

Colorado CTE Course – Scope and Sequence

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| 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 <ul style="list-style-type: none"> • Life Cycles • Classification Systems • Crop classifications | 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 and herbaceous plants (e.g., | |

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| <ul style="list-style-type: none"> Plant identification characteristics | | | | <p>life cycles, growth habit, plant use and as monocotyledons or dicotyledons, woody, herbaceous, etc.).</p> <p>PS.02.01.02.b. Identify and describe important plants to agricultural and ornamental plant systems by common names.</p> | |
| <p>Unit 3: Plant anatomy, physiology, & processes</p> <ul style="list-style-type: none"> Plant parts & functions (roots, stems, leaves, flowers) Photosynthesis Respiration Transpiration & Translocation | 30% | <p>PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.</p> | <p>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</p> | <p>PS.02.02.01.a. Identify structures in a typical plant cell and summarize the function of plant cell organelles.</p> <p>PS.02.02.01.b. Compare and contrast mitosis and meiosis.</p> <p>PS.02.02.02.a. Identify and summarize the components, the types and the functions of plant roots.</p> <p>PS.02.02.02.b. Analyze root tissues and explain the pathway of water and nutrients into and through root tissues.</p> <p>PS.02.02.03.a. Identify and summarize the components and the functions of plant stems.</p> <p>PS.02.02.03.b. Analyze and describe the difference in arrangement of vascular tissue between monocot and dicot plant stems.</p> | |

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| | | | <p>PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems. <i>SCIENCE: SC.HS.2.3 SC.HS.2.5</i></p> | <p>PS.02.02.04.a. Research and summarize leaf morphology and the functions of leaves.</p> <p>PS.02.02.04.b. Analyze how leaves capture light energy and summarize the exchange of gases.</p> <p>PS.02.02.05.a. Identify and summarize the components of a flower, the functions of a flower and the functions of flower components.</p> <p>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).</p> <p>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.</p> <p>PS.02.03.01.b. Apply knowledge of photosynthesis to analyze how various environmental factors will affect the rate of photosynthesis.</p> <p>PS.02.03.02.a. Summarize the stages of cellular</p> | |
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| | | | | <p>respiration including their products and byproducts.</p> <p>PS.02.03.02.b. Analyze the factors that affect cellular respiration processes and rate in a crop production setting.</p> <p>PS.02.03.03.a. Summarize primary growth and the role of the apical meristem.</p> <p>PS.02.03.03.b. Analyze plant growth and assess the process of secondary plant growth.</p> <p>PS.02.03.04.a. Identify and categorize the five groups of naturally occurring plant hormones and synthetic plant growth regulators.</p> <p>PS.02.03.05.a. Compare and contrast the effects of transpiration, translocation and assimilation on plants.</p> <p>PS.02.03.05.b. Identify and analyze the factors affecting transpiration, translocation and assimilation rate and products.</p> | |
| <p>Unit 4: Environmental Growth Factors</p> <ul style="list-style-type: none"> • Temperature, light, water, air, nutrition. • Impact on plant growth and scheduling. | 17% | <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><u>SCIENCE: SC.HS.2.6</u></p> | <p>PS.01.01.01.a. Identify and summarize the three measurements of light – color, intensity and duration – that affect plant growth.</p> <p>PS.01.01.02.a. Identify and summarize the effects of air and temperature on plant metabolism and growth.</p> | |

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| | | | | <p>PS.01.01.02.b. Determine the optimal air and temperature conditions for plant growth.</p> <p>PS.01.01.03.a. Identify and summarize the effects of water quality on plant growth, (e.g., pH, dissolved solids, etc.).</p> <p>PS.01.01.03.b. Analyze and describe plant responses to water conditions.</p> | |
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| 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. | | | |
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| Instructional Unit Topic | Suggested Length of Instruction | CTE or Academic Standard Alignment | Competency / Performance Indicator | Outcome / Measurement | CTSO Integration |
| Unit 1: Nutrients & Fertilization <ul style="list-style-type: none"> 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. <u>MATH: MA.HS.N.Q.A</u> | 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. | |

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| | | | | <p>PS.01.03.02.b – Contrast pH and cation exchange capacity between mineral soil and soilless growing media</p> <p>PS.01.03.02.c – Adjust the pH of growing media for specific plants or crops</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>PS.01.03.06.a – Summarize the impact of environmental factors on nutrient availability (moisture, temperature, pH, etc...)</p> | |
| <p>Unit 2: Reproduction including genetics, GMO's/Biotech and germ test</p> <ul style="list-style-type: none"> • Sexual vs. asexual • Pollination/fertilization • Germination • Seed viability • Cutting Prorogation • Plant Genetics • GMO/Biotech | 20% | <p>PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.</p> | <p>PS.03.01. Demonstrate plant propagation techniques in plant system activities.</p> | <p>PS.03.01.01.a. Identify examples of and summarize pollination, cross-pollination and self- pollination of flowering plants.</p> <p>PS.03.01.02.a. Demonstrate sowing techniques for providing favorable conditions to meet the factors of seed germination.</p> <p>PS.03.01.02.c. Conduct tests associated with seed germination rates, viability and vigor.</p> <p>PS.03.01.03.a. Summarize optimal conditions for asexual propagation and</p> | |

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| | | | | <p>demonstrate techniques used to propagate plants by cuttings, division, separation, layering, budding and grafting.</p> <p>PS.03.01.03.c. Evaluate asexual propagation practices based on productivity and efficiency</p> | |
| <p>Unit 3: Integrated Pest Management</p> <ul style="list-style-type: none"> • Pests & Identification • Economic threshold • Steps of IPM • Organic/Niche vs conventional practices | 16% | <p>PS.03 Propagate, culture, and harvest plans and plant products based on current industry standards.</p> | <p>PS.03.03 Develop and implement a plan for integrated pest management for plant production.</p> | <p>PS.03.03.01.a Identify and categorize plant pests, diseases and disorders.</p> <p>PS.03.03.01.b Identify and analyze major local weeds, insect pests and infection and noninfectious plant diseases.</p> <p>PS.03.03.02.a Diagram the life cycle of major plant pests and diseases.</p> <p>PS.03.03.03.a Identify and summarize pest control strategies associated with integrated pest management and the importance of determining economic threshold.</p> <p>PS.03.03.04.a Distinguish between risks and benefits associated with the materials and methods used in plant pest management.</p> | |
| <p>Unit 4: Soils</p> <ul style="list-style-type: none"> • Components • Structure • Texture • Profiles • Erosion | 10% | <p>PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental</p> | <p>PS.01.02. Prepare and manage growing media for use in plant systems.</p> | <p>PS.01.02.01.a – Identify the major components of growing media and describe how growing media support plant growth.</p> | |

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| <ul style="list-style-type: none"> • Web Soil survey | | | | <p>PS.01.02.01.b – Describe the physical and chemical characteristic of growing media and explain the influence they have on plant growth</p> <p>PS.01.02.02.a. Identify the categories of soil water.</p> <p>PS.01.02.02.b. Discuss how soil drainage and water-holding capacity can be improved.</p> | |
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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/>)

Math:

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

Science:

- SC.HS.2.2 – Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.
- 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.

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.

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.