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 fields associated with mechanics. Students will be exposed to mechanical, fluid, electrical, and thermal power that are associated with the field of agriculture. 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.

Grade 9-12

½ or 1 credit

Max Credit = 1

Standard 1	AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) CLUSTER SKILLS		
Topic 1.1	***Analyze how issues, trends, technologies, and public policies impact systems in the Agriculture, Food, & Natural Resources Career Cluster.***		
	Student Competencies		
	1.1.1	**RESEARCH, EXAMINE, AND DISCUSS ISSUES AND TRENDS THAT IMPACT AFNR SYSTEMS ON LOCAL, STATE, NATIONAL, AND GLOBAL LEVELS.**	
		1.1.1.1	Examine historical and current data to identify issues impacting AFNR systems.
		1.1.1.2	Research and summarize trends impacting AFNR systems.
	1.1.2	**EXAMINE TECHNOLOGIES AND ANALYZE THEIR IMPACT ON AFNR SYSTEMS.**	
		1.1.2.1	Research technologies used in AFNR systems.
		1.1.2.2	Compare and contrast AFNR systems before and after the integration of technology.
	1.1.3	**IDENTIFY PUBLIC POLICIES AND EXAMINE THEIR IMPACT ON AFNR SYSTEMS.**	
		1.1.3.1	Summarize public policies affecting AFNR systems.
		1.1.3.2	Identify influential historical and current public policies that impact AFNR systems.
Topic 1.2	***Evaluate the nature and scope of the Agriculture, Food, & Natural Resources Career Cluster and the role of agriculture, food, and natural resources (AFNR) in society and the economy.***		
	Student Competencies		
	1.2.1	**RESEARCH AND USE GEOGRAPHIC AND ECONOMIC DATA TO SOLVE PROBLEMS IN AFNR SYSTEMS.**	
		1.2.1.1	Research and describe different types of geographic data used in AFNR systems.
		1.2.1.2	Identify and examine economic data related to AFNR systems (e.g., commodity markets, food marketing, food, and nutritional assistance programs, etc.).
	1.2.2	**EXAMINE THE COMPONENTS OF THE AFNR SYSTEMS AND ASSESS THEIR IMPACT ON THE LOCAL, STATE, NATIONAL, AND GLOBAL SOCIETY AND ECONOMY.**	
		1.2.2.1	Identify and summarize the components within AFNR systems (e.g., Animal Systems: health, nutrition, genetics, etc.; Natural Resources Systems: soil, water, etc.).
		1.2.2.2	Define and summarize societies on local, state, national, and global levels and describe how they relate to AFNR systems.
		1.2.2.3	Examine and summarize the components of the agricultural economy (e.g., environmental, crops, livestock, etc.).

Topic 1.3	***Examine and summarize the importance of health, safety, and environmental management systems in AFNR workplaces.***		
	Student Competencies		
	1.3.1	**IDENTIFY AND EXPLAIN THE IMPLICATIONS OF REQUIRED REGULATIONS TO MAINTAIN AND IMPROVE SAFETY, HEALTH, AND ENVIRONMENTAL MANAGEMENT SYSTEMS.**	
		1.3.1.1	Research and explain the implications of regulatory, safety, and health standards on AFNR systems (e.g., SDS, bioterrorism, etc.)
		1.3.1.2	Summarize the importance of safety, health, and environmental management in the workplace.
	1.3.2	**DEVELOP AND IMPLEMENT A PLAN TO MAINTAIN AND IMPROVE HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE AND PERFORMANCE.**	
		1.3.2.1	Research and identify components required in health and safety performance plans.
		1.3.2.2	Examine and categorize examples of environmental compliance plans from AFNR workplace.
	1.3.3	**APPLY HEALTH AND SAFETY PRACTICES TO AFNR WORKPLACES.**	
		1.3.3.1	Research and summarize the purposes and objectives of health and safety policies and procedures relevant to AFNR careers.
		1.3.3.2	Identify emergency response procedures for health and safety issues at AFNR workplaces.
		1.3.3.3	Examine and categorize examples of how to avoid health or safety risks in AFNR workplaces.
		1.3.3.4	Examine and categorize the risk level of contamination or injury as associated with AFNR tasks in the workplace.
	1.3.4	**USE APPROPRIATE PROTECTIVE EQUIPMENT AND DEMONSTRATE SAFE AND PROPER USE OF AFNR TOOLS AND EQUIPMENT.**	
		1.3.4.1	Identify and differentiate the appropriate protective equipment for the safe use and operation of specific tools and equipment (e.g. PPE, etc.).
		1.3.4.2	Identify standard tools, equipment and safety procedures related to AFNR tasks.
		1.3.4.3	Read and interpret operating instructions related to operation, storage and maintenance of tools and equipment related AFNR tasks.
Topic 1.4	***Demonstrate stewardship of natural resources in AFNR activities.***		
	Student Competencies		
	1.4.1	**IDENTIFY AND IMPLEMENT PRACTICES TO STEWARD NATURAL RESOURCES IN DIFFERENT AFNR SYSTEMS.**	
		1.4.1.1	Define stewardship of natural resources and distinguish how it connects to AFNR systems.
		1.4.1.2	Read and interpret the definition of sustainability and summarize how it relates to AFNR activities.

Topic 1.5	***Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food, & Natural Resources career pathways.***		
	Student Competencies		
	1.5.1	**EVALUATE AND IMPLEMENT THE STEPS AND REQUIREMENTS TO PURSUE A CAREER OPPORTUNITY IN EACH OF THE AFNR CAREER PATHWAYS (E.G., GOALS, DEGREES, CERTIFICATIONS, RESUMES, COVER LETTER, PORTFOLIOS, INTERVIEWS, ETC.).**	
		1.5.1.1	Identify and summarize the steps to pursue a career in an AFNR pathway (e.g., self-assessment, set goals, etc.).
		1.5.1.2	Examine the educational, training, and experiential requirements to pursue a career in an AFNR pathway (e.g., degrees, certifications, training, internships, etc.).
		1.5.1.3	Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.
	1.5.2	**EXAMINE AND CHOOSE CAREER OPPORTUNITIES THAT ARE MATCHED TO PERSONAL SKILLS, TALENTS, AND CAREER GOALS IN AN AFNR PATHWAY OF INTEREST.**	
		1.5.2.1	Examine and categorize careers in each of the AFNR pathways.
		1.5.2.2	Research and describe careers in each of the AFNR pathways and choose potential careers connecting to personal interests and skills.

Standard 5	**ENVIRONMENTAL SERVICE SYSTEMS**		
Topic 5.5	***Use tools, equipment, machinery, & technology common to tasks in environmental service systems.***		
	Student Competencies		
	5.5.1	**USE TECHNOLOGICAL AND MATHEMATICAL TOOLS TO MAP LAND, FACILITIES AND INFRASTRUCTURE FOR ENVIRONMENTAL SERVICE SYSTEMS.**	
		5.5.1.1	Examine the importance and describe applications of surveying and mapping for environmental service systems.
		5.5.1.2	Research the methods in which GIS can be used in environmental service systems (e.g., tracing of point pollution, control of the spread of invasive species, etc.).
		5.5.1.3	Research how advancements in technology (e.g., unmanned aerial vehicles and drones, genetic modification, fracking, alternative energy, etc.) have changed environmental service systems.

Standard 9	POWER, STRUCTURAL, AND TECHNICAL SYSTEMS		
Topic 9.1	***Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.***		
	Student Competencies		
	9.1.1	**APPLY PHYSICAL SCIENCE AND ENGINEERING PRINCIPLES TO ASSESS AND SELECT ENERGY SOURCES FOR AFNR POWER, STRUCTURAL, AND TECHNICAL SYSTEMS.**	
		9.1.1.1	Research and identify renewable and nonrenewable energy sources used in AFNR.
		9.1.1.2	Compare and contrast the pathways of delivery for renewable and nonrenewable energy sources in an AFNR enterprise or business.
		9.1.1.3	Summarize methods and compare and contrast units used to benchmark energy use of AFNR structures (e.g., EUIs, BTUs, etc.).
	9.1.2	**APPLY PHYSICAL SCIENCE AND ENGINEERING PRINCIPLES TO DESIGN, IMPLEMENT, AND IMPROVE SAFE AND EFFICIENT MECHANICAL SYSTEMS IN AFNR SITUATIONS.**	
		9.1.2.1	Compare and contrast applications of simple machines in AFNR related mechanical systems.
		9.1.2.2	Identify the tools, machines, and equipment needed to construct and/or fabricate a project in AFNR.
		9.1.2.3	Examine owner's manuals to classify the types of safety hazards associated with different mechanical systems used in AFNR (e.g., caution, warning, danger, etc.).
	9.1.3	**APPLY PHYSICAL SCIENCE PRINCIPLES TO METAL FABRICATION USING A VARIETY OF WELDING AND CUTTING PROCESSES (E.G., SMAW, GMAW, GTAW, FUEL-OXYGEN AND PLASMA ARC TORCH, ETC.).**	
		9.1.3.1	Compare and contrast the principles and procedures of different welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).
		9.1.3.2	Compare and contrast the properties of different metals used in AFNR power, structural, and technical systems (e.g., malleability, conductivity, optical properties, chemical composition, etc.).
Topic 9.2	***Operate and maintain AFNR mechanical equipment and power systems.***		
	Student Competencies		
	9.2.1	**PERFORM PREVENTATIVE MAINTENANCE AND SCHEDULED SERVICE TO MAINTAIN EQUIPMENT, MACHINERY, AND POWER UNITS USED IN AFNR SETTINGS.**	
		9.2.1.1	Maintain the cleanliness and appearance of equipment, machinery, and power units used in AFNR power, structural, and technical systems to assure proper functionality.
		9.2.1.2	Examine operator's manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery, and power units used in AFNR power, structural, and technical systems.

	9.2.2	**OPERATE MACHINERY AND EQUIPMENT WHILE OBSERVING ALL SAFETY PRECAUTIONS IN AFNR SETTINGS.**	
		9.2.2.1	Research and summarize the use of equipment, machinery, and power units for AFNR power, structural, and technical systems.
		9.2.2.2	Examine and 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 9.4	***Plan, build, and maintain AFNR structures.***		
	Student Competencies		
	9.4.1	**CREATE SKETCHES AND PLANS FOR AFNR STRUCTURES.**	
		9.4.1.1	Interpret and explain the meaning of symbols used in sketches of agricultural structures.
		9.4.1.2	Read and interpret the parts and/or views of plans for agricultural structures.
		9.4.1.3	Apply scale measurement and dimension to develop sketches of agricultural structures.
		9.4.1.4	Construct plans for agricultural structures using current technology (e.g., drafting software, computer-aided design, etc.).
		9.4.1.5	Create sketches of an agricultural structure by applying principles of design.
		9.4.1.6	Evaluate, plan, and design functional and efficient facilities for use in AFNR power, structural, and technical systems.
	9.4.2	**DETERMINE STRUCTURAL REQUIREMENTS, SPECIFICATIONS, AND ESTIMATE COSTS FOR AFNR STRUCTURES**	
		9.4.2.1	Summarize and categorize the information needed to complete a bill of materials and cost estimate for an AFNR structure.
		9.4.2.2	Research and summarize sources of industry construction and materials standards and their importance (e.g., American National Standards Institute, ANSI, Underwriters' Laboratories, UL, etc.).
		9.4.2.3	Analyze a project plan to prepare a bill of materials and an estimate of material costs.
		9.4.2.4	Assess and analyze local building code requirements for agriculture structures.
		9.4.2.5	Create a project cost estimate, including materials, labor, and management for an AFNR structure.
		9.4.2.6	Design and conduct a building functionality and safety assessment on an agricultural structure using knowledge of industry standards and local code requirements.
	9.4.3	**FOLLOW ARCHITECTURAL AND MECHANICAL PLANS TO CONSTRUCT, MAINTAIN, AND/OR REPAIR AFNR STRUCTURES (E.G., MATERIAL SELECTION, SITE PREPARATION AND/OR LAYOUT, PLUMBING, CONCRETE/ MASONRY, ETC.).**	
		9.4.3.1	Examine the criteria in selecting materials for constructing, maintaining, and/or repairing AFNR structures.
		9.4.3.2	Summarize the characteristics needed for an ideal building site.
		9.4.3.3	Compare and contrast the characteristics of wood and/or metal products used in AFNR structures.

		9.4.3.4	Compare and contrast the characteristics of materials used in plumbing and water systems (e.g., copper, PVC, PEX, etc.).
		9.4.3.5	Compare and contrast the characteristics of fencing materials, including government regulations and applicable installation codes.
		9.4.3.6	Summarize the characteristics of the components found in concrete.
		9.4.3.7	Differentiate between types of insulation materials used in AFNR structures.
		9.4.3.8	Analyze and assess samples of materials or products for quality and efficiency of workmanship.
		9.4.3.9	Complete a building site analysis checklist to select an ideal building site.
		9.4.3.10	Calculate costs associated with the repair and replacement of wood and/or metal components an AFNR structure.
		9.4.3.11	Calculate the cost of a water system in an AFNR structure (e.g., copper, PVC, etc.).
		9.4.3.12	Measure and calculate the cost of fencing materials.
		9.4.3.13	Calculate volume for concrete projects.
		9.4.3.14	Calculate BTU loss in an AFNR structure.
		9.4.3.15	Select materials for a project based upon an analysis of the project and the quality of the materials.
		9.4.3.16	Assess site characteristics, identify adjustments, and demonstrate procedures for preparing a building site.
		9.4.3.17	Construct AFNR structures using wood and/or metal materials.
		9.4.3.18	Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures.
		9.4.3.19	Construct, maintain, and/or repair fencing, including wood, static wire, electrical wire, and other fencing materials.
		9.4.3.20	Construct, maintain, and/or repair AFNR structures with concrete, brick, stone, or masonry.
		9.4.3.21	Insulate a structure and estimate reduced BTU loss.
	9.4.4	**APPLY ELECTRICAL WIRING PRINCIPLES IN AFNR STRUCTURES.**	
		9.4.4.1	Compare and contrast direct and alternating current.
		9.4.4.2	Distinguish electrical circuits and the components of each.
		9.4.4.3	Assess and analyze the electrical requirements of an AFNR structure.
		9.4.4.4	Calculate the cost of operating an electrical motor.
		9.4.4.5	Install and/or repair fixtures following appropriate codes and standards.
		9.4.4.6	Plan and wire electrical circuits (i.e., single pole switch, three-way switch, duplex outlet, etc.).
Topic 9.5	***Use control, monitoring, geospatial, and other technologies in AFNR power, structural, and technical systems.***		
	Student Competencies		
	9.5.1	**APPLY COMPUTER AND OTHER TECHNOLOGIES (E.G., ROBOTICS, CNC, UAS, ETC.) TO SOLVE PROBLEMS AND INCREASE THE EFFICIENCY OF AFNR SYSTEMS.**	
		9.5.1.1	Research and categorize computer technologies used to solve problems and increase efficiency in AFNR systems.

	9.5.1.2	Examine and summarize the specific intent of technologies used to solve problems and increase the efficiency of AFNR systems (e.g., robotics, UAS, CNC, etc.).
	9.5.1.3	Analyze data using computer programs and other current technologies used in AFNR systems.
	9.5.1.4	Calculate the change in efficiency after using technologies in AFNR systems.
	9.5.1.5	Solve problems and calculate changes in efficiency using computer technologies for AFNR systems.
	9.5.1.6	Solve problems and evaluate changes in efficiency and create recommendations for the use of technologies in AFNR systems.
9.5.2	**PREPARE AND/OR USE ELECTRICAL DRAWINGS TO DESIGN, INSTALL, AND TROUBLESHOOT ELECTRONIC CONTROL SYSTEMS IN AFNR SETTINGS.**	
	9.5.2.1	Examine and categorize electrical control system components used in AFNR systems (e.g., transistors, relays, HVAC, logic controllers, etc.).
	9.5.2.2	Differentiate between the purpose of electrical sensors and controls used in AFNR power, structural, and technical systems.
	9.5.2.3	Research and summarize the importance of AFNR power, structural, and technical control systems using programmable logic controllers (PLC) and/or other computer-based systems.
	9.5.2.4	Analyze schematic drawings for electrical control systems used in AFNR systems.
	9.5.2.5	Interpret maintenance schedules for electrical control systems used in AFNR power, structural, and technical systems.
	9.5.2.6	Assess the functions of AFNR power, structural, and technical control systems using programmable logic controllers (PLC) in agricultural production and manufacturing.
	9.5.2.7	Design schematic drawings for electrical control systems used in AFNR systems.
	9.5.2.8	Troubleshoot electrical control system performance problems found in AFNR power, structural, and technical systems.
	9.5.2.9	Develop and implement AFNR power, structural, and technical control systems using programmable logic controllers (PLC) and/or other computer-based systems.

Career Ready Practices (CRP)

FFA & SUPERVISED AGRICULTURAL EXPERIENCE

CRP 1	**Act as a responsible and contributing citizen and employee.**
CRP 2	**Apply appropriate academic and technical skills.**
CRP 3	**Attend to personal health and financial well-being.**
CRP 4	**Communicate clearly, effectively, and with reason.**
CRP 5	**Consider the environmental, social, and economic impacts of decisions.**
CRP 6	**Demonstrate creativity and innovation.**
CRP 7	**Employ valid and reliable research strategies.**
CRP 8	**Utilize critical thinking to make sense of problems and persevere in solving them.**
CRP 9	**Model integrity, ethical leadership, and effective management.**
CRP 10	**Plan education and career path aligned to personal goals.**
CRP 11	**Use technology to enhance productivity.**
CRP 12	**Work productively in teams while using cultural/global competence.**