AGRICULTURAL WELDING AND FABRICATION

#01046

Description

This course provides students in agriculture an opportunity to reinforce and extend their understanding of applied mechanical applications. Students will be exposed to mechanical, electrical, and thermal power associated with 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 relations skills will be covered. Leadership development and supervised Agricultural Experiences (SAEs) are also integral to this course.

½ to 1 credit
Max credit=1
Grades 10-12

Standard 1		***AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) FOUNDATIONAL PATHWAY SKILLS***
Topic 1.1	**Research, examine, and discuss issues and trends that impact AFNR systems on local, state, national, and global levels.**	
	Student Competencies	
	1.1.2	Summarize trends impacting AFNR systems.
	1.1.3	Analyze AFNR issues and their impact on local, state, national, and global levels.
	1.1.4	Predict the impact of current trends in AFNR systems on local, state, national, and global levels.
	1.1.5	Interpret AFNR issues and their impacts to audiences with limited AFNR knowledge.
	1.1.6	Determine the opportunities emerging trends create within the AFNR systems.
Topic 1.2	**Examine technologies and analyze their impact on AFNR systems.**	
	Student Competencies	
	1.2.2	Compare and contrast AFNR systems before and after the integration of technology.
	1.2.3	Demonstrate appropriate use of technologies in AFNR workplace scenarios.
	1.2.4	Analyze how technology is used in AFNR systems to maximize productivity.
Topic 1.3	**Identify public policies and examine their impact on AFNR systems.**	
	Student Competencies	
	1.3.1	Summarize public policies affecting AFNR systems.
Topic 1.6	**Identify and explain the implications of required regulations to maintain and improve safety, health, and environmental management systems.**	
	Student Competencies	
	1.6.1	Identify implications of regulatory, safety, and health standards on AFNR systems (e.g., SDS, bio-terrorism, etc.)
	1.6.2	Summarize the importance of safety, health, and environmental management in the workplace.
	1.6.3	Explain a health, safety, and environmental procedures to comply with regulatory and safety standards.
Topic 1.7	**Develop and implement a plan to maintain and improve health, safety, and environmental compliance and performance.**	
	Student Competencies	
	1.7.1	Identify components required in health and safety performance plans.
	1.7.2	Identify examples of environmental compliance plans from AFNR workplace.
	1.7.3	Analyze the effectiveness of health and safety performance plans of an AFNR workplace.
Topic 1.8	**Apply health and safety practices to AFNR workplaces.**	
	Student Competencies	
	1.8.1	Identify emergency response procedures for health and safety issues at AFNR workplaces.
	1.8.2	Identify examples of how to avoid health or safety risks in AFNR workplaces.

	1.8.3	Describe the risk level of contamination or injury as associated with AFNR tasks in the workplace.
	1.8.4	Assess various emergency response plan requirements for an AFNR workplaces and/or facility.
	1.8.5	Discuss first aid knowledge and procedures relevant to AFNR workplaces.
Topic 1.9	**Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.**	
	Student Competencies	
	1.9.1	Identify and differentiate the appropriate protective equipment for the safe use and operation of specific tools and equipment (e.g. PPE, etc.).
	1.9.2	Identify standard tools, equipment, and safety procedures related to AFNR tasks.
	1.9.3	Outline operating instructions related to operation, storage, and maintenance of tools and equipment related AFNR tasks.
	1.9.4	Demonstrate adherence to protective equipment requirements when using various AFNR tools and equipment.
	1.9.5	Demonstrate the set up and adjustment for tools and equipment related to AFNR tasks.
	1.9.6	Demonstrate appropriate operation, storage, and maintenance techniques for AFNR tools and equipment.
	1.9.7	Design plans to ensure the use of appropriate protective equipment when using various AFNR tools and equipment.
	1.9.8	Choose appropriate tools and equipment to complete AFNR tasks.
	1.9.9	Design operation, storage, and maintenance plans or schedules for AFNR tools and equipment.
Topic 1.11	**Assess and explain the natural resource related trends, technologies, and policies that impact AFNR systems.**	
	Student Competencies	
	1.11.1	Discuss historical and current natural resources trends and technologies.
	1.11.2	Identify current local, state, and federal policies impacting AFNR systems.
	1.11.3	Dissect natural resources trends and technologies impacting AFNR systems (e.g., climate change, green technologies, water resources, etc.).
	1.11.4	Compare natural resources policies impacting current AFNR systems (e.g., for water resources, land use, air quality, etc.).
	1.11.5	Predict emerging natural resource trends and technologies within AFNR systems.
	1.11.6	Propose strategies for implementing a new natural resources policy to positively impact AFNR systems.
Topic 1.12	**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.).**	
	Student Competencies	
	1.12.1	Identify steps to pursue a career in an AFNR pathway (e.g., self-assessment, set goals, etc.).
	1.12.2	Classify the educational, training, and experiential requirements to pursue a career in an AFNR pathway (e.g., degrees, certifications, training, internships, etc.).
	1.12.3	Describe 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.
	1.12.4	Design a personal plan outlining goals and steps to obtain a career in an AFNR pathway.
	1.12.5	Analyze personal skills for attaining a career in an AFNR pathway.

	1.12.6	Communicate personal goals, experiences, education, and skills utilizing specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) for an AFNR career.
	1.12.7	Assess personal AFNR career goal progress.
	1.12.8	Design a personal plan for attaining the required education, training, and experiences for a career in an AFNR pathway.
	1.12.9	Justify personal goals, experiences, education, and skills to pursue a career in an AFNR pathway.
Topic 1.13	**Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.**	
	Student Competencies	
	1.13.1	Describe careers in each of the AFNR pathways.
	1.13.2	Assess how personal skills and align them with potential career opportunities in AFNR pathways.
	1.13.3	Evaluate the results of a personal career assessment related to potential careers in AFNR pathways.
Topic 1.16	**Implement the components of a Foundational SAE.**	
	Student Competencies	
	1.16.1	Investigate career opportunities based on individual strengths and preferences.
	1.16.2	Identify employability skills that are important in a chosen career field.
	1.16.3	Define record keeping and its relationship to personal financial literacy.
	1.16.4	Define workplace safety and its importance with AFNR.
	1.16.5	Identify issues, trends, technologies, and public policies that impact AFNR systems.
	1.16.6	Create a career plan of study.
	1.16.7	Perform an employability skills self-assessment to determine areas for growth.
	1.16.8	Craft a personal financial plan that supports one's financial goals.
	1.16.9	Analyze situations for workplace safety hazards.
	1.16.10	Research and analyze how issues, trends, technologies, and public policies impact AFNR systems.
	1.16.11	Implement and adjust a career plan of study.
	1.16.12	Practice employability skills that are important in a chosen career field.
	1.16.13	Apply personal financial practices that lead to financial independence.
	1.16.14	Design a workplace safety plan for a foundational SAE.
	1.16.15	Apply knowledge of issues, trends, technologies, and public policies that impact AFNR systems to solve a problem.

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.).
	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	
	10.3.1	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.).
	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	
	10.4.1	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.
	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	
	10.5.1	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.).
	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 10.9	**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.
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.).
Topic 10.13	**Apply electrical wiring principles in AFNR structures.**	
	Student Competencies	
	10.13.1	Compare and contrast direct and alternating current.
	10.13.2	Contrast electrical circuits and the components of each.
	10.13.3	Analyze the electrical requirements of an AFNR structure.
	10.13.4	Calculate the cost of operating an electrical component or load (e.g., heater, motor, etc.).