ADVANCED AG WELDING & FABRICATION

#01047

Description

This course can be a continuation of 01046 Agricultural Welding and Fabrication or can be offered in alternating years.

This course provides students in agriculture an opportunity to reinforce and extend understanding of applied mechanical applications. Students will be exposed to mechanical, electrical and thermal power that are associated with the field of agricultural welding. Applied activities develop an understanding and skill development in metal joining and fabrication processes. Instruction will prepare students to select, operate, repair, fabricate and maintain a variety of agricultural machinery and equipment. Processes covered may include: Oxyfuel Cutting/Heating/Welding, Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Flux-cored Arc Welding (FCAW), Gas Tungsten Arc Welding (GTAW), Air-carbon Arc Cutting, Plasma Arc Cutting, Safety and Metal Fabrication. In addition, record keeping, communication skills, employability and human relation skills will be covered. Leadership development and Supervised Agricultural Experiences (SAE's) are also integral to this course.

Grade 10-12

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.
		1.1.3.3	Analyze and assess at least two public policies that impact each AFNR system.
		1.1.3.4	Create and propose a hypothetical policy that will impact current AFNR systems.
		1.1.3.5	Evaluate a public policy within AFNR systems and defend or challenge it.
		1.1.3.6	Create a plan for implementing a new public policy that will positively 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.
Topic 1.6	***Analyze the interaction among AFNR systems in the production, processing, and management of food, fiber, and fuel and the sustainable use of natural resources.***		
	Student Competencies		
	1.6.1	**EXAMINE AND EXPLAIN FOUNDATIONAL CYCLES AND SYSTEMS OF AFNR.**	
		1.6.1.1	Research and explain the foundational cycles in AFNR (e.g., water cycle, nutrient cycle, carbon cycle, etc.).
		1.6.1.2	Examine and describe examples of systems within AFNR (e.g., sustainability, gate-to-plate, etc.).
	1.6.2	**ANALYZE AND EXPLAIN THE CONNECTION AND RELATIONSHIPS BETWEEN DIFFERENT AFNR SYSTEMS ON A NATIONAL AND GLOBAL LEVEL.**	
		1.6.2.1	Summarize how AFNR systems connect and relate on a national and global level (e.g., soil, water, economic, etc.).
		1.6.2.2	Examine and summarize changes that happen in AFNR systems on a national and global level (e.g., using less irrigation water, reduction of inputs, etc.).

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.).
		9.1.1.4	Assess the environmental impacts of renewable and nonrenewable energy sources used in AFNR.
		9.1.1.5	Calculate the costs of using renewable and nonrenewable energy sources in an AFNR enterprise or business.
		9.1.1.6	Convert energy utilized in an AFNR structure to an energy utilization index (e.g., convert CCF, KWH, etc. to Btu consumption per square foot, 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.).
		9.1.2.4	Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems.
		9.1.2.5	Calculate the maintenance and purchase cost of tools, machines, and equipment used in AFNR.
		9.1.2.6	Select, maintain, and demonstrate the proper use of tools, machines, and equipment used in different AFNR related mechanical systems.
		9.1.2.7	Apply the scientific method to devise strategies to improve the efficiency of operation of AFNR related mechanical systems.
		9.1.2.8	Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery, and equipment.
		9.1.2.9	Conduct a safety inspection of tools, machines, and equipment used in different AFNR related mechanical systems.

	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.).
		9.1.3.3	Analyze the situation and determine the best welding and cutting process to be used in metal fabrication.
		9.1.3.4	Assess and select the proper electrode for use in various shielded metal arc welding situations.
		9.1.3.5	Evaluate the quality of metal fabrication procedures (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).
		9.1.3.6	Construct and/or repair metal structures and equipment using metal fabrication procedures.
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.
		9.2.1.3	Develop a preventative maintenance schedule for equipment, machinery, and power units used in AFNR power, structural, and technical systems.
		9.2.1.4	Service filtration systems and maintain fluid levels on equipment, machinery, and power units in accordance with operator's manuals.
		9.2.1.5	Devise a strategy to communicate to different audiences, preventative maintenance, and service schedule for equipment, machinery, and power units used in AFNR power, structural, and technical systems.
		9.2.1.6	Assess and adjust equipment (e.g., belts and drives, chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning.
	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.).

	9.2.2.3	Analyze and calculate the cost of using equipment, machinery, and power units for AFNR power, structural, and technical systems.
	9.2.2.4	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural, and technical systems.
	9.2.2.5	Perform pre-operation inspections, start-up, & shut-down procedures on equipment, machinery, and power units as specified in owner's manuals.
	9.2.2.6	Adjust equipment, machinery, and power units for safe and efficient operation in AFNR power, structural, and technical systems.
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.

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.

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.**