

Colorado CTE Course – Scope and Sequence

Course Name	Greenhouse Production		Course Details	Level 3 course in the Plant Science Pathway course sequence. This would be the next level of course in the Horticulture / Green Industry strand after Hort Science		
			Course = 0.50 Carnegie Unit Credit			
Course Description	This advanced course offers instruction in greenhouse production. Units of study include plant identification, greenhouse management, integrated pest management, propagation, growing media, growing greenhouse crops, horticulture mechanics, Agribusiness units will cover operating a horticultural business, pricing work, advertising, and sales. Participation in FFA student organization activities and Supervised Agricultural Experience (SAE) projects is an integral course component for leadership development, career exploration and reinforcement of academic concepts.					
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.					
SCED Identification #	18053	Schedule calculation based on 60 % of instructional time in semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.				
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at https://www.cde.state.co.us/standardsandinstruction/essentialskills						
Instructional Unit Topic	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration	
Careers and Industry	2%	CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.	CS.05.02. Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.	CS.05.02.01.a. Examine and categorize careers in Greenhouse Production		
Structures and Equipment <ul style="list-style-type: none"> • Types of Greenhouse designs • Greenhouse structural materials & applications <ul style="list-style-type: none"> ○ Superstructures ○ Glazing ○ Floors & walkways 		PST.04. Plan, build and maintain AFNR structures.	PST.04.02. Determine structural requirements, specifications and estimate costs for AFNR structures	PST.04.01.02.c. Evaluate, plan and design functional and efficient facilities for use in AFNR power, structural and technical systems. PST.04.02.02.b. Assess and analyze local building code		

<ul style="list-style-type: none"> ○ Benches ● Environmental control <ul style="list-style-type: none"> ○ Heating, cooling, ventilation ● Water systems <ul style="list-style-type: none"> ○ Hose, drip, spray/mist 		<p>PST.05. Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.</p>	<p>PST.04.03. 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.).</p> <p>PST.05.01. Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.</p> <p>PST.05.02. Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.</p> <p>PST.05.03. Performance Indicator: Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.</p>	<p>requirements for agriculture structures.</p> <p>PST.04.03.07.a. Differentiate between types of insulation materials used in AFNR structures.</p> <p>PST.05.01.02.a. Examine and summarize the specific intent of technologies used to solve problems and increase the efficiency of AFNR systems (e.g., robotics, UAS, CNC, etc.).</p> <p>PST.05.02.03.a. Research and summarize the importance of AFNR power, structural and technical control systems using programmable logic controllers (PLC) and/or other computer-based systems.</p> <p>PST.05.03.02.c. Solve problems and evaluate changes in efficiency and create recommendations for the use of technologies in AFNR systems.</p>	
<p>Containers, Media, Greenhouse Crops</p> <ul style="list-style-type: none"> ● Types of Greenhouse crops 	<p>6%</p>	<p>PS.01. Develop and implement a crop management plan for a given production goal that</p>	<p>PS.01.02. Prepare and manage growing media for use in plant systems.</p>	<p>PS.01.02.01.b. Describe the physical and chemical characteristics of growing media and explain the</p>	

<ul style="list-style-type: none"> • Growing containers <ul style="list-style-type: none"> ○ Ground beds ○ Bench beds ○ Containers • Growing media <ul style="list-style-type: none"> ○ Components ○ Applications ○ Adv / dis adv 		<p>accounts for environmental factors.</p> <p>PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.</p>	<p>PS.03.02. Develop and implement a management plan for plant production.</p> <p>PS.03.04. Apply principles and practices of sustainable agriculture to plant production.</p>	<p>influence they have on plant growth.</p> <p>PS.01.02.01.c. Formulate and prepare growing media for specific plants or crops.</p> <p>PS.03.02.02.a. List and summarize the reasons for preparing growing media before planting.</p> <p>PS.03.04.01.c. Research, prepare and defend plans for a plant systems enterprise that aligns with USDA sustainable practices criteria.</p>	
<p style="text-align: center;">Nutrients</p> <ul style="list-style-type: none"> • Nutritional requirements <ul style="list-style-type: none"> ○ Growing stage of crop • Feeding programs <ul style="list-style-type: none"> ○ Continuous vs intermittent • Fertilizers, forms & types • Application methods <ul style="list-style-type: none"> ○ Slow release ○ Fertigation ○ Foliar spray 	4%	<p>PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.</p>	<p>PS.01.03. Develop and implement a fertilization plan for specific plants or crops.</p>	<p>PS.01.03.01.c. Monitor plants for signs of nutrient deficiencies and prepare a scouting report to correct elements negatively affecting plant growth in a field or greenhouse.</p> <p>PS.01.03.02.a. Discuss the influence of pH and cation exchange capacity on the availability of nutrients.</p> <p>PS.01.03.04.a. Identify fertilizer sources of essential plant nutrients; explain fertilizer formulations, including organic and inorganic; and describe different methods of fertilizer application.</p>	

<p>Propagation</p> <ul style="list-style-type: none"> • Propagation methods • Propagation production processes <ul style="list-style-type: none"> ○ Equipment ○ Growing management ○ 	<p>12%</p>	<p>PS.03. CCTC Standard: Propagate, culture and harvest plants and plant products based on current industry standards.</p>	<p>PS.03.02. Performance Indicator: Develop and implement a management plan for plant production.</p>	<p>PS.03.02.04.c. 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.).</p> <p>PS.03.02.05.c. Prepare plant production schedules utilizing plant growth knowledge to get plants to their optimal growth stage at a given time.</p> <p>PS.03.02.06.c. Research, select and defend technology for use in controlled atmosphere production.</p>	
<p>Growth Factors</p> <ul style="list-style-type: none"> • Control of growth factors to manage crop timing <ul style="list-style-type: none"> ○ Temperature ○ CO2 enrichment ○ Hardening ○ Photoperiod control ○ PGRs 	<p>15%</p>	<p>PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.</p>	<p>PS.01.01. Determine the influence of environmental factors on plant growth.</p>	<p>PS.01.01.01.c. Analyze plant responses to varied light color, intensity and duration and recommend modifications to light for desired plant growth.</p> <p>PS.01.01.02.c. Design, implement and evaluate a plan to maintain optimal air and temperature conditions for plant growth.</p> <p>PS.01.01.03.c. Analyze plant responses to water conditions and recommend modifications to water for desired plant growth.</p>	

<p>Integrated Pest Management</p> <ul style="list-style-type: none"> • Common pest identification • Pest scouting • Pest control techniques 	5%	<p>PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.</p>	<p>PS.03.02. Develop and implement a management plan for plant production.</p> <p>PS.03.03. Develop and implement a plan for integrated pest management for plant production.</p>	<p>PS.03.02.01.c. Produce pest- and disease-free propagation material.</p> <p>PS.03.03.01.c. Devise solutions for plant pests, diseases and disorders.</p> <p>PS.03.03.02.c. Design and implement a crop scouting program.</p> <p>PS.03.03.03.c. Employ pest management strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed.</p> <p>PS.03.03.04.b. Examine and apply procedures for the safe handling, use and storage of pesticides including personal protective equipment and reentry interval.</p>	
<p>Aquaponics/Hydroponics</p> <ul style="list-style-type: none"> • System requirements • System designs <ul style="list-style-type: none"> ○ NFT, aero, water bed, ebb & flow 	2%	<p>PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.</p>	<p>PS.03.02. Develop and implement a management plan for plant production.</p>	<p>PS.03.02.06.c. Research, select and defend technology for use in controlled atmosphere production.</p> <p>PS.03.02.07.c. Research, select and defend the use of a hydroponic or aquaponic plant system.</p>	
<p>Marketing and Business</p>	2%	<p>ABS.03. Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles</p>	<p>ABS.03.01. Performance Indicator: Develop, assess and manage cash budgets to achieve AFNR business goals.</p>	<p>ABS.03.01.01.a. Compare and contrast components of cash budgets (e.g., anticipated revenue, production costs, overhead costs, profit, etc.) and identify the appropriate components to include in a</p>	

		<p>ABS.05. Use sales and marketing principles to accomplish AFNR business objectives.</p>	<p>ABS.05.01. Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.</p> <p>ABS.05.03. Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.</p>	<p>budget given the nature of the AFNR enterprise.</p> <p>ABS.03.01.02.a. Research and summarize factors that impact management of cash budgets in AFNR businesses (e.g., changes in price of inputs/outputs, financial investment performance, capital purchases, human resources, etc.).</p> <p>ABS. 05.01.02.a. Research and summarize different forms of market competition found in AFNR businesses (e.g., direct competitors, indirect competitors, replacement competitors, etc).</p> <p>ABS.05.01.02.b. Compare and contrast different forms of market competition and how they can be applied to different AFNR businesses.</p> <p>ABS.05.03.01.a. Identify and explain marketing principles used in AFNR businesses (e.g., 4 P's-product, place, price, promotion; attention, interest, desire, action, etc.).</p> <p>ABS.05.03.02.a. Research and categorize different strategies used in marketing programs for AFNR businesses (e.g., Internet, direct to customer, social media, etc.).</p>	
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