

Colorado CTE Course – Scope and Sequence

Course Name	Principles of Plant Science A		Course Details	Level 2 course in the Plant Science Pathway. This course could serve for either the Agronomy or Horticulture strand.	
			Course = 0.50 Carnegie Unit Credit		
Course Description	Plant Science provides students with knowledge and information about the growth, development, and reproduction of plants used for food, fiber, and beautification. Topics may include plant anatomy and physiology, plant growth processes such as photosynthesis, propagation (reproduction) methods, taxonomy and classification, and plant identification. The course will also highlight developing communication skills, leadership skills, and incorporate a survey of the careers within the plant science industry. 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 #	18051	Schedule calculation based on 60 % of instructional time in the 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 Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Unit 1: Industry & Careers	8%	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.05.01.02.a. Examine the educational, training and experiential requirements to pursue a career in an AFNR pathway (e.g., degrees, certifications, training, internships, etc.).	
Unit 2: Plant Identification & Classification - Life Cycles - Classification Systems	5%	PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.	PS.02.01. Classify plants according to taxonomic systems.	PS.02.01.01.a. Identify and summarize systems used to classify plants based on specific characteristics. PS.02.01.02.a. Describe the morphological characteristics used to identify agricultural	

• Crop classifications • Plant identification characteristics				and herbaceous plants (e.g., life cycles, growth habit, plant use and as monocotyledons or dicotyledons, woody, herbaceous, etc.). PS.02.01.02.b. Identify and describe important plants to agricultural and ornamental plant systems by common names.	
Unit 3: Plant anatomy, physiology, & processes • Plant parts & functions (roots, stems, leaves, flowers) • Photosynthesis • Respiration • Transpiration & Translocation	30%	PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.	PS.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems. SCIENCE: SC.HS.2.2	PS.02.02.01.a. Identify structures in a typical plant cell and summarize the function of plant cell organelles. PS.02.02.01.b. Compare and contrast mitosis and meiosis. PS.02.02.02.a. Identify and summarize the components, the types and the functions of plant roots. PS.02.02.02.b. Analyze root tissues and explain the pathway of water and nutrients into and through root tissues. PS.02.02.03.a. Identify and summarize the components and the functions of plant stems. PS.02.02.03.b. Analyze and describe the difference in arrangement of vascular tissue between monocot and dicot plant stems.	

			PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems. <i>SCIENCE: SC.HS.2.3</i> <i>SC.HS.2.5</i>	PS.02.02.04.a. Research and summarize leaf morphology and the functions of leaves. PS.02.02.04.b. Analyze how leaves capture light energy and summarize the exchange of gases. PS.02.02.05.a. Identify and summarize the components of a flower, the functions of a flower and the functions of flower components. PS.02.02.05.b. Apply knowledge of flower structure to differentiate between the types of flowers and flower inflorescence (e.g., complete, incomplete, perfect, imperfect). PS.02.03.01.a. Summarize the importance of photosynthesis to plant life on earth and the process of photosynthesis, including the types (c3, c4, Cam), its stages (e.g., light-dependent and light independent reactions), and its products and byproducts. PS.02.03.01.b. Apply knowledge of photosynthesis to analyze how various environmental factors will affect the rate of photosynthesis. PS.02.03.02.a. Summarize the stages of cellular respiration	
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				including their products and byproducts. PS.02.03.02.b. Analyze the factors that affect cellular respiration processes and rate in a crop production setting. PS.02.03.03.a. Summarize primary growth and the role of the apical meristem. PS.02.03.03.b. Analyze plant growth and assess the process of secondary plant growth. PS.02.03.04.a. Identify and categorize the five groups of naturally occurring plant hormones and synthetic plant growth regulators. PS.02.03.05.a. Compare and contrast the effects of transpiration, translocation and assimilation on plants. PS.02.03.05.b. Identify and analyze the factors affecting transpiration, translocation and assimilation rate and products.	
Unit 4: Environmental Growth Factors • Temperature, light, water, air, nutrition. • Impact on plant growth	17%	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.01.01.01.a. Identify and summarize the three measurements of light – color, intensity and duration – that affect plant growth. PS.01.01.02.a. Identify and summarize the effects of air	

and scheduling.				and temperature on plant metabolism and growth. PS.01.01.02.b. Determine the optimal air and temperature conditions for plant growth. PS.01.01.03.a. Identify and summarize the effects of water quality on plant growth, (e.g., pH, dissolved solids, etc.). PS.01.01.03.b. Analyze and describe plant responses to water conditions.	

Course Name	Principles of Plant Science B		Course Details	Level 2 course in the Plant Science pathway. This course could serve for either the Agronomy or Horticulture strand.	
			Course = 0.50 Carnegie Unit Credit		
Course Description	Plant Science provides students with knowledge and information about the growth, development, and reproduction of plants used for food, fiber, and beautification. Topics may include plant anatomy and physiology, plant growth processes such as photosynthesis, propagation (reproduction) methods, taxonomy and classification, and plant identification. The course will also highlight developing communication skills, leadership skills, and incorporate a survey of the careers within the plant science industry. 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 #	18051	Schedule calculation based on 60 calendar days of a 90-day 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 Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Unit 1: Nutrients & Fertilization - Macro, micro, & trace nutrients. - Nutrient function - Deficiency symptoms - Fertilizer & nutrient sources	14%	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. MATH: MA.HS.N.Q.A	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.01.03.02.a Discuss the influence of pH and cation exchange on the availability	

				of nutrients. PS.01.03.02.b – Contrast pH and cation exchange capacity between mineral soil and soilless growing media PS.01.03.02.c – Adjust the pH of growing media for specific plants or crops 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.01.03.06.a – Summarize the impact of environmental factors on nutrient availability (moisture, temperature, pH, etc...)	
Unit 2: Reproduction including genetics, GMO's/Biotech and germ test • Sexual vs. asexual • Pollination/fertilization • Germination • Seed viability • Cutting Prorogation • Plant Genetics • GMO/Biotech	20%	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.03.01.01.a. Identify examples of and summarize pollination, cross-pollination and self- pollination of flowering plants. PS.03.01.02.a. Demonstrate sowing techniques for providing favorable conditions to meet the factors of seed germination. PS.03.01.02.c. Conduct tests associated with seed germination rates, viability and vigor.	

				PS.03.01.03.a. Summarize optimal conditions for asexual propagation and demonstrate techniques used to propagate plants by cuttings, division, separation, layering, budding and grafting. PS.03.01.03.c. Evaluate asexual propagation practices based on productivity and efficiency	
Unit 3: Integrated Pest Management • Pests & Identification • Economic threshold • Steps of IPM • Organic/Niche vs conventional practices	16%	PS.03 Propagate, culture, and harvest plans and plant products based on current industry standards.	PS.03.03 Develop and implement a plan for integrated pest management for plant production.	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 infection and noninfectious plant diseases. PS.03.03.02.a Diagram the life cycle of major plant pests and diseases. PS.03.03.03.a Identify and summarize pest control strategies associated with integrated pest management and the importance of determining economic threshold. PS.03.03.04.a Distinguish between risks and benefits associated with the materials and methods used in plant pest management.	
Unit 4: Soils • Components	10%	PS.01. Develop and implement a crop	PS.01.02. Prepare and manage growing media	PS.01.02.01.a – Identify the major components of	

• Structure • Texture • Profiles • Erosion • Web Soil survey		management plan for a given production goal that accounts for environmental	for use in plant systems.	growing media and describe how growing media support plant growth. PS.01.02.01.b – Describe the physical and chemical characteristic of growing media and explain the influence they have on 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.	

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 identify and classify plants, evaluate plant growth and development, investigate propagation methods, assess plant health, and solve plant production challenges through laboratory activities, field investigations, 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 plant identification guides, scientific literature, plant physiology resources, taxonomy references, propagation manuals, crop production information, and industry publications to understand plant growth, development, and management.

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 plant anatomy, physiology, taxonomy, classification, propagation, photosynthesis, plant reproduction, crop production, plant nutrition, and plant science careers to communicate effectively in plant science settings.

Standard 3: Writing and Composition

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

Students evaluate plant production practices, propagation methods, plant management strategies, and crop production decisions, defending recommendations using scientific evidence, laboratory observations, and plant science data.

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

Students develop plant propagation procedures, plant identification reports, crop production plans, laboratory reports, and technical documents explaining plant growth, physiology, and management 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 plant species, plant anatomy and physiology, propagation techniques, crop classification systems, plant nutrition, environmental influences on plant growth, and careers in plant science to develop evidence-based solutions that improve plant production and management.

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