



## Plant Science II

Course Number	490800
Grade Level	9-12
Career Cluster	Agriculture
Pathway	Plant Systems
Course Sequence	Level 3
CTSO	FFA
Industry Recognized Credential	<a href="https://forms.act.org/certificate/pdf/NCRC-InformationFlyer.pdf">https://forms.act.org/certificate/pdf/NCRC-InformationFlyer.pdf</a>
Minimum Equipment List	LINK
Course Description	

CIP Codes	CIP Title
1.0601	Applied Horticulture/Horticulture Operations, General
1.0603	Ornamental Horticulture
1.0604	Greenhouse Operations and Management
1.0605	Landscaping and Groundskeeping
1.0606	Plant Nursery Operations and Management
1.1101	Plant Sciences, General
1.1102	Agronomy and Crop Science

SOC Codes	SOC Title
19-1013	Soil and Plant Scientists
19-4013	Agricultural Technicians
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers
37-3011	Landscaping and Groundskeeping Workers
11-9031	Farmers, Ranchers, and Other Agricultural Managers
19-1031	Conservation Scientists
45-2091	Agricultural Equipment Operators



## Course Standards

<b>Plant Science II</b> <b>Domain 1</b> <b>Examine and evaluate career opportunities in the plant science industry</b>	
<b>Standard 1.1 Evaluate and implement the steps and requirements to pursue a career opportunity in Plant Science.</b>	
Performance Indicators	
1.1.1	Research educational requirements for careers in field production, greenhouse management, nursery operations, and landscape design, including degrees, certifications, and internships.
1.1.2	Analyze personal skillset and create a plan for obtaining the required education, training, and experiences to obtain a career in Plant Science with a focus on traditional agriculture, controlled environment agriculture, and ornamental horticulture.
<b>Standard 1.2 Assess the opportunities in Plant Science available through Career Development Events, Supervised Agricultural Experiences and other FFA activities.</b>	
Performance Indicators	
1.2.1	Examine the Nursery & Landscape, Floriculture, or Agronomy Career Development Events for opportunities to exhibit skills needed in Plant Science.
1.2.2	Research ways that plant science skills may be implemented as Supervised Agricultural Experiences and identify other FFA activities.
<b>Domain 2</b> <b>Investigate and apply safety, health, and regulatory standards throughout plant production systems</b>	
<b>Standard 2.1 Ensure plant production meets all safety, health, and regulatory standards.</b>	
Performance Indicators	
2.1.1	Research and explain the implications of regulatory, safety, and health standards on Plant Systems.
2.1.2	Construct and implement methods to evaluate compliance with required safety, health, and environmental management regulations in Plant Systems.



2.1.3	Identify standard tools, equipment, and safety procedures related to plant systems tasks.
2.1.4	Research and summarize how safety is ensured at each stage of the following processes: harvesting, processing, and storing (e.g., Food Safety Modernization Act, Good Agricultural Practices, etc.).
<b>Domain 3</b> <b>Design and manage optimal growing environments for different production goals</b>	
<b>Standard 3.1 Analyze and control environmental factors.</b>	
Performance Indicators	
3.1.1	Design systems to maintain optimal air quality, temperature, and humidity for specific crops in the greenhouse.
3.1.2	Evaluate and modify water conditions to support desired plant growth outcomes.
3.1.3	Monitor and record environmental conditions throughout crop production cycles.
3.1.4	Implement greenhouse environmental controls to meet production schedules and market targets.
<b>Standard 3.2 Compare and implement production systems.</b>	
Performance Indicators	
3.2.1	Identify and describe the different production goals in plant systems (e.g., agronomy, vegetable and fruit production, nursery/landscape or floriculture).
3.2.2	Analyze structures and technologies for controlled atmosphere production in the greenhouse.
3.2.3	Design, implement, and evaluate hydroponic and aquaponic production systems.
3.2.4	Compare traditional soil-based and soilless production methods.
3.2.5	Select and defend appropriate production technologies based on crop requirements and economic factors.



<b>Domain 4</b>	
<b>Prepare and manage growing substrates for optimal plant performance</b>	
<b>Standard 4.1 Formulate and prepare growing media.</b>	
Performance Indicators	
4.1.1	Analyze soil and growing media properties affecting germination and plant growth.
4.1.2	Formulate growing media for specific crops and production systems (e.g., greenhouse, hydroponic, or traditional).
4.1.3	Modify soil drainage and water-holding capacity for targeted applications.
4.1.4	Prepare soil and growing media with appropriate amendments.
<b>Standard 4.2 Optimize growing substrate conditions.</b>	
Performance Indicators	
4.2.1	Analyze and adjust pH of growing media for specific plant requirements.
4.2.2	Evaluate growing media performance and make necessary adjustments.
4.2.3	Implement sustainable practices in growing media preparation and management.
<b>Domain 5</b>	
<b>Develop comprehensive fertilization programs for diverse production systems</b>	
<b>Standard 5.1 Assess and address plant nutritional needs.</b>	
Performance Indicators	
5.1.1	Identify and describe fertilization programs for plant systems (e.g., greenhouse and horticulture crops, agronomy, vegetable and fruit production, nursery/landscape, floriculture).
5.1.1	Monitor plants for nutrient deficiency symptoms and prepare diagnostic reports.



5.1.2	Interpret soil and plant tissue analysis results to prescribe fertilizer applications.
5.1.3	Design fertilization plans based on crop requirements and environmental factors.
5.1.4	Calibrate application equipment for precise nutrient delivery (e.g., spray rig, greenhouse fertilizer injector, compression sprayer).
<b>Standard 5.2 Implement precision nutrition management.</b>	
Performance Indicators	
5.2.1	Develop species-specific fertilization schedules for greenhouse and field production.
5.2.2	Evaluate and adjust fertility programs based on plant response and environmental conditions.
5.2.3	Integrate organic and synthetic nutrient sources effectively.
<b>Domain 6</b> <b>Master plant propagation and crop production techniques</b>	
<b>Standard 6.1 Implement advanced propagation techniques.</b>	
Performance Indicators	
6.1.1	Apply principles of plant pollination and fertilization in propagation programs.
6.1.2	Overcome seed dormancy mechanisms and maintain seed viability.
6.1.3	Demonstrate sexual and asexual propagation methods (e.g., cuttings, division, layering, budding, grafting).
6.1.4	Manage environmental conditions to optimize propagation success in both traditional and greenhouse production.
6.1.5	Evaluate propagation practices for productivity and efficiency.



<b>Standard 6.2 Develop advanced production management plans.</b>	
Performance Indicators	
6.2.1	Inspect and prepare pest-free propagation materials.
6.2.2	Apply pre-plant treatments and evaluate their effectiveness.
6.2.3	Calculate seeding rates and calibrate planting equipment.
6.2.4	Implement production schedules based on market timing and environmental predictions.
6.2.5	Control plant growth through mechanical, cultural, and chemical methods.
<b>Standard 6.3 Optimize harvest and post-harvest handling.</b>	
Performance Indicators	
6.3.1	Assess crop maturity and implement proper harvesting techniques.
6.3.2	Analyze mechanical harvesting processes and equipment.
6.3.3	Apply post-harvest procedures that maintain product quality (e.g., product grading, safe handling techniques, and effective packaging).
6.3.4	Identify and describe storage and shipping protocols for various plant products.
<b>Domain 7</b>	
<b>Develop and implement comprehensive pest management strategies</b>	
<b>Standard 7.1 Design integrated pest management programs for diverse production systems.</b>	
Performance Indicators	
7.1.1	Identify and analyze major weeds, insects, and plant diseases in field and greenhouse environments.
7.1.2	Predict pest problems based on environmental conditions and life cycles.



7.1.3	Design and implement a comprehensive crop scouting program in the field or pest monitoring cards in the greenhouse.
7.1.4	Develop solutions for plant pests, diseases, and physiological disorders.
<b>Standard 7.2 Implement safe and effective pest control measures.</b>	
Performance Indicators	
7.2.1	Select appropriate pesticide formulations including organic and synthetic options.
7.2.2	Employ integrated pest management strategies and assess their effectiveness in greenhouses and traditional farming.
7.2.3	Apply safe handling, storage, and application procedures for pesticides.
7.2.4	Implement personal protective equipment protocols and reentry intervals.
7.2.5	Adjust pest management plans based on monitoring results and effectiveness.
<b>Domain 8</b>	
<b>Apply design principles to enhance environments through plant systems</b>	
<b>Standard 8.1 Evaluate and select plants for environmental enhancement.</b>	
Performance Indicators	
8.1.1	Describe methods of environmental enhancement in plant systems (e.g., greenhouse/horticulture crops, agronomy, vegetable and fruit production, nursery/landscape, floriculture).
8.1.1	Categorize plants by their functional and aesthetic purposes.
8.1.2	Select appropriate plants based on environmental conditions and design objectives.
8.1.3	Install plants according to professional design specifications.
8.1.4	Evaluate existing designs and provide improvement recommendations.



<b>Standard 8.2 Create comprehensive plant-based designs.</b>	
Performance Indicators	
8.2.1	Apply principles and elements of design in plant systems.
8.2.2	Integrate ecological factors into landscape and production designs.
8.2.3	Utilize design tools, including computer software and traditional methods.
8.2.4	Create designs that balance aesthetic appeal with functional requirements.
<b>Domain 9</b> <b>Integrate modern technologies in plant production and management</b>	
<b>Standard 9.1 Evaluate and implement production technologies.</b>	
Performance Indicators	
9.1.1	Research emerging technologies in controlled environment agriculture.
9.1.2	Compare automation systems for greenhouse and field production.
9.1.3	Investigate precision agriculture technologies for crop monitoring and management.
9.1.4	Evaluate the economic and environmental benefits of technology adoption.
<b>Standard 9.2 Design integrated production systems.</b>	
Performance Indicators	
9.2.1	Analyze traditional versus modern production methods.
9.2.2	Design sustainable production systems that minimize environmental impact.



9.2.3	Integrate multiple production technologies to optimize efficiency and quality.
<b>Domain 10</b> <b>Develop comprehensive business and marketing strategies for plant enterprises</b>	
<b>Standard 10.1 Create a comprehensive business and marketing plan for a plant science enterprise</b>	
Performance Indicators	
10.1.1	Create a business plan for plant enterprises (e.g., agronomy, vegetable and fruit production, nursery/landscape, or floriculture).
10.1.2	Design a marketing plan using the four keys: product, placement, price, and promotion.
10.1.3	Prepare plant production schedules utilizing plant growth knowledge to get plants to their optimal growth stage at a given time.
10.1.4	Distinguish niche markets.
10.1.5	Create a marketing/promotion piece for a selected crop.
<b>Domain 11</b> <b>Evaluate business ownership structures and associated risks in plant systems</b>	
<b>Standard 11.1 Identify the advantages and disadvantages of owning plant-based businesses</b>	
Performance Indicators	
11.1.1	Identify the advantages and disadvantages of owning a plant system business (e.g., greenhouse/horticulture crops, agronomy, vegetable and fruit production, nursery/landscape, floriculture).
11.1.2	Identify the difference between personal and business risk.
11.1.3	Compare the forms of business ownership (e.g., sole proprietor, partnership, LLC, C-Corp, non-profit).
11.1.4	List and describe laws that protect businesses, employees, and customers.



**Contributors**

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