AGRICULTURE III

#01073

Description

This course develops agricultural skills necessary for employment, entrepreneurship, or further education in agriculture and agricultural occupations. Units may include: crop and livestock production, farm business management, agribusiness, horticulture, natural resources, agricultural mechanics, aquaculture, and water management. Leadership development and supervised agricultural experiences will also be emphasized.

Grade 10-12

½ or 1 credit

Max Credit = 1

Standard 1	AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) CLUSTER SKILLS		
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		
	1.2.2	**EXAMINE THE COMPONENTS OF THE AFNR SYSTEMS AND ASSESS THEIR IMPACT ON THE LOCAL, STATE, NATIONAL, AND GLOBAL SOCIETY AND ECONOMY.**	
		1.2.2.4	Assess components within AFNR systems and analyze relationships between systems.
		1.2.2.5	Assess how people within societies on local, state, national, and global levels interact with AFNR systems on daily, monthly, or yearly basis.
		1.2.2.6	Assess the economic impact of an AFNR system on a local, state, national, and global level.
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.**	
		1.3.1.3	Execute health, safety, and environmental procedures to comply with regulatory and safety standards.
		1.3.1.4	Analyze existing required regulations within an AFNR workplace.
	1.3.3	**APPLY HEALTH AND SAFETY PRACTICES TO AFNR WORKPLACES.**	
		1.3.3.5	Analyze and evaluate the impact of current health and safety practices of AFNR workplaces.
		1.3.3.6	Assess various emergency response plan requirements for an AFNR workplaces and/or facility.
		1.3.3.7	Assess and apply first aid knowledge and procedures relevant to AFNR workplaces.
		1.3.3.8	Assess the safety priorities and select appropriate responses for different levels of contamination or injury at an AFNR workplace.
	1.3.4	**USE APPROPRIATE PROTECTIVE EQUIPMENT AND DEMONSTRATE SAFE AND PROPER USE OF AFNR TOOLS AND EQUIPMENT.**	
		1.3.4.5	Complete the set up and adjustment for tools and equipment related to AFNR tasks.
		1.3.4.6	Assess and demonstrate appropriate operation, storage, and maintenance techniques for AFNR tools and equipment.
		1.3.4.7	Design and implement plans to ensure the use of appropriate protective equipment when using various AFNR tools and equipment.
		1.3.4.8	Evaluate and select appropriate tools and equipment to complete AFNR tasks.

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.).**	
		1.5.1.6	Assess personal goals, experiences, education, and skillsets and organize them to produce the appropriate tools and develop the skills to effectively communicate about one's qualifications for an AFNR career.
		1.5.1.7	Evaluate progress toward AFNR career goals and identify opportunities for improvement and necessary adjustments to one's plan of action.
		1.5.1.8	Implement one's personal plan of action for obtaining the required education, training, and experiences and evaluate progress to identify opportunities for improvement and necessary adjustments.
		1.5.1.9	Evaluate, update, and improve a set of personal tools to reflect current skills, experiences, education, goals, etc. and complete the processes needed to pursue and obtain 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.**	
		1.5.2.5	Interpret and evaluate the results of a personal career assessment and connect them to potential careers in AFNR pathways.
		1.5.2.6	Conduct interviews with career professionals within AFNR pathways and summarize the results.

Standard 2	**AGRIBUSINESS SYSTEMS**		
Topic 2.1	***Apply management planning principles in AFNR businesses.***		
	Student Competencies		
	2.1.4	**EVALUATE, DEVELOP AND IMPLEMENT PROCEDURES USED TO RECRUIT, TRAIN, AND RETAIN PRODUCTIVE HUMAN RESOURCES FOR AFNR BUSINESSES.**	
		2.1.4.1	Research and explain the meaning and functions of human resources in AFNR businesses (e.g., recruitment, evaluate employee performance, employee record management, compensation, etc.).
		2.1.4.2	Identify and explain programs used in AFNR businesses to recruit, train, and retain employees and define their purpose (e.g., career development, training plans, recruitment plans, evaluation programs, etc.).
		2.1.4.3	Research and summarize purposes and objectives of benefit and compensation plans for AFNR businesses.

		2.1.4.4	Create methods to describe specific positions and structures of an AFNR business to share with human resources (e.g., job descriptions, business information sheet, pamphlet, etc.).
		2.1.4.5	Analyze and evaluate programs used to recruit, train, and retain employees based on their effectiveness.
Topic 2.5	***Use sales and marketing principles to accomplish AFNR business objectives.***		
	Student Competencies		
	2.5.1	**ANALYZE THE ROLE OF MARKETS, TRADE, COMPETITION AND PRICE IN RELATION TO AN AFNR BUSINESS SALES AND MARKETING PLANS.**	
		2.5.1.1	Distinguish and explain markets related to AFNR businesses (e.g. commodity markets, energy markets, etc.).
		2.5.1.2	Research and summarize different forms of market competition found in AFNR businesses (e.g., direct competitors, indirect competitors, replacement competitors, etc.).
		2.5.1.3	Analyze and describe the role of trade and price in the market structure as it relates to AFNR businesses.
		2.5.1.4	Compare and contrast different forms of market competition and how they can be applied to different AFNR businesses.
	2.5.2	**ASSESS AND APPLY SALES PRINCIPLES AND SKILLS TO ACCOMPLISH AFNR BUSINESS OBJECTIVES.**	
		2.5.2.1	Identify and explain components of the sales process for AFNR businesses (e.g., understanding needs, develop solutions, close sale, etc.).
		2.5.2.2	Research and summarize examples of different types of sales calls used in AFNR businesses (e.g., cold calls, face-to-face meetings, follow up calls, etc.).
		2.5.2.3	Apply the sales process to AFNR businesses and communicate ways of accomplishing the businesses' goals and objectives.
		2.5.2.4	Assess different customer reactions that could be encountered during different types of sales calls used in AFNR businesses and prepare an appropriate response (e.g., objections, competitor prices, competing products, post-sale service, complaints about product, etc.).
		2.5.2.5	Analyze the sales process of AFNR businesses and create methods to suggest improvements.
		2.5.2.6	Create strategies for developing plans for different types of sales calls used in AFNR businesses.
	2.5.3	**ASSESS MARKETING PRINCIPLES AND DEVELOP MARKETING PLANS TO ACCOMPLISH AFNR BUSINESS OBJECTIVES.**	
		2.5.3.1	Identify and explain marketing principles used in AFNR businesses (e.g., 4 P's [product, place, price, promotion]; attention, interest, desire, action, etc.).
		2.5.3.2	Research and categorize different strategies used in marketing programs for AFNR businesses (e.g., Internet, direct to customer, social media, etc.).

	2.5.3.3	Research and summarize the purpose, components and process to develop marketing plans for AFNR businesses.
	2.5.3.4	Assess and select appropriate alternative marketing strategies (e.g. value-adding, branding, niche marketing, etc.) for AFNR businesses using established marketing principles.
	2.5.3.5	Compare and contrast the strategies of marketing for products and services used in AFNR businesses (e.g., direct marketing, commodities, etc.).
	2.5.3.6	Perform a market analysis to gather information for marketing plans for AFNR businesses (e.g., evaluation of competitors, customers, domestic and international policy, regulations and rules, standards, etc.).

Standard 3	**ANIMAL SYSTEMS**	
Topic 3.1	***Analyze historic and current trends impacting the animal systems industry.***	
	Student Competencies	
	3.1.3	**ANALYZE AND APPLY LAWS AND SUSTAINABLE PRACTICES TO ANIMAL AGRICULTURE FROM A GLOBAL PERSPECTIVE.**
	3.1.3.3	Analyze the structure of laws governing animal industries, international trade, and animal production policies.
	3.1.3.4	Analyze the local and global impact of sustainable animal agriculture practices on human and environmental systems.
Topic 3.3	***Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction, and/or economic production.***	
	Student Competencies	
	3.3.1	**ANALYZE THE NUTRITIONAL NEEDS OF ANIMALS.**
	3.3.1.3	Differentiate between nutritional needs of animals in different growth stages and production systems (e.g., maintenance, gestation, natural, organic, etc.).
	3.3.1.4	Correlate a species' nutritional needs to feedstuffs that could meet those needs.
	3.3.1.5	Assess nutritional needs for an individual animal based on its growth stage and production system.
	3.3.1.6	Design and defend the use of a nutritional program by demonstrating the relationship between the nutrient requirements and the feedstuffs provided.
	3.3.2	**ANALYZE FEED RATIONS AND ASSESS IF THEY MEET THE NUTRITIONAL NEEDS OF ANIMALS.**
	3.3.2.4	Determine the relative nutritional value of feedstuffs by evaluating their general quality and condition.
	3.3.2.5	Appraise the adequacy of feed rations using data from the analysis of feedstuffs, animal requirements, and performance.

		3.3.2.6	Compare and contrast methods that utilize feed additives and growth promotants with production practices that do not (e.g., organic versus conventional production methods).
		3.3.2.7	Select appropriate feedstuffs for animals based on a variety of factors (e.g., economics, digestive system, and nutritional needs, etc.).
		3.3.2.8	Select and utilize animal feeds based on nutritional requirements, using rations for maximum nutrition and optimal economic production.
	3.3.3	**UTILIZE INDUSTRY TOOLS TO MAKE ANIMAL NUTRITION DECISIONS.**	
		3.3.3.4	Utilize tools and equipment to perform animal nutrition tasks.
		3.3.3.5	Analyze and apply information from a feed label and feeding directions to feed animals.
		3.3.3.6	Analyze technologies used to provide animal nutrition and summarize their potential benefits and consequences.
Topic 3.5	***Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.***		
	Student Competencies		
	3.5.1	**DESIGN ANIMAL HOUSING, EQUIPMENT, AND HANDLING FACILITIES FOR THE MAJOR SYSTEMS OF ANIMAL PRODUCTION.**	
		3.5.1.3	Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe, sustainable, and efficient use of the facility.
		3.5.1.4	Analyze the use of modern equipment, technology, and handling facility procedures and determine if they enhance the safe, economic and sustainable production of animals.
		3.5.1.5	Design an animal facility focusing on animal requirements, economic efficiency, sustainability, safety, and ease of handling.
		3.5.1.6	Select, use, and evaluate equipment, technology, and handling procedures to enhance sustainability and production efficiency.
	3.5.2	**COMPLY WITH GOVERNMENT REGULATIONS AND SAFETY STANDARDS FOR FACILITIES USED IN ANIMAL PRODUCTION.**	
		3.5.2.3	Analyze animal facilities to determine if standards have been met.
		3.5.2.4	Analyze the structure of laws pertaining to animal systems.
		3.5.2.5	Evaluate facility designs and make recommendations to ensure that it meets standards for the legal, safe, ethical, economical, and efficient production of animals.
		3.5.2.6	Evaluate the impact of laws pertaining to animal systems.
Topic 3.7	***Apply principles of effective animal health care.***		
	Student Competencies		
	3.7.1	**DESIGN PROGRAMS TO PREVENT ANIMAL DISEASES, PARASITES, AND OTHER DISORDERS AND ENSURE ANIMAL WELFARE.**	
		3.7.1.1	Identify and summarize specific tools and technology used in animal health management.
		3.7.1.2	Explain methods of determining animal health and disorders.

	3.7.1.3	List and summarize the characteristics of wounds, common diseases, parasites, and physiological disorders that affect animals.
	3.7.1.4	Identify and summarize characteristics of causal agents and vectors of diseases and disorders in animals.
	3.7.1.5	Explain the clinical significance of common veterinary methods and treatment (e.g., aseptic techniques, antibiotic use, wound management, etc.).
	3.7.1.6	Describe and demonstrate the proper use and function of specific tools and technology related to animal health management.
	3.7.1.7	Perform simple health-check evaluations on animals and practice basic emergency response procedures related to animals.
	3.7.1.8	Identify and describe common illnesses and disorders of animals based on symptoms and problems caused by wounds, diseases, parasites, and physiological disorders.
	3.7.1.9	Research and analyze data to evaluate preventive measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
	3.7.1.10	Assess the safety and effectiveness of facilities and equipment used for surgical and nonsurgical veterinary treatments and procedures.
3.7.2	**ANALYZE BIOSECURITY MEASURES UTILIZED TO PROTECT THE WELFARE OF ANIMALS ON A LOCAL, STATE, NATIONAL, AND GLOBAL LEVEL.**	
	3.7.2.1	Summarize the importance of biosecurity to the animal industry at multiple levels (e.g., local, state, national, global).
	3.7.2.2	Identify and describe zoonotic diseases including their historical significance and potential future implications.
	3.7.2.3	Analyze procedures at the local, state, and national levels to ensure biosecurity of the animal industry.
	3.7.2.4	Analyze the health risk of different zoonotic diseases to humans and identify prevention methods.

Standard 4	BIOTECHNOLOGY SYSTEMS		
Topic 4.1	***Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical, and legal implications, etc.).***		
	Student Competencies		
	4.1.3	**ANALYZE THE RELATIONSHIP AND IMPLICATIONS OF BIOETHICS, LAWS, AND PUBLIC PERCEPTIONS ON APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE (E.G., ETHICAL, LEGAL, SOCIAL, CULTURAL ISSUES).**	
		4.1.3.7	Devise and support an argument for or against an ethical issue associated with biotechnology in agriculture.
		4.1.3.8	Propose a solution for a legal issue associated with biotechnology in agriculture.
		4.1.3.9	Design studies to examine public perceptions of scientifically-based arguments regarding biotechnology in agriculture and reflect on the reasons why the public may support or resist significant breakthroughs using biotechnology.
Topic 4.2	***Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).***		
	Student Competencies		
	4.2.3	**APPLY STANDARD OPERATING PROCEDURES FOR THE SAFE HANDLING OF BIOLOGICAL AND CHEMICAL MATERIALS IN A LABORATORY.**	
		4.2.3.4	Demonstrate advanced aseptic techniques in the laboratory (e.g., sterile work area, sterile handling, personal hygiene, etc.).
		4.2.3.5	Analyze and select an appropriate standard operating procedure for working with biological materials based upon their classification.
		4.2.3.6	Formulate and prepare solutions using standard operating procedures (e.g., proper labeling, storage, etc.).
	4.2.5	**EXAMINE AND PERFORM SCIENTIFIC PROCEDURES USING MICROBES, DNA, RNA, AND PROTEINS IN A LABORATORY.**	
		4.2.5.1	Differentiate types of organisms and demonstrate safe handling to maintain organism purity and personal safety (e.g., plant and animal tissue, cell cultures, microbes, etc.).
		4.2.5.2	Compare and contrast the structures of DNA and RNA and investigate how genotype influences phenotype.
		4.2.5.3	Extract and purify DNA and RNA according to standard operating procedures.
		4.2.5.4	Examine and document the role and applications of proteins in agricultural biotechnology.
		4.2.5.5	Synthesize the relationship between proteins, enzymes, and antibodies.

Topic 4.3	*Demonstrate the application of biotechnology to solve problems in Agriculture, Food, & Natural Resources systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).*		
	Student Competencies		
	4.3.2	**APPLY BIOTECHNOLOGY PRINCIPLES, TECHNIQUES, AND PROCESSES TO ENHANCE THE PRODUCTION OF FOOD THROUGH THE USE OF MICROORGANISMS AND ENZYMES.**	
		4.3.2.1	Summarize reasons for detecting microbes and identify sources of microbes.
		4.3.2.2	Examine enzymes, the changes they cause and the physical and chemical parameters that affect enzymatic reactions (e.g., food, cellulosic bioenergy, etc.).
		4.3.2.3	Identify and categorize foods produced through the use of biotechnology (e.g., fermentation, etc.) to change the chemical properties of food for an intended purpose (e.g., create desirable nutritional profile, preservation, flavor, etc.).
		4.3.2.4	Assess and describe the use of biotechnology to detect microbes.
		4.3.2.5	Analyze processes by which enzymes are produced through biotechnology.
		4.3.2.6	Compare and contrast the effectiveness, purpose, and outcomes associated with biotechnology as well as conventional processes used in food processing.
		4.3.2.7	Design and perform an assay to detect a target microorganism in food, water, or the environment.
		4.3.2.8	Conduct studies using scientific techniques to improve or discover enzymes for use in biotechnology (e.g., microbial strain selection).
		4.3.2.9	Process food using biotechnology to achieve an intended purpose (e.g., preservation, flavor enhancement, etc.).
	4.3.4	**APPLY BIOTECHNOLOGY PRINCIPLES, TECHNIQUES, AND PROCESSES TO ENHANCE PLANT AND ANIMAL CARE AND PRODUCTION (E.G., SELECTIVE BREEDING, PHARMACEUTICALS, BIODIVERSITY, ETC.).**	
		4.3.4.1	Research and describe the aims and techniques involved in selective plant-breeding process.
		4.3.4.2	Examine and classify biotechnology processes applicable to animal health (e.g., genetic testing, etc.).
		4.3.4.3	Research and categorize the types of pharmaceuticals developed for animals and humans through biotechnology.
		4.3.4.4	Summarize the need for global biodiversity and applications of biotechnology to reduce threats to biodiversity.
		4.3.4.5	Choose techniques and identify tools used to monitor and direct plant breeding.
		4.3.4.6	Assess the benefits, risks, and opportunities associated with using biotechnology to promote animal health.
		4.3.4.7	Distinguish the difference between plant-based and animal-based pharmaceuticals and describe their role in agriculture.
		4.3.4.8	Assess whether current threats to biodiversity will have an unsustainable impact on human populations.
		4.3.4.9	Perform plant-breeding techniques (e.g., plant tissue culture, etc.).

Standard 5	ENVIRONMENTAL SERVICE SYSTEMS		
Topic 5.3	***Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology.***		
	Student Competencies		
	5.3.2	**APPLY SOIL SCIENCE AND HYDROLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.**	
		5.3.2.1	Differentiate and distinguish land uses, capability factors, and land capability classes.
		5.3.2.2	Research and describe the process of soil formation through weathering.
		5.3.2.3	Examine and explain how the physical qualities of the soil influence the infiltration and percolation of water.
		5.3.2.4	Summarize environmental hazards associated with groundwater supplies.
		5.3.2.5	Research and summarize hydrogeology and differentiate between groundwater and surface water.
		5.3.2.6	Research and describe how groundwater and surface water interactions affect the existence of wetlands.
		5.3.2.7	Use a soil survey to determine the land capability classes for different parcels of land in an area.
		5.3.2.8	Differentiate rock types and relate the chemical composition of mineral matter in soils to the parent material.
		5.3.2.9	Assess the physical qualities of the soil that determine its potential for filtration of groundwater supplies and likelihood for flooding.
		5.3.2.10	Assess the effectiveness of precautions taken to prevent or reduce contamination of groundwater supplies.
		5.3.2.11	Analyze how interactions between groundwater and surface water affect flow and availability of water.
		5.3.2.12	Analyze the importance of the roles played by wetlands in regards to water availability, prevention of flooding, and other factors.
		5.3.2.13	Design a master land-use management plan for a given area that utilizes land capability classes in order to minimize erosion and flooding, maximize development and preservation of topsoil, etc.
		5.3.2.14	Evaluate the soil composition in order to predict the impact of that soil on environmental service systems.
		5.3.2.15	Conduct tests of soil to determine its potential for filtration of groundwater supplies and likelihood for flooding.

		5.3.2.16	Evaluate the methods used in a given example to protect groundwater supplies.
		5.3.2.17	Construct explanations and solutions to situations involving the declining availability of water that incorporate groundwater flow equations as well as human activity.
		5.3.2.18	Evaluate and select strategies for wetlands preservation and restoration that maximize services provided by wetlands while taking human concerns into consideration.
	5.3.3	**APPLY CHEMISTRY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.**	
		5.3.3.1	Examine and summarize how chemistry affects soil structure and function (e.g., pH, cation-exchange capacity, filtration capability, flooding likelihood, etc.).
		5.3.3.2	Examine and summarize how chemistry affects water quality and function (e.g., oxygen saturation, pH, biomagnification, etc.).
		5.3.3.3	Examine and summarize how chemistry affects air quality and function (e.g., heat retention, formation of smog and acid rain, etc.).
		5.3.3.4	Examine and summarize the relationship between water and soil chemistry and the formation of different kinds of wetlands (e.g., fens, peat bogs, potholes, etc.).
		5.3.3.5	Analyze the soil chemistry of a sample.
		5.3.3.6	Analyze the water chemistry of a sample.
		5.3.3.7	Analyze how components of atmospheric chemistry (e.g., air chemical components, heat, moisture, etc.) affect air quality.
		5.3.3.8	Assess how different kinds of wetlands are formed based on the different kinds of soil and water chemistry present in each case.
	5.3.4	**APPLY MICROBIOLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.**	
		5.3.4.1	Describe the microbial biodiversity found in soil and summarize the contribution of microbial biodiversity to the physical and chemical characteristics of soil.
		5.3.4.2	Research and describe how microbial populations in an ecosystem affect carbon cycling.
		5.3.4.3	Examine and explain the role that microbes play in wastewater treatment.
Topic 5.4	***Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation).***		
	Student Competencies		
	5.4.3	**APPLY TECHNIQUES TO ENSURE A SAFE SUPPLY OF DRINKING WATER AND ADEQUATE TREATMENT OF WASTEWATER ACCORDING TO APPLICABLE RULES AND REGULATIONS.**	
		5.4.3.1	Categorize chemical and physical properties of drinking water.
		5.4.3.2	Research methods commonly used to treat wastewater and septic waste.
		5.4.3.3	Analyze and document all steps in the public drinking water treatment process according to applicable standards.

Topic 5.5	***Use tools, equipment, machinery, & technology common to tasks in environmental service systems.***		
	Student Competencies		
	5.5.2	**PERFORM ASSESSMENTS OF ENVIRONMENTAL CONDITIONS USING EQUIPMENT, MACHINERY, AND TECHNOLOGY.**	
		5.5.2.1	Research and summarize methods used to determine water quality (e.g., dissolved oxygen, chemical tests, macroinvertebrates, etc.) and determine if a source of water has been contaminated.
		5.5.2.2	Research and summarize methods and tools used to measure soil health and determine if an area of land has been contaminated (e.g., soil probes, core monolith, soil fertility tests, etc.).
		5.5.2.5	Assess different measurements of water quality to determine their effectiveness and limitations.
		5.5.2.6	Assess different measurements of soil quality (e.g., soil horizons, soil texture, organic matter, soil respiration, etc.) to determine their effectiveness and limitations.
		5.5.2.9	Evaluate a sample of water to determine its quality and if it has been contaminated.
		5.5.2.10	Evaluate a sample of soil to determine its quality and if it has been contaminated.

Standard 6	**FOOD PRODUCTS AND PROCESSING SYSTEMS**		
Topic 6.2	***Apply principles of nutrition, biology, microbiology, chemistry, and human behavior to the development of food products.***		
	Student Competencies		
	6.2.1	**APPLY PRINCIPLES OF NUTRITION AND BIOLOGY TO DEVELOP FOOD PRODUCTS THAT PROVIDE A SAFE, WHOLESOME, AND NUTRITIOUS FOOD SUPPLY FOR LOCAL AND GLOBAL FOOD SYSTEMS.**	
		6.2.1.1	Research and summarize properties of common food constituents (e.g., proteins, carbohydrates, fats, vitamins, minerals).
		6.2.1.2	Research and report methods of nutritional planning to meet essential needs for the human diet (e.g., MyPlate).
		6.2.1.3	Compare and contrast the relative value of food constituents relative to food product qualities (e.g., taste, appearance, etc.).
		6.2.1.4	Compare and contrast the nutritional needs of different human diets.

	6.2.2	**APPLY PRINCIPLES OF MICROBIOLOGY AND CHEMISTRY TO DEVELOP FOOD PRODUCTS TO PROVIDE A SAFE, WHOLESOME, AND NUTRITIOUS FOOD SUPPLY FOR LOCAL AND GLOBAL FOOD SYSTEMS.**	
		6.2.2.1	Examine and describe the basic chemical makeup of different types of food.
		6.2.2.2	Identify common food additives and identify their properties (e.g., preservatives, antioxidants, buffers, stabilizers, colors, flavors, etc.).
		6.2.2.3	Research and summarize the application of biochemistry in the development of new food products (e.g., value added food products, genetically engineered food products, etc.).
		6.2.2.4	Explain how the chemical and physical properties of foods influence nutritional value and eating quality.
		6.2.2.5	Describe the purpose of common food additives and how they influence the chemistry of food.
		6.2.2.6	Analyze how food products and processing facilities use biochemistry concepts to develop new food products.
		6.2.2.7	Design and conduct experiments to determine the chemical and physical properties of food products.
		6.2.2.8	Devise and apply strategies to determine what additives are utilized and why they are included in a variety of food products.
		6.2.2.9	Develop and implement plans to engineer new food items using biochemistry concepts.
	6.2.3	**APPLY PRINCIPLES OF HUMAN BEHAVIOR TO DEVELOP FOOD PRODUCTS TO PROVIDE A SAFE, WHOLESOME, AND NUTRITIOUS FOOD SUPPLY FOR LOCAL AND GLOBAL FOOD SYSTEMS.**	
		6.2.3.1	Examine and explain the importance of food labeling to the consumer.
		6.2.3.2	Research and summarize relevant factors in planning and developing a new food product (e.g., regulation, creativity, economics, etc.).
		6.2.3.3	Examine, interpret, and explain the meaning of required components on a food label.
		6.2.3.4	Determine consumer preference and market potential for a new food product using a variety of methods (e.g., double-blind testing, etc.).
		6.2.3.5	Determine a strategy to prepare and label foods according to the established standards of regulatory agencies.
		6.2.3.6	Design new food products that meet a variety of goals (e.g., consumer preferences, market, nutritional needs, regulatory requirements, etc.).
Topic 6.3	***Select and process food products for storage, distribution, and consumption.***		
	Student Competencies		
	6.3.3	**CREATE FOOD DISTRIBUTION PLANS AND PROCEDURES TO ENSURE SAFE DELIVERY OF FOOD PRODUCTS.**	
		6.3.3.1	Assess and describe the environmental impact of distributing food locally and globally.
		6.3.3.2	Examine the various paths food products take to get from food processing centers to consumers.

		6.3.3.3	Research and summarize different types of market demands for food products (e.g., local food, organic, non-GMO, etc.).
		6.3.3.4	Research and document ways to reduce environmental impact from food distribution activities.
		6.3.3.5	Interpret safety procedures used in food distribution to ensure a safe product is being delivered to consumers.
		6.3.3.6	Assess and explain how market demand for food products influences the distribution of food products.
Topic 6.4	***Explain the scope of the food industry and the historical and current developments of food product and processing.***		
	Student Competencies		
	6.4.1	**EXAMINE THE SCOPE OF THE FOOD INDUSTRY BY EVALUATING LOCAL AND GLOBAL POLICIES, TRENDS, AND CUSTOMS FOR FOOD PRODUCTION.**	
		6.4.1.1	Research and summarize examples of policy and legislation that affect food products and processing systems in the United States and around the world (e.g., labeling, GMOs, biosecurity, food system policy, dietary guidelines, etc.).
		6.4.1.2	Examine the impact of consumer trends on food products and processing practices (e.g., health and nutrition, organic, information about food products, local food movements, farm-to-fork supply chains, food system transparency, etc.).
		6.4.1.3	Compare and contrast cultural differences regarding food products and processing practices.
		6.4.1.4	Analyze the similarities and differences amongst policies and legislation that affect the food products and processing system in the U.S. or around the world.
		6.4.1.5	Construct and implement methods to obtain data on food consumer trends in a specific market.
		6.4.1.6	Analyze food production and distribution outcomes based on cultural customs.
	6.4.2	**EVALUATE THE SIGNIFICANCE AND IMPLICATIONS OF CHANGES AND TRENDS IN THE FOOD PRODUCTS AND PROCESSING INDUSTRY IN THE LOCAL AND GLOBAL FOOD SYSTEMS.**	
		6.4.2.1	Describe and explain the components of the food products and processing industry (e.g., processing, distribution, byproducts, etc.).
		6.4.2.2	Identify and explain environmental and safety concerns about the food supply.
		6.4.2.3	Research and describe current and emerging technologies related to food products and processing (e.g., high pressure processing of foods, automation, biotechnology, etc.).
		6.4.2.4	Analyze & document significant changes & trends in the food products/processing industry.
		6.4.2.5	Research & summarize current issues related to the safety and environmental concerns about foods and food processing (e.g., GMOs, irradiation, microorganisms, contamination, etc.).
		6.4.2.6	Evaluate desirable and undesirable outcomes of emerging technologies used in the food products and processing systems.

	6.4.3	**IDENTIFY AND EXPLAIN THE PURPOSE OF INDUSTRY ORGANIZATIONS, GROUPS, AND REGULATORY AGENCIES THAT INFLUENCE THE LOCAL AND GLOBAL FOOD SYSTEMS.**	
		6.4.3.1	Examine and summarize the purposes of organizations that influence or regulate the food products and processing industry.
		6.4.3.2	Examine and describe the importance and usage of regulatory oversight of food safety and security in food products and processing (e.g., internationally, nationally, state, and local).
		6.4.3.3	Evaluate the changes in the food products and processing industry brought about by industry organizations or regulatory agencies.
		6.4.3.4	Assess and summarize the application of industry standards in the food products and processing industry.

Standard 7	**NATURAL RESOURCE SYSTEMS**		
Topic 7.2	***Analyze the interrelationships between natural resources and humans.***		
	Student Competencies		
	7.2.3	**ANALYZE HOW MODERN PERCEPTIONS OF NATURAL RESOURCE MANAGEMENT, PROTECTION, ENHANCEMENT, & IMPROVEMENT CHANGE & DEVELOP OVER TIME.**	
		7.2.3.4	Analyze how social considerations can affect the use and sustainability of natural resources.
		7.2.3.5	Examine and describe the relationship between current trends in natural resource systems and historical figures that played a prominent role in shaping how natural resources are viewed and used today.
		7.2.3.6	Analyze & document how some technological advancements changed how natural resources were used and viewed (e.g., Industrial Revolution, fossil fuels, green technology, etc.).
	7.2.4	**EXAMINE AND EXPLAIN HOW ECONOMICS AFFECTS THE USE OF NATURAL RESOURCES.**	
		7.2.4.4	Assess whether economic value increases or decreases the conservation, protection, improvement, and enhancement of natural resources.
		7.2.4.5	Assess the importance of the use of natural resources on local, state, and national economies.
		7.2.4.6	Analyze and document how the adoption of green technology and/or alternative energy affected a local, state, or national economy.

	7.2.5	**COMMUNICATE INFORMATION TO THE PUBLIC REGARDING TOPICS RELATED TO THE MANAGEMENT, PROTECTION, ENHANCEMENT, AND IMPROVEMENT OF NATURAL RESOURCES.**	
		7.2.5.4	Assess the effectiveness of different methods for communicating natural resource messages.
		7.2.5.5	Assess how to most effectively communicate a message about the conservation, management, enhancement, and improvement of natural resources via social media and the Internet.
		7.2.5.6	Analyze and summarize examples of how communication can be used to influence behavior, call people to action, and instill a sense of civic behavior related to the conservation, management, enhancement, and improvement of natural resources.
Topic 7.3	***Develop plans to ensure sustainable production and processing of natural resources.***		
	Student Competencies		
	7.3.1	**SUSTAINABLY PRODUCE, HARVEST, PROCESS, AND USE NATURAL RESOURCE PRODUCTS (E.G., FOREST PRODUCTS, WILDLIFE, MINERALS, FOSSIL FUELS, SHALE OIL, ALTERNATIVE ENERGY, RECREATION, AQUATIC SPECIES, ETC.).**	
		7.3.1.1	Summarize forest harvesting methods.
		7.3.1.2	Research and describe methods by which wildlife can be sustainably harvested (e.g., controlled harvests, hunting licenses, regulations, etc.).
		7.3.1.3	Compare and contrast the costs and benefits (e.g., impacts on environment, economic, wildlife, etc.) of mineral extraction to a local, state, and/or national economy.
		7.3.1.4	Compare and contrast the costs and benefits (e.g., impacts on environment, economic, wildlife, etc.) of fossil fuels to a local, state, and/or national economy.
		7.3.1.5	Compare and contrast the costs and benefits (e.g., environmental impacts, etc.) of shale oil from fracking to a local, state, and/or national economy.
		7.3.1.6	Compare and contrast the costs and benefits (e.g., environmental impacts, etc.) of alternative sources of energy (e.g., hydroelectric, solar, wind, biofuels, geothermal, etc.).
		7.3.1.7	Research and summarize how recreational uses of natural resources can be changed to improve sustainability.
		7.3.1.8	Categorize aquatic species used for commercial and recreational purposes.
		7.3.1.9	Assess harvesting methods in regards to their economic value, environmental impact, and other factors.
		7.3.1.10	Assess and apply techniques used to harvest wildlife in regards to sustainability, practicality, and other factors.
		7.3.1.11	Assess the economic impact of mineral extraction in regards to the costs and benefits to a local, state, and/or national economy.
		7.3.1.12	Assess the economic impact of fossil fuel extraction in regards to the costs and benefits to a local, state, and/or national economy.

		7.3.1.13	Assess the economic impact of shale oil extraction (i.e., fracking) in regards to the costs and benefits to a local, state, and/or national economy.
		7.3.1.14	Assess and evaluate factors that affect the economic, environmental, and social sustainability in regards to the use of alternative sources of energy.
		7.3.1.15	Assess different options for improving the sustainability of outdoor recreation based on its impact on natural resources and likelihood of acceptance.
		7.3.1.16	Analyze and apply techniques used to acquire aquatic species for their environmental, economic, and social sustainability.
	7.3.2	**DEMONSTRATE CARTOGRAPHIC SKILLS, TOOLS, AND TECHNOLOGIES TO AID IN DEVELOPING, IMPLEMENTING, AND EVALUATING NATURAL RESOURCE MANAGEMENT PLANS.**	
		7.3.2.1	Summarize how to use maps and technologies to identify directions and land features, calculate actual distance, and determine the elevations of points.
		7.3.2.2	Summarize how GIS can be used to manage, conserve, improve, and enhance the natural resources of an area.
		7.3.2.3	Apply cartographic skills and tools and technologies (e.g., land surveys, geographic coordinate systems, etc.) to locate natural resources.
		7.3.2.4	Analyze an area's resources using GIS technologies.

Standard 8	**PLANT SYSTEMS**	
Topic 8.1	***Develop and implement a crop management plan for a given production goal that accounts for environmental factors.***	
	Student Competencies	
	8.1.1	**DETERMINE THE INFLUENCE OF ENVIRONMENTAL FACTORS ON PLANT GROWTH.**
	8.1.1.4	Analyze and describe plant responses to light color, intensity, and duration.
	8.1.1.5	Determine the optimal air and temperature conditions for plant growth.
	8.1.1.6	Analyze and describe plant responses to water conditions.
	8.1.1.7	Analyze plant responses to varied light color, intensity, and duration and recommend modifications to light for desired plant growth.
	8.1.1.8	Design, implement, and evaluate a plan to maintain optimal air and temperature conditions for plant growth.
	8.1.1.9	Analyze plant responses to water conditions and recommend modifications to water for desired plant growth.

	8.1.2	**PREPARE AND MANAGE GROWING MEDIA FOR USE IN PLANT SYSTEMS.**	
		8.1.2.3	Describe the physical and chemical characteristics of growing media and explain the influence they have on plant growth.
		8.1.2.4	Discuss how soil drainage and water-holding capacity can be improved.
		8.1.2.5	Formulate and prepare growing media for specific plants or crops.
		8.1.2.6	Determine the hydraulic conductivity for soil and how the results influence irrigation practices.
	8.1.3	**DEVELOP AND IMPLEMENT A FERTILIZATION PLAN FOR SPECIFIC PLANTS OR CROPS.**	
		8.1.3.7	Analyze the effects of nutrient deficiencies and symptoms and recognize environmental causes of nutrient deficiencies.
		8.1.3.8	Contrast pH and cation exchange capacity between mineral soil and soilless growing media.
		8.1.3.9	Interpret laboratory analyses of soil and tissue samples.
		8.1.3.10	Calculate the amount of fertilizer to be applied based on nutrient recommendation and fertilizer analysis.
		8.1.3.11	Assess and describe the shorthand long-term effects production methods have on soil.
		8.1.3.12	Assess and describe the impact environmental factors have on a crop.
		8.1.3.13	Monitor plants for signs of nutrient deficiencies and prepare a scouting report to correct elements negatively affecting plant growth in a field or greenhouse.
		8.1.3.14	Adjust the pH of growing media for specific plants or crops.
		8.1.3.15	Prescribe fertilizer applications based on the results of a laboratory analysis of soil and plant tissue samples.
		8.1.3.16	Calibrate application equipment to meet plant nutrient needs.
Topic 8.4	***Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).***		
	Student Competencies		
	8.4.1	**EVALUATING, IDENTIFYING, AND PREPARING PLANTS TO ENHANCE AN ENVIRONMENT.**	
		8.4.1.1	Identify and categorize plants by their purpose (e.g., floral plants, landscape plants, house plants, etc.).
		8.4.1.2	Summarize the applications of design in agriculture and ornamental plant systems.
		8.4.1.3	Demonstrate proper use of plants in their environment (e.g., focal and filler plants in floriculture, heat tolerant and shade plants in a landscape design, etc.).
		8.4.1.4	Create a design utilizing plants in their proper environments.
		8.4.1.5	Install plants according to a design plan that uses the proper plants based on the situation and environment.
		8.4.1.6	Evaluate a design and provide feedback and suggestions for improvement (e.g., a floral arrangement, a landscape or a landscape plan, etc.).

	8.4.2	**CREATE DESIGNS USING PLANTS.**	
		8.4.2.1	Research and summarize the principles and elements of design for use in plant systems.
		8.4.2.2	Identify and categorize tools used for design (e.g., computer landscape software, drawing tools, florist tools, etc.).
		8.4.2.3	Explain the concept of landscape ecology and summarize factors that shape the ecology of a landscape (e.g., composition, structure, function, etc.).
		8.4.2.4	Apply principles and elements of design that form the basis of artistic impression.
		8.4.2.5	Demonstrate the use of tools used for creating designs.
		8.4.2.6	Research and provide examples of ecological factors incorporated into landscape designs.
		8.4.2.7	Analyze designs to identify use of design principles and elements.
		8.4.2.8	Choose and properly use appropriate tools to create a desired design.
		8.4.2.9	Utilize green technologies and sustainable practices that prevent or limit negative environmental impacts.

Standard 9	POWER, STRUCTURAL, AND TECHNICAL SYSTEMS		
Topic 9.2	***Operate and maintain AFNR mechanical equipment and power systems.***		
	Student Competencies		
	9.2.2	**OPERATE MACHINERY AND EQUIPMENT WHILE OBSERVING ALL SAFETY PRECAUTIONS IN AFNR SETTINGS.**	
		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 9.3	***Service and repair AFNR mechanical equipment and power systems.***		
	Student Competencies		
	9.3.2	**SERVICE ELECTRICAL SYSTEMS AND COMPONENTS OF MECHANICAL EQUIPMENT AND POWER SYSTEMS USING A VARIETY OF TROUBLESHOOTING AND/OR DIAGNOSTIC METHODS.**	
		9.3.2.1	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.).
		9.3.2.2	Compare and contrast the characteristics of electronic components used in AFNR power, structural, and technical systems (e.g., battery, resistor, diode, transistor, capacitor, etc.).
		9.3.2.3	Classify the uses of electrical sensors and controls in AFNR power, structural, and technical systems.
		9.3.2.4	Assess the tools used to measure the basic units of electrical circuits in AFNR power, structural, and technical systems, and perform the measurements.
		9.3.2.5	Analyze and interpret electrical system symbols and diagrams.
		9.3.2.6	Distinguish and select materials and tools used in electrical control circuit installation.
		9.3.2.7	Analyze and design electrical circuits for AFNR power, structural, and technical systems using knowledge of the basic units of electricity.
		9.3.2.8	Conduct testing procedures to evaluate and repair malfunctioning electrical components and systems used in AFNR power, structural, and technical systems.
		9.3.2.9	Plan and install electrical control circuits and/or circuit boards to assure proper operation within 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.**	
		9.4.1.5	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**	
		9.4.2.4	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.).

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.**