PLC), microcontrollers, and/or other computer-based systems.
Topic 10.16	**Apply geospatial principles and technologies to solve problems and increase the efficiency of AFNR systems.**	
	Student Competencies	
	10.16.1	Identify the various geospatial technologies (i.e., GPS, GIS, remote sensing, telematics, etc.) used in AFNR systems.
	10.16.2	Describe the components of precision technologies used in AFNR systems.
	10.16.3	Assess geospatial technology (i.e., GPS, GIS, remote sensing, telematics, etc.) use and applications in AFNR systems.
	10.16.4	Analyze the economic impact of utilizing precision technologies (e.g., GPS/GIS, remote sensing, etc.) in AFNR systems.
	10.16.5	Analyze and interpret data from maps utilizing geospatial technologies.
	10.16.6	Install new and troubleshoot faulty instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.).