BOTANY/HORTICULTURAL SCIENCE II

#01054

Description

These courses prepare students to produce greenhouse/nursery plants and to maintain plant growth and propagation structures. Topics to be covered include: soils, plants, plant identification, and plant entomology. Courses examine the importance of plant cell structures, functions of cells, plant processes, nonvascular plants, vascular plants, roots, stems, leaves, flowers, and reproduction of plants. Students may be introduced to the biological, environmental, conservation, and ecological concepts encountered in our environment. Landscape design units will prepare students to design, construct, and maintain planted areas and devices for the beautification of home grounds and other areas of human habitation and recreation. These courses will reinforce and extend students' understanding of science by associating basic scientific principles and concepts with relevant applications in agriculture. Leadership development and supervised agricultural experience programs are also an integral part of this course.

Note: These courses can be taught for Agricultural Education credit only. For Science credit, Botany/Horticultural Science I can be found under Science.

Grade 9-12

½ or 1 credit

Max Credit = 1

Standard 1	AGRICULTURE, FOOD, & NATURAL RESOURCES (AFNR) CLUSTER SKILLS		
Topic 1.1	***Analyze how issues, trends, technologies, and public policies impact systems in the Agriculture, Food, & Natural Resources Career Cluster.***		
	Student Competencies		
	1.1.1	**RESEARCH, EXAMINE, AND DISCUSS ISSUES AND TRENDS THAT IMPACT AFNR SYSTEMS ON LOCAL, STATE, NATIONAL, AND GLOBAL LEVELS.**	
		1.1.1.5	Evaluate and explain AFNR issues and their impacts to audiences with limited AFNR knowledge.
		1.1.1.6	Evaluate and explain emerging trends and the opportunities they may create within the AFNR systems.
	1.1.2	**EXAMINE TECHNOLOGIES AND ANALYZE THEIR IMPACT ON AFNR SYSTEMS.**	
		1.1.2.5	Solve problems in AFNR workplaces or scenarios using technology.
		1.1.2.6	Evaluate the importance of technology use and how it impacts AFNR systems.
	1.1.3	**IDENTIFY PUBLIC POLICIES AND EXAMINE THEIR IMPACT ON 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.**	
		1.2.1.3	Analyze and interpret AFNR related geographic data using a variety of systems and technologies (e.g., GIS, GPS, etc.).
		1.2.1.4	Analyze and interpret a set of economic data and explain how it impacts an AFNR system.
	1.2.2	**EXAMINE THE COMPONENTS OF THE AFNR SYSTEMS AND ASSESS THEIR IMPACT ON THE LOCAL, STATE, NATIONAL, AND GLOBAL SOCIETY AND ECONOMY.**	
		1.2.2.7	Devise and implement a strategy for explaining components of AFNR systems to audiences with limited knowledge.
		1.2.2.8	Evaluate how society traditions, customs, or policies have resulted from practices with AFNR systems.
		1.2.2.9	Evaluate how positive or negative changes in the local, state, national, or global economy impacts AFNR systems.

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.**
	1.3.1.5	Evaluate how AFNR organizations/businesses promote improved health, safety, and environmental management and determine steps to maintain compliance with regulatory and safety standards in AFNR situations.
	1.3.2	**DEVELOP AND IMPLEMENT A PLAN TO MAINTAIN AND IMPROVE HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE AND PERFORMANCE.**
	1.3.2.5	Create and implement a plan to improve safety, health, and environmental management regulations in an AFNR workplace.
	1.3.2.6	Devise and implement a strategy to educate employees on environmental compliance and performance in an AFNR workplace.
	1.3.3	**APPLY HEALTH AND SAFETY PRACTICES TO AFNR WORKPLACES.**
	1.3.3.9	Create and implement a health and safety policy plan for AFNR workplaces.
	1.3.3.10	Create and implement a plan to communicate appropriate responses for health and safety situations within an AFNR workplace.
	1.3.3.11	Conduct a survey and evaluate results of AFNR workplaces to identify structure of health and safety practices and number of employees certified in first aid training.
	1.3.3.12	Create a plan to mitigate the level of contamination or injury identified as a risk in the workplace.
	1.3.4	**USE APPROPRIATE PROTECTIVE EQUIPMENT AND DEMONSTRATE SAFE AND PROPER USE OF AFNR TOOLS AND EQUIPMENT.**
	1.3.4.4	Analyze and demonstrate adherence to protective equipment requirements when using various 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.
	1.3.4.9	Devise and implement operation, storage, and maintenance plans or schedules for AFNR tools and equipment.

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.**	
		1.4.1.5	Devise strategies for stewarding natural resources at home and within community.
		1.4.1.6	Evaluate sustainability policies and plans and prepare summary of potential improvements for AFNR businesses or organizations.
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.).**	
		1.5.1.7	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.
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.**	
		1.6.1.3	Analyze and explain how foundational cycles affect production, processing, and management of food, fiber, and fuel.
		1.6.1.4	Analyze AFNR systems and determine their impact on producing and processing food, fiber, and fuel.
		1.6.1.6	Evaluate AFNR systems and predict how the systems may change or adapt in the future of food, fiber, and fuel production based on current trends and data.

	1.6.2	**ANALYZE AND EXPLAIN THE CONNECTION AND RELATIONSHIPS BETWEEN DIFFERENT AFNR SYSTEMS ON A NATIONAL AND GLOBAL LEVEL.**	
		1.6.2.3	Analyze differences between AFNR systems on a national and global scale.
		1.6.2.4	Analyze the connections and relationships impacted when there is a change in an AFNR system on a national and global level.
		1.6.2.5	Evaluate how AFNR systems impact each other on a national and global level.
		1.6.2.6	Evaluate how changes in one AFNR system can benefit cost components of other systems on a national and global level.

Standard 2	**AGRIBUSINESS SYSTEMS**		
Topic 2.1	***Apply management planning principles in AFNR businesses.***		
	Student Competencies		
	2.1.1	**APPLY MICRO- AND MACROECONOMIC PRINCIPLES TO PLAN AND MANAGE INPUTS AND OUTPUTS IN AN AFNR BUSINESS.**	
		2.1.1.4	Apply microeconomic principles to calculate values associated with different inputs and outputs in AFNR businesses (e.g., price, point of equilibrium, opportunity costs, marginal costs, etc.).
		2.1.1.5	Analyze and describe the relationship between AFNR business and industry outputs and domestic and global macroeconomic trends (e.g., Gross Domestic Product, national income, rate of growth, price levels, etc.).
	2.1.2	**READ, INTERPRET, EVALUATE AND WRITE STATEMENTS OF PURPOSE TO GUIDE BUSINESS GOALS, OBJECTIVES, AND RESOURCE ALLOCATION.**	
		2.1.2.3	Assess different approaches for creating statements of purpose for AFNR businesses and choose an appropriate approach to meet organizational needs.
	2.1.3	**DEVISE AND APPLY MANAGEMENT SKILLS TO ORGANIZE AND RUN AN AFNR BUSINESS IN AN EFFICIENT, LEGAL, AND ETHICAL MANNER.**	
		2.1.3.5	Assess and describe the positive and negative impact of local, state, federal, international, and industry regulations on the management and operation of AFNR businesses.
		2.1.3.6	Analyze the importance of using ethical standards and develop methods to communicate ethical standards within AFNR businesses.
		2.1.3.7	Devise strategies to improve the operation of AFNR businesses using management skills.
		2.1.3.8	Devise management or operational strategies to address and adhere to local, state, federal, international, and industry regulations.

Topic 2.2	***Use record keeping to accomplish AFNR business objectives, manage budgets, and comply with laws and regulations.***		
	Student Competencies		
	2.2.1	**APPLY FUNDAMENTAL ACCOUNTING PRINCIPLES, SYSTEMS, TOOLS, AND APPLICABLE LAWS AND REGULATIONS TO RECORD, TRACK, AND AUDIT AFNR BUSINESS TRANSACTIONS (E.G., ACCOUNTS, DEBITS, CREDITS, ASSETS, LIABILITIES, EQUITY, ETC.).**	
		2.2.1.4	Evaluate the implementation and appropriateness of accounting systems and procedures used for record keeping in AFNR businesses.
		2.2.1.5	Compare and contrast the benefits and limitations of different tools and services for recording, tracking, and auditing AFNR business transactions (e.g., convenience, costs, data security, etc.).
		2.2.1.7	Select appropriate accounting systems and develop accounting procedures to maintain records for AFNR businesses.
Topic 2.4	***Develop a business plan for an AFNR business.***		
	Student Competencies		
	2.4.1	**ANALYZE CHARACTERISTICS AND PLANNING REQUIREMENTS ASSOCIATED WITH DEVELOPING BUSINESS PLANS FOR DIFFERENT TYPES OF AFNR BUSINESSES.**	
		2.4.1.5	Compare and contrast business plans for different types of ownership structures used in AFNR businesses.
		2.4.1.6	Analyze the information needed and strategies to obtain the information to complete an AFNR business plan (e.g., SMART goals and objectives, needs assessment, cash flow projection, etc.).
		2.4.1.7	Demonstrate the application of entrepreneurial skills to conceptualize an AFNR business (e.g., idea generation, opportunity analysis, risk assessment, etc.).
	2.4.2	**DEVELOP PRODUCTION AND OPERATIONAL PLANS FOR AN AFNR BUSINESS.**	
		2.4.2.3	Compare and contrast the strengths and weaknesses of operational plans from different AFNR businesses to determine best practices.
		2.4.2.4	Identify and assess alternative production systems for a specific agricultural product.
		2.4.2.5	Make recommendations to improve operational plans for an AFNR business based on best practices.
		2.4.2.6	Create strategies to improve the production process of an agricultural product for an AFNR facility (e.g., SWOT strengths, weaknesses, opportunities, and threats; supply chain management; etc.).
	2.4.3	**IDENTIFY AND APPLY STRATEGIES TO MANAGE OR MITIGATE RISK.**	
		2.4.3.1	Assess and classify sources of risk for an AFNR business (e.g., financial risk, public perception of company, etc.).
		2.4.3.2	Research and summarize examples that illustrate the importance of risk and uncertainty within AFNR businesses.
		2.4.3.3	Risk management strategies for AFNR businesses (e.g., cash flow projection, analyze market trends, etc.).

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.**	
		2.5.1.3	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.
		2.5.1.5	Evaluate and predict future trends for a specific AFNR product as related to markets, trade and price (e.g., corn, oil, wheat, etc.).
		2.5.1.6	Design and conduct experiments to determine market competition effectiveness of different AFNR businesses.
	2.5.2	**ASSESS AND APPLY SALES PRINCIPLES AND SKILLS TO ACCOMPLISH AFNR BUSINESS OBJECTIVES.**	
		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.).
	2.5.3	**ASSESS MARKETING PRINCIPLES AND DEVELOP MARKETING PLANS TO ACCOMPLISH AFNR BUSINESS OBJECTIVES.**	
		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 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		
	4.1.1	**INVESTIGATE AND EXPLAIN THE RELATIONSHIP BETWEEN PAST, CURRENT AND EMERGING APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE (E.G., MAJOR INNOVATORS, HISTORICAL DEVELOPMENTS, POTENTIAL APPLICATIONS OF BIOTECHNOLOGY, ETC.).**	
		4.1.1.5	Analyze the developmental progression of biotechnology and the evolution of scientific knowledge.
		4.1.1.6	Assess and summarize current work in biotechnology being done to add value to agricultural and society.
		4.1.1.7	Analyze and document emerging problems and issues associated with agricultural biotechnology.
		4.1.1.8	Assess the benefits and risks associated with using biotechnology to improve agriculture.
		4.1.1.10	Evaluate the outcomes and impacts of biotechnology on the globalization of agriculture.
		4.1.1.11	Design a potential application of biotechnology to meet emerging agricultural and societal needs.
		4.1.1.12	Evaluate the short-term and long-term benefits and risks of applying biotechnology to agriculture.
	4.1.2	**EVALUATE THE SCOPE AND IMPLICATIONS OF REGULATORY AGENCIES ON APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE AND PROTECTION OF PUBLIC INTERESTS (E.G., HEALTH, SAFETY, ENVIRONMENTAL ISSUES, ETC.).**	
		4.1.2.4	Assess and summarize the role and scope of agencies that regulate biotechnology.
		4.1.2.5	Analyze the impact major regulatory issues have on public acceptance of biotechnology in agriculture.
		4.1.2.6	Research and summarize factors and data that regulatory agencies use to evaluate the potential risks a new application of biotechnology may pose to health, safety, and the environment.
		4.1.2.7	Explain and critique a decision made by a major agency that regulates agricultural biotechnology.
		4.1.2.8	Critique and propose a solution for a major regulatory issue pertaining to biotechnology in agriculture.
	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).**	
		4.1.3.4	Analyze the implications bioethics may have on future advancements in AFNR.
		4.1.3.5	Determine the significance and impacts of legal issues related to biotechnology in agriculture.
		4.1.3.6	Analyze the impact of public perceptions on the application of biotechnology in different AFNR systems.
		4.1.3.7	Devise and support an argument for or against an ethical issue associated with biotechnology in agriculture.

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.
	4.2.4	**SAFELY MANAGE AND DISPOSE OF BIOLOGICAL MATERIALS, CHEMICALS, AND WASTES ACCORDING TO STANDARD OPERATING PROCEDURES.**	
		4.2.4.4	Assess the need for personal protective equipment in a variety of situations and select the appropriate equipment to wear when working with biological and chemical materials.
		4.2.4.5	Inventory biological and chemical materials and maintain accurate records of supplies and expiration dates.
		4.2.4.6	Perform waste disposal according to the standard operating procedures.
		4.2.4.7	Evaluate the benefits and limitations of personal protective equipment.
		4.2.4.8	Create a plan for stocking and maintaining supplies of biological and chemical materials in a laboratory.
		4.2.4.9	Propose a management plan to reduce laboratory waste and prevent ecological or health problems related to waste disposal.
	4.2.5	**EXAMINE AND PERFORM SCIENTIFIC PROCEDURES USING MICROBES, DNA, RNA, AND PROTEINS IN A LABORATORY.**	
		4.2.5.6	Characterize the physical and biological properties of organisms.
Topic 4.3	***Demonstrate the application of biotechnology to solve problems in AFNR systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).***		
	Student Competencies		
	4.3.3	**APPLY BIOTECHNOLOGY PRINCIPLES, TECHNIQUES, AND PROCESSES TO PROTECT THE ENVIRONMENT AND MAXIMIZE USE OF NATURAL RESOURCES (E.G., BIOMASS, BIOPROSPECTING, INDUSTRIAL BIOTECHNOLOGY, ETC.).**	
		4.3.3.1	Examine the consequences of agricultural practices on natural populations.
		4.3.3.3	Research and summarize the potential applications of bioprospecting in biotechnology and agriculture.
		4.3.3.4	Analyze how biotechnology can be used to monitor the effects of agricultural practices on natural populations.
		4.3.3.7	Evaluate the impact of modified organisms on the natural environment.

Standard 7	NATURAL RESOURCE SYSTEMS	
Topic 7.1	***Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.***	
	Student Competencies	
7.1.1	**APPLY METHODS OF CLASSIFICATION TO EXAMINE NATURAL RESOURCE AVAILABILITY AND ECOSYSTEM FUNCTION IN A PARTICULAR REGION.**	
	7.1.1.1	Summarize and classify the different kinds of natural resources using common classification schemes (e.g., living vs. non-living, renewable vs. nonrenewable, native vs. introduced, etc.).
	7.1.1.5	Analyze the interdependence of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and assess the dependence of organisms on nonliving components (climate, geography, energy flow, nutrient cycling, etc.).
	7.1.1.6	Analyze how biodiversity develops through evolution, natural selection, and adaptation; explain the importance of biodiversity to ecosystem function and availability of natural resources.
7.1.2	**CLASSIFY DIFFERENT TYPES OF NATURAL RESOURCES IN ORDER TO ENABLE PROTECTION, CONSERVATION, ENHANCEMENT, AND MANAGEMENT IN A PARTICULAR GEOGRAPHICAL REGION.**	
	7.1.2.1	Research and examine the characteristics used to identify trees and woody plants.
	7.1.2.2	Research and examine the characteristics used to identify herbaceous plants.
	7.1.2.7	Apply identification techniques to determine the species of a tree or woody plant.
	7.1.2.8	Apply identification techniques to determine the species of an herbaceous plant.

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.**	
	8.1.1.7	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.**	
		8.1.2.5	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.**	
		8.1.3.11	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.
		8.1.3.17	Devise a plan for soil management for a selected production method.
		8.1.3.18	Devise a plan to meet plant nutrient needs based on environmental factors present.
Topic 8.2	***Apply principles of classification, plant anatomy, and plant physiology to plant production and management.***		
	Student Competencies		
	8.2.1	**CLASSIFY PLANTS ACCORDING TO TAXONOMIC SYSTEMS.**	
		8.2.1.5	Classify agricultural and ornamental plants according to the hierarchical classification system.
		8.2.1.6	Identify and describe important plants to agricultural and ornamental plant systems by scientific names.
	8.2.2	**APPLY KNOWLEDGE OF PLANT ANATOMY AND THE FUNCTIONS OF PLANT STRUCTURES TO ACTIVITIES ASSOCIATED WITH PLANT SYSTEMS.**	
		8.2.2.13	Apply the knowledge of cell differentiation and the functions of the major types of cells to plant systems.
		8.2.2.14	Correlate the active and passive transport of minerals into and through the root system to plant nutrition.
		8.2.2.15	Evaluate the function of the xylem, phloem, and cambium tissues and the impact on plant systems.
		8.2.2.16	Devise a plan for plant management practices that takes into account leaf structure and functions.
		8.2.2.17	Evaluate flower structures and analyze the impact of plant structure on plant breeding, production, and use.
		8.2.2.18	Evaluate the impact of different seed and fruit structures to plant culture and use.
	8.2.3	**APPLY KNOWLEDGE OF PLANT PHYSIOLOGY AND ENERGY CONVERSION TO PLANT SYSTEMS.**	
		8.2.3.11	Evaluate the impact of photosynthesis and the factors that affect it on plant management, culture, and production problems.
		8.2.3.12	Evaluate the impact of plant respiration on plant growth, crop management, and post-harvest handling decisions.

		8.2.3.13	Relate the principles of primary and secondary growth to plant systems.
		8.2.3.14	Select and defend the use of specific plant growth regulators to produce desired responses from plants.
		8.2.3.15	Devise plans for plant management that applies knowledge of transpiration, translocation, and assimilation on plant growth.
Topic 8.3	***Propagate, culture, and harvest plants and plant products based on current industry standards.***		
	Student Competencies		
	8.3.1	**DEMONSTRATE PLANT PROPAGATION TECHNIQUES IN PLANT SYSTEM ACTIVITIES.**	
		8.3.1.6	Examine and apply the process of plant pollination and/or fertilization.
		8.3.1.7	Handle seed to overcome seed dormancy mechanisms and to maintain seed viability and vigor.
		8.3.1.8	Manage the plant environment to support asexual reproduction.
		8.3.1.9	Demonstrate aseptic micropropagation techniques.
		8.3.1.10	Compare and contrast the potential risks and advantages associated with genetically modified plants.
		8.3.1.11	Select and defend the use of pollination methods and practices used to maximize crop pollination.
		8.3.1.12	Conduct tests associated with seed germination rates, viability, and vigor.
		8.3.1.13	Evaluate asexual propagation practices based on productivity and efficiency.
		8.3.1.14	Propagate plants by micropropagation.
		8.3.1.15	Evaluate the impact of using genetically modified crops on other production practices.
	8.3.2	**DEVELOP AND IMPLEMENT A MANAGEMENT PLAN FOR PLANT PRODUCTION.**	
		8.3.2.15	Produce pest- and disease-free propagation material.
		8.3.2.16	Analyze how mechanical planting equipment performs soil preparation and seed placement.
		8.3.2.17	Adjust and calibrate mechanized seeding and/or planting equipment for desired seed application rate.
		8.3.2.18	Prepare and implement a plant production schedule based on predicted environmental conditions and desired market target (e.g., having plants ready to market on a specific day such as Mother's Day, organic production, low maintenance landscape plants, etc.).
		8.3.2.19	Prepare plant production schedules utilizing plant growth knowledge to get plants to their optimal growth stage at a given time.
		8.3.2.20	Research, select, and defend technology for use in controlled atmosphere production.
		8.3.2.21	Research, select, and defend the use of a hydroponic or aquaponic plant system.
	8.3.3	**DEVELOP AND IMPLEMENT A PLAN FOR INTEGRATED PEST MANAGEMENT FOR PLANT PRODUCTION.**	
		8.3.3.7	Demonstrate pesticide formulations including organic and synthetic active ingredients and selection of pesticide to control specific pest.
		8.3.3.8	Examine and apply procedures for the safe handling, use, and storage of pesticides including personal protective equipment and reentry interval.
		8.3.3.9	Devise solutions for plant pests, diseases, and disorders.
		8.3.3.10	Design and implement a crop scouting program.

		8.3.3.11	Employ pest management strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed.
		8.3.3.12	Evaluate environmental and consumer concerns regarding pest management strategies.
	8.3.4	**APPLY PRINCIPLES AND PRACTICES OF SUSTAINABLE AGRICULTURE TO PLANT PRODUCTION.**	
		8.3.4.4	Analyze the alignment of modern technologies used in production systems (e.g., precision agriculture, GE crops, etc.) with USDA sustainable practices criteria.
		8.3.4.5	Compare and contrast the impact on greenhouse gas, carbon footprint of the national/international production system with local/regional production system markets.
		8.3.4.6	Compare and contrast differing research conclusions related to environmental factors and their effect on plants.
	8.3.5	**HARVEST, HANDLE, AND STORE CROPS ACCORDING TO CURRENT INDUSTRY STANDARDS.**	
		8.3.5.8	Research and analyze practices used to maintain a safe product through harvest, processing, storage, and shipment (e.g., Food Safety Modernization Act, Good Agricultural Practices, etc.).
		8.3.5.9	Analyze the proper conditions required to maintain the quality of plants and plant products held in storage and during shipping.
		8.3.5.10	Demonstrate techniques for grading, handling, and packaging plants and plant products for distribution.
		8.3.5.11	Analyze the processed used by mechanical harvesting equipment.
		8.3.5.12	Implement and evaluate the effectiveness of plans to reduce crop loss.
		8.3.5.13	Research laws and apply regulations to ensure the production of plants and plant products that are safe for distribution and use.
		8.3.5.14	Monitor and evaluate environmental conditions in storage facilities for plants and plant products.
		8.3.5.15	Evaluate techniques for grading, handling, and packaging plants and plant products.
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.**	
		8.4.1.5	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.**	
		8.4.2.7	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.

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.**