



ADVANCED AG WELDING AND FABRICATION

#01047

Description

This course can be a continuation of 01046 Agricultural Welding and Fabrication or be offered in alternating years. This course provides students in agriculture an additional opportunity to reinforce and extend their understanding of applied mechanical applications. Advanced applications will further develop knowledge 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 projects. 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	<i>AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) FOUNDATIONAL PATHWAY SKILLS</i>	
Topic 1.2	Examine technologies and analyze their impact on AFNR systems.	
	Student Competencies	
	1.2.5	Develop solutions in AFNR workplaces or scenarios using technology.
	1.2.6	Evaluate the importance of technology use and how it impacts 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	
	1.6.4	Analyze existing required regulations within an AFNR workplace.
	1.6.5	Evaluate how AFNR organizations and businesses promote improved health, safety, and environmental management.
	1.6.6	Develop methods to evaluate compliance with required safety, health, and environmental management regulations.
Topic 1.7	Develop and implement a plan to maintain and improve health, safety, and environmental compliance and performance.	
	Student Competencies	
	1.7.4	Prepare plans to improve environmental compliance and performance within an AFNR system.
	1.7.5	Create and implement a plan to improve safety, health, and environmental management regulations in an AFNR workplace.
	1.7.6	Develop a strategy to educate employees on environmental compliance and performance in an AFNR workplace.
Topic 1.8	Apply health and safety practices to AFNR workplaces.	
	Student Competencies	
	1.8.5	Discuss first aid knowledge and procedures relevant to AFNR workplaces.
	1.8.6	Select appropriate responses for different levels of contamination or injury at an AFNR workplace.
	1.8.7	Create a plan to communicate appropriate responses for health and safety situations within an AFNR workplace.
	1.8.8	Evaluate AFNR workplaces to identify structure of health and safety practices and number of employees certified in first aid training.
	1.8.9	Create a plan to mitigate the level of contamination or injury identified as a risk in the workplace.
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 1.12	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 1.15	Recognize the value of a Supervised Agricultural Experience (SAE) as Work-Based Learning.	
	Student Competencies	
	1.15.1	Define Supervised Agricultural Experience (SAE).
	1.15.2	Describe the lifelong learning and career skills that SAEs provide.
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.
Topic 1.17	Recognize the options within and participate in immersive supervised agricultural experiences.	
	Student Competencies	
	1.17.1	Describe the knowledge and skills required to be successful in a specific AFNR career field.

Standard 10	<i>POWER, STRUCTURAL, AND TECHNICAL SYSTEMS</i>	
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 10.7	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.).
Topic 10.9	Create plans for AFNR structures.	
	Student Competencies	
	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.

	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	
	10.10.3	Analyze a project plan to prepare a bill of materials.
	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 10.12	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	
	10.12.3	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.).
	10.12.5	Contrast the characteristics of fencing materials, including government regulations and applicable installation codes for AFNR structures.
	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.).
	10.12.12	Calculate the cost of fencing materials for AFNR structures.
	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.
	10.12.19	Construct and/or repair fencing, including wood, static wire, electrical wire, and other fencing materials for AFNR structures.
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.).
	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.