

Colorado AFNR Course Scope and Sequence

Course Name	Crop Production & Management		Course Details	Level 3 course in the Plant Science pathway. This course aligns to the sequence in the Agronomy/Crop Production Strand.		
			Course = 0.50 Carnegie Unit Credit			
<b>Course Description</b>	Students in this course will cover topics in sustainable agriculture, planting, soil preparation, integrated pest mgt, harvest, handling and storing according to current industry standards, development of production plans, food/biosecurity, fertilizer mgt, and water mgt. " 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.					
<b>Note:</b>	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 #		Schedule calculation based on 60% of a semester instructional time. 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 <a href="https://www.cde.state.co.us/standardsandinstruction/essentialskills">https://www.cde.state.co.us/standardsandinstruction/essentialskills</a>						
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration	
<b>Unit 1: Careers</b>	3%	<b>CS.05.</b> Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.	<b>CS.05.01.</b> 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.).	<p><b>CS.05.01.01.b.</b> Create a personal plan outlining goals and steps to obtain a career in an AFNR pathway.</p> <p><b>CS.05.01.02.b.</b> Analyze personal skillset and create a plan for obtaining the required education, training and experiences to obtain a career in an AFNR pathway.</p> <p><b>CS.05.01.03.b.</b> Assess personal goals, experiences, education and skillsets and organize them</p>		

				<p>to produce the appropriate tools and develop the skills to effectively communicate about one's qualifications for an AFNR career.</p> <p><b>CS.05.02.02.a.</b> Research and describe careers in each of the AFNR pathways and choose potential careers connecting to personal interests and skills.</p>	
			<p><b>CS.05.02.</b> Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.</p>		
<b>Unit 2: Marketing (domestic and global)</b>	4%	<b>PS.03.</b> Propagate, culture and harvest plants and plant products based on current industry standards.	<p><b>PS.03.04.</b> Performance Indicator: Apply principles and practices of sustainable agriculture to plant production.</p> <p><u><a href="#">SCIENCE: SC.HS.3.9</a></u></p>	<p><b>PS.03.04.02.a.</b> Summarize national/international and local/regional food production systems.</p> <p><b>PS.03.04.02.b.</b> Compare and contrast the impact on greenhouse gas, carbon footprint of the national/international production system with local/regional production system markets.</p> <p><b>PS.03.04.02.c.</b> Select and defend the use of nationally/internationally grown or locally/regionally grown for a production operation system.</p>	
<b>Unit 3: Risk Management &amp; Compliance (FSA, insurance, water, GMO's)</b>	4%	<b>PS.03.</b> Propagate, culture and harvest plants and plant products based on current industry standards.	<b>PS.03.01.</b> Demonstrate plant propagation techniques in plant system activities.	<b>PS.03.01.05.a.</b> Summarize the principles of recombinant DNA technology and the basic steps in the process.	

				<p><b>PS.03.01.05.b.</b> Compare and contrast the potential risks and advantages associated with genetically modified plants.</p> <p><b>PS.03.01.05.c.</b> Evaluate the impact of using genetically modified crops on other production practices.</p>	
<b>Unit 4: Precision Data</b>	8%	<p><b>PST.05.</b> Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems</p>	<p><b>PST.05.03.</b> Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems. <i>SCIENCE: SC.HS.3.11 SC.HS.3.9 NGSS.HS.ETS1.3</i></p>	<p><b>PST.05.03.01.a.</b> Research and summarize the impact of utilizing geospatial technologies (i.e., GPS, GIS, remote sensing, telematics, etc. ) in AFNR systems.</p> <p><b>PST.05.03.01.b.</b> Analyze and interpret trends in data collected utilizing geospatial technologies.</p> <p><b>PST.05.03.01.c.</b> Collect data and create maps utilizing geospatial technologies.</p> <p><b>PST.05.03.02.a.</b> Examine the components of precision technologies used in AFNR systems.</p> <p><b>PST.05.03.02.b.</b> Analyze and calculate the economic impact of utilizing precision technologies (e.g., GPS/GIS) in AFNR systems.</p>	

				<p><b>PST.05.03.02.c.</b> Install, maintain and service instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.) used in AFNR systems.</p>	
<p><b>Unit 5: Soil Management &amp; Tillage</b></p>	3%	<p><b>PS.01.</b> Develop and implement a crop management plan for a given production goal that accounts for environmental factors</p>	<p><b>PS.01.02.</b> Performance Indicator: Prepare and manage growing media for use in plant systems</p>	<p><b>PS.01.02.01.c.</b> Formulate and prepare growing media for specific plants or crops.</p> <p><b>PS.01.02.02.a.</b> Identify the categories of soil water.</p> <p><b>PS.01.02.02.b.</b> Discuss how soil drainage and water-holding capacity can be improved.</p> <p><b>PS.01.02.02.c.</b> Determine the hydraulic conductivity for soil and how the results influence irrigation practices.</p>	
<p><b>Unit 6: IPM (Insects, weeds, chemicals)</b></p>	7%	<p><b>PS.03.</b> Propagate, culture and harvest plants and plant products based on current industry standards.</p>	<p><b>PS.03.02.</b> Develop and implement a management plan for plant production. <a href="#">ELA: RW.HS1.2.2</a></p> <p><b>PS.03.03</b> Develop and implement a plan for integrated pest management for plant production</p>	<p><b>PS.03.02.01.b.</b> Inspect propagation material for evidence of pests or disease</p> <p><b>PS.03.02.01.c.</b> Produce pest- and disease-free propagation material.</p> <p><b>PS.03.03.01.a.</b> Identify and categorize plant pests, diseases and disorders.</p>	

**PS.03.03.01.b.** Identify and analyze major local weeds, insect pests and infectious and noninfectious plant diseases.

**PS.03.03.01.c.** Devise solutions for plant pests, diseases and disorders.

**PS.03.03.02.a.** Diagram the life cycle of major plant pests and diseases.

**PS.03.03.02.b.** Predict pest and disease problems based on environmental conditions and life cycles.

**PS.03.03.02.c.** Design and implement a crop scouting program.

**PS.03.03.03.a.** Identify and summarize pest control strategies associated with integrated pest management and the importance of determining economic threshold.

**PS.03.03.03.b.** Demonstrate pesticide formulations including organic and synthetic active ingredients and selection of pesticide to control specific pest.

**PS.03.03.03.c.** Employ pest management

				<p>strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed.</p> <p><b>PS.03.02.04.a.</b> Observe and record environmental conditions during the germination, growth and development of a crop.</p> <p><b>PS.03.02.04.b.</b> Monitor the progress of plantings and determine the need to adjust environmental conditions.</p> <p><b>PS.03.02.04.c.</b> 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>	
<b>Unit 7: Fertilizer Management, (soil sample, plant tissue sample, calibrate equip)</b>	7%	<b>PS.01.</b> Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	<b>PS.01.03.</b> Develop and implement a fertilization plan for specific plants or crops. <a href="#">MATH: MA.HS.N.Q.A</a>	<p><b>PS.01.03.01.a.</b> Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.).</p> <p><b>PS.01.03.01.b.</b> Analyze the effects of nutrient deficiencies and symptoms and recognize</p>	

environmental causes of nutrient deficiencies.

**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.

**PS.01.03.03.a.** Collect soil and plant tissue samples using generally accepted procedures and explain how incorrect sample collection will affect the results of a laboratory analysis.

**PS.01.03.03.b.** Interpret laboratory analyses of soil and tissue samples.

**PS.01.03.03.c.** Prescribe fertilizer applications based on the results of a laboratory analysis of soil and plant tissue samples.

**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.

**PS.01.03.04.b.** Calculate the amount of fertilizer to be applied based on

				<p>nutrient recommendation and fertilizer analysis.</p> <p><b>PS.01.03.04.c.</b> Calibrate application equipment to meet plant nutrient needs.</p> <p><b>PS.01.03.06.a.</b> Summarize the impact of environmental factors on nutrient availability (e.g., moisture, temperature, pH, etc.).</p>	
<p><b>Unit 8: Crop Production (corn, wheat, alfalfa, sorghum, millet, vegetables, potatoes, grass hay, soy beans, barley, sunflowers, hemp, specialty)</b></p> <ul style="list-style-type: none"> <li>• Growth Seasons</li> <li>• Varieties</li> <li>• Water/Irrigation</li> <li>• Tillage</li> <li>• Planting</li> <li>• Harvesting</li> <li>• Rotation</li> <li>• Uses</li> <li>• Crop processing</li> <li>• Storage</li> </ul>	24%	<p><b>PS.01.</b> Develop and implement a crop management plan for a given production goal that accounts for environmental factors.</p> <p><b>PS.02.</b> Apply principles of classification, plant anatomy, and plant physiology to plant production and management.</p> <p><b>PS.03.</b> Propagate, culture and harvest plants and plant</p>	<p><b>PS.01.01.</b> Determine the influence of environmental factors on plant growth. <a href="#">SCIENCE:SC.HS.2.6</a></p> <p><b>PS.01.02.</b> Prepare and manage growing media for use in plant systems.</p> <p><b>PS.02.03.</b> Apply knowledge of plant physiology and energy conversion to plant systems. <a href="#">SCIENCE: SC.HS.2.3</a> <a href="#">SC.HS.2.5</a></p>	<p><b>PS.01.01.02.b.</b> Determine the optimal air and temperature conditions for plant growth.</p> <p><b>PS.01.02.02.a.</b> Identify the categories of soil water.</p> <p><b>PS.01.02.02.b.</b> Discuss how soil drainage and water-holding capacity can be improved.</p> <p><b>PS.01.02.02.c.</b> Determine the hydraulic conductivity for soil and how the results influence irrigation practices.</p> <p><b>PS.02.03.05.c.</b> Devise plans for plant management that applies knowledge of transpiration, translocation and assimilation on plant growth.</p> <p><b>PS.03.01.02.a.</b> Demonstrate sowing</p>	



		<p>products based on current industry standards.</p>	<p><b>PS.03.01.</b> Demonstrate plant propagation techniques in plant system activities</p> <p><b>PS.03.02.</b> Develop and implement a management plan for plant production. <a href="#">ELA: RW.HS1.2.2</a></p>	<p>techniques for providing favorable conditions to meet the factors of seed germination.</p> <p><b>PS.03.01.02.b.</b> Handle seed to overcome seed dormancy mechanisms and to maintain seed viability and vigor.</p> <p><b>PS.03.01.02.c.</b> Conduct tests associated with seed germination rates, viability and vigor.</p> <p><b>PS.03.02.02.a.</b> List and summarize the reasons for preparing growing media before planting.</p> <p><b>PS.03.02.02.b.</b> Prepare soil and growing media for planting with the addition of amendments.</p> <p><b>PS.03.02.02.c.</b> Analyze how mechanical planting equipment performs soil preparation and seed placement.</p> <p><b>PS.03.02.03.a.</b> Determine seeding rate need for specified plant population or desired quantity of finished plants.</p> <p><b>PS.03.02.03.b.</b> Apply pre-plant treatments required of seeds and plants and evaluate the results.</p>	
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			<p><b>PS.03.05</b> Harvest, handle and store crops according to current industry standards. <i>ELA: RST.9-10.3</i> <i>RST.9-10.4</i> <i>WHST.9-10.2a</i></p>	<p><b>PS.03.05.01.b.</b> Assess the stage of growth to determine crop maturity or marketability and demonstrate proper harvesting techniques.</p> <p><b>PS.03.05.01.c.</b> Analyze the processed used by mechanical harvesting equipment.</p> <p><b>PS.03.05.02.a.</b> Research and summarize reasons for calculating crop loss and or damage.</p> <p><b>PS.03.05.02.b.</b> Evaluate crop yield and loss data and make recommendations to reduce crop loss.</p> <p><b>PS.03.05.02.c.</b> Implement and evaluate the effectiveness of plans to reduce crop loss.</p> <p><b>PS.03.05.03.a.</b> Research and summarize how safety is ensured at each stage of the following processes: harvesting, processing and storing.</p> <p><b>PS.03.05.03.b.</b> 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.).</p>	
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**PS.03.05.03.c.** Research laws and apply regulations to ensure the production of plants and plant products that are safe for distribution and use.

**PS.03.05.04.a.** Identify and categorize plant preparation methods for storing and shipping plants and plant products.

**PS.03.05.04.b.** Analyze the proper conditions required to maintain the quality of plants and plant products held in storage and during shipping.

**PS.03.05.04.c.** Monitor and evaluate environmental conditions in storage facilities for plants and plant products.

**PS.03.05.05.a.**  
Summarize the reasons for preparing plants and plant products for distribution.

**PS.03.05.05.b.**  
Demonstrate techniques for grading, handling and packaging plants and plant products for distribution.

**PS.03.05.05.c.** Evaluate techniques for grading,

				handling and packaging plants and plant products.	
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**CAS Academic Standards Alignment:** Online Version: <https://www.cde.state.co.us/apps/standards/>; Download version: <https://www.cde.state.co.us/apps/standards/>

**Reading, Writing, and Communicating:** (RST/WHST are Common Core Standards aligned; <http://www.corestandards.org/ELA-Literacy/RI/introduction-for-6-12/>)

- RW.HS.1.2.2 – Understand the logical progression of ideas in increasingly complex texts.
- RST.9-10.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*.
- RST.9-10.2a - Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

**Math:**

- MA.HS.N-Q.A – Quantities: Reason quantitatively and use units to solve problems.

**Science:**

- SC.HS.2.3 – Organisms use matter and energy to live and grow.
- SC.HS.2.5 – Matter and energy necessary for life are conserved as they move through ecosystems.
- SC.HS.2.6 – A complex set of interactions determine how ecosystems respond to disturbances.
- SC.HS.3.9 – Resources availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
- SC.HS.3.11 -Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technology
- NGSS.ETS.HS.1.3 – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural and environmental impacts.

**Essential Skills:**

Problem Solver:

- **Critical Thinking and Analysis:** The ability to apply a deliberate process of identifying problems, gathering information, and weighing possible solutions, including: making choices rooted in understanding patterns, cause-and-effect relationships, and the impacts that a decision can have on the individual and others.

Community Member:

- **Civic Engagement:** The ability to develop and apply knowledge, skills, and habits gained from experiences – within communities of diverse perspectives – to address issues, affect change, and/or solve problems.

Empowered Individual:

- **Self-Management:** The ability to manage one's emotions, thoughts and behaviors effectively in different situation and to achieve goals and aspirations, including: the capacity to delay gratification, manage stress, stay productive and accountable, and feel motivation & agency to accomplish personal/collective goals.
- **Career Awareness:** The ability to apply the knowledge and understanding of how one's dreams, experiences, and interests translate into career fulfillment and lifelong pursuits in local, regional, national, and global career pathways and opportunities.