

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			
Course Description	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.				
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 #		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 https://www.cde.state.co.us/standardsandinstruction/essentialskills					
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Unit 1: Careers	3%	CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.	CS.05.01. 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.).	CS.05.01.01.b. Create a personal plan outlining goals and steps to obtain a career in an AFNR pathway. CS.05.01.02.b. Analyze personal skillset and create a plan for obtaining the required education, training and experiences to obtain a career in an AFNR pathway. CS.05.01.03.b. Assess personal goals, experiences, education and skillsets and organize them to produce	

			CS.05.02. Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.	the appropriate tools and develop the skills to effectively communicate about one's qualifications for an AFNR career. CS.05.02.02.a. Research and describe careers in each of the AFNR pathways and choose potential careers connecting to personal interests and skills.	
Unit 2: Marketing (domestic and global)	4%	PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.	PS.03.04. Performance Indicator: Apply principles and practices of sustainable agriculture to plant production. <u>SCIENCE: SC.HS.3.9</u>	PS.03.04.02.a. Summarize national/international and local/regional food production systems. PS.03.04.02.b. Compare and contrast the impact on greenhouse gas, carbon footprint of the national/international production system with local/regional production system markets. PS.03.04.02.c. Select and defend the use of nationally/internationally grown or locally/regionally grown for a production operation system.	

Unit 3: Risk Management & Compliance (FSA, insurance, water, GMO's)	4%	PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.	PS.03.01. Demonstrate plant propagation techniques in plant system activities.	PS.03.01.05.a. Summarize the principles of recombinant DNA technology and the basic steps in the process. PS.03.01.05.b. Compare and contrast the potential risks and advantages associated with genetically modified plants. PS.03.01.05.c. Evaluate the impact of using genetically modified crops on other production practices.	
Unit 4: Precision Data	8%	PST.05. Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems	PST.05.03. Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems. <i>SCIENCE: SC.HS.3.11</i> <i>SC.HS.3.9</i> <i>NGSS.HS.ETS1.3</i>	PST.05.03.01.a. Research and summarize the impact of utilizing geospatial technologies (i.e., GPS, GIS, remote sensing, telematics, etc.) in AFNR systems. PST.05.03.01.b. Analyze and interpret trends in data collected utilizing geospatial technologies. PST.05.03.01.c. Collect data and create maps utilizing geospatial technologies. PST.05.03.02.a. Examine the components of precision technologies used in AFNR systems.	

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

			PS.03.03 Develop and implement a plan for integrated pest management for plant production	PS.03.02.01.c. Produce pest- and disease-free propagation material. PS.03.03.01.a. Identify and categorize plant pests, diseases and disorders. 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.	
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				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 strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed. PS.03.02.04.a. Observe and record environmental conditions during the germination, growth and development of a crop. PS.03.02.04.b. Monitor the progress of plantings and determine the need to adjust environmental conditions. 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.).	
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Unit 7: Fertilizer Management, (soil sample, plant tissue sample, calibrate equip)	7%	PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	PS.01.03. Develop and implement a fertilization plan for specific plants or crops. <i>MATH: MA.HS.N.Q.A</i>	PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.). PS.01.03.01.b. Analyze the effects of nutrient deficiencies and symptoms and recognize 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.	
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				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 nutrient recommendation and fertilizer analysis. PS.01.03.04.c. Calibrate application equipment to meet plant nutrient needs. PS.01.03.06.a. Summarize the impact of environmental factors on nutrient availability (e.g., moisture, temperature, pH, etc.).	
Unit 8: Crop Production (corn, wheat, alfalfa, sorghum, millet, vegetables, potatoes, grass hay, soy beans, barley, sunflowers, hemp, specialty) • Growth Seasons • Varieties • Water/Irrigation • Tillage • Planting • Harvesting • Rotation • Uses • Crop processing	24%	PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	PS.01.01. Determine the influence of environmental factors on plant growth. <u>SCIENCE:SC.HS.2.6</u> PS.01.02. Prepare and manage growing media for use in plant systems.	PS.01.01.02.b. Determine the optimal air and temperature conditions for plant growth. PS.01.02.02.a. Identify the categories of soil water. PS.01.02.02.b. Discuss how soil drainage and water-holding capacity can be improved. PS.01.02.02.c. Determine the hydraulic conductivity	

Storage		PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management. PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.	PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems. <u>SCIENCE: SC.HS.2.3</u> <u>SC.HS.2.5</u> PS.03.01. Demonstrate plant propagation techniques in plant system activities PS.03.02. Develop and implement a management plan for plant production. <u>ELA: RW.HS.1.2.2</u>	for soil and how the results influence irrigation practices. PS.02.03.05.c. Devise plans for plant management that applies knowledge of transpiration, translocation and assimilation on plant growth. PS.03.01.02.a. Demonstrate sowing techniques for providing favorable conditions to meet the factors of seed germination. PS.03.01.02.b. Handle seed to overcome seed dormancy mechanisms and to maintain seed viability and vigor. PS.03.01.02.c. Conduct tests associated with seed germination rates, viability and vigor. PS.03.02.02.a. List and summarize the reasons for preparing growing media before planting. PS.03.02.02.b. Prepare soil and growing media for planting with the addition of amendments. PS.03.02.02.c. Analyze how mechanical planting	
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			equipment performs soil preparation and seed placement. PS.03.02.03.a. Determine seeding rate need for specified plant population or desired quantity of finished plants. PS.03.02.03.b. Apply pre-plant treatments required of seeds and plants and evaluate the results. PS.03.02.03.c. Adjust and calibrate mechanized seeding and/or planting equipment for desired seed application rate. PS.03.02.04.a. Observe and record environmental conditions during the germination, growth and development of a crop. PS.03.02.04.b. Monitor the progress of plantings and determine the need to adjust environmental conditions. PS.03.03.04.a. Distinguish between risks and benefits associated with the materials and methods used in plant pest management.	
		PS.03.03 Develop and implement a plan for integrated pest management for plant production		

			PS.03.05 Harvest, handle and store crops according to current industry standards. ELA: RST.9-10.3 RST.9-10.4 WHST.9-10.2a	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. PS.03.03.04.c. Evaluate environmental and consumer concerns regarding pest management strategies. PS.03.05.01.a. Identify and summarize harvesting methods and equipment. PS.03.05.01.b. Assess the stage of growth to determine crop maturity or marketability and demonstrate proper harvesting techniques. PS.03.05.01.c. Analyze the processed used by mechanical harvesting equipment. PS.03.05.02.a. Research and summarize reasons for calculating crop loss and or damage. PS.03.05.02.b. Evaluate crop yield and loss data and make recommendations to reduce crop loss.	
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				PS.03.05.02.c. Implement and evaluate the effectiveness of plans to reduce crop loss. PS.03.05.03.a. Research and summarize how safety is ensured at each stage of the following processes: harvesting, processing and storing. PS.03.05.03.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.). 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.	
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				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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Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc)

[CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Standard 1: Oral Expression and Listening

Prepared Graduate 1: *Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.*

Students collaborate to develop crop production plans, evaluate soil preparation and fertility management practices, implement integrated pest management strategies, and solve production challenges through field investigations, laboratory activities, and project-based learning.

Standard 2: Reading for All Purposes

Prepared Graduate 4: *Read a wide range of informational texts to build knowledge and to better understand the human experience.*

Students analyze crop production manuals, soil test reports, fertilizer recommendations, integrated pest management resources, water management guidelines, food and biosecurity protocols, and agricultural research to understand sustainable crop production systems.

Prepared Graduate 5: *Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.*

Students develop and apply specialized vocabulary related to agronomy, soil fertility, crop nutrition, planting systems, irrigation, integrated pest management, biosecurity, harvest, storage, and sustainable crop production to communicate effectively in agricultural settings.

Standard 3: Writing and Composition

Prepared Graduate 6: *Craft arguments using techniques specific to the genre.*

Students evaluate crop management practices, fertilizer programs, irrigation methods, pest management strategies, and production decisions, defending recommendations using scientific evidence, field observations, and production data.

Prepared Graduate 7: *Craft informational/explanatory texts using techniques specific to the genre.*

Students develop crop production plans, integrated pest management plans, fertility recommendations, harvest and storage procedures, and technical reports explaining sustainable crop production practices using scientific evidence.

Standard 4: Research Inquiry and Design

Prepared Graduate 10: *Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.*

Students research crop varieties, soil fertility, water management practices, integrated pest management strategies, food and biosecurity measures, and sustainable production techniques to develop evidence-based crop management plans that improve productivity and environmental stewardship.

Note: *Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.*