

Colorado AFNR Course Scope and Sequence

Course Name	Irrigation & Water Management		Course Details	Level 4 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	This course will focus on water law, irrigation systems, design and installation, transpiration and water use, irrigation scheduling, chemigation and fertigation, water quality. 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 #	18099	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.05.01.02.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: Categories of Soil Water	3%	PS.01 Develop and implement a crop production management plan for a given production goal that accounts for environmental factors.	PS.01.02. Prepare and manage growing media for use in plant systems	PS.01.02.02.a. Identify the categories of soil water		

Unit 3: Holding Capacity, Availability, & Hydraulic Conductivity	4%	PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	PS.01.02. Prepare and manage growing media for use in plant systems	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 4: Water Conservation	6%	PLSC.05 Understand the history and management of water resources in plant systems	PLSC.05.07 Explain principles of water conservation	PLSC.05.07.a Define water conservation and why conservation is important in agriculture PLSC.05.07.b Describe how irrigation practice and plant/crop choice is related to water consumption/ water conservation PLSC.05.07.c Relate water conservation to common soil conservation practices (i.e. waterways, runoff, no till, minimum till) PLSC.05.07.d Develop a water conservation plan for a local enterprise	
Unit 5: Evapotranspiration & Use	3%	PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.	PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems. SCIENCE:SC.HS.2.3 SC.HS.2.5	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. PS.02.03.05.c. Devise plans for plant management that applies knowledge of transpiration, translocation and assimilation on plant growth	
Unit 6: Irrigation Systems & Government's role Systems • Irrigation Districts • Bureau of Reclamation	2%	NRES.05. Manage Human Interactions with Natural Resources	NRES.05.01 Identify and understand the role of governing agencies involved in natural resources	NRES.05.01.a Identify main governing agencies of natural resources, their history and the areas they manage NRES.05.01.b Determine how policy is made in regards to natural Resources NRES.05.01.c Determine how to utilize governing agencies NRES.05.01.d Evaluate public policy/governing agencies and form personal opinions	
Unit 7: Water Rights & Legal Considerations • Prior Appropriation vs. Riparian	8%	PLSC.05 Understand the history and management of water resources in plant systems	PLSC.05.01 Understand the history and background of water use in plant systems	PLSC.05.01.a Identify important historical events related to water use, pollution, and conservation PLSC.05.01.b Describe how past events have shaped current policy	

				regarding Colorado Water Law PLSC.05.01.c Explain the major components of the current Colorado Water Law	
Unit 8: Compacts & Allocation	2%	NRES.05. Manage Human Interactions with Natural Resources	NRES.05.02 Become familiar with laws relating to water, air, land, and outdoor recreation	NRES.05.02.a Recognize laws that impact local resources NRES.05.02.b Interpret the purpose of laws that relate to local resources NRES.05.02.c Analyze the impact laws have on local resources NRES.05.02.d Create a needs assessment for laws relating to natural resources	
Unit 9: Water Quality	5%	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.01.01.03.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. PS.01.01.03.c. Analyze plant responses to water conditions and recommend modifications to water for desired plant growth.	
Unit 10: Potable vs. Non-Potable Use and Applications	1%	PLSC.05. Manage Human Interactions with Natural Resources	PLSC.05.06 Determine factors influencing water quality	PLSC.05.06.d Evaluate the results of water tests and determine changes	

				that need to be made to produce high quality water for agriculture and municipal purposes	
Unit 11: Stream/Watershed Management	2%	PLSC.05 Manage Human Interactions with Natural Resource	PLSC.05.08 Describe the relationship of water shed, and water sources on plant systems	PLSC.05.08.a Describe properties of watersheds and identify the boundaries of local watersheds PLSC.05.08.b Relate the function of watersheds to natural resources PLSC.05.08.c Analyze ecosystem functions of a watershed PLSC.05.08.d Locate and analyze local watersheds	
Unit 12: Water Hydraulics – Pressure, Flow Rates, Grade	6%	PLSC.05. Manage Human Interactions with Natural Resources	PLSC.05.05 Understand the principles of soil/water hydraulics	PLSC.05.05.a Define hydraulics and how it controls the movement of water through a system PLSC.05.05.b Calculate dynamic and static water pressure	
Unit 13: System Management/Maintenance, Installation and Design	12%	PLSC.05 Manage Human Interactions with Natural Resources	PLSC.05.03 Understand irrigation methods, systems, and equipment	PLSC.05.03.a Define irrigation and why it is needed in agriculture PLSC.05.03.b Identify common irrigation systems, methods and equipment and explain the main water users in agriculture PLSC.05.03.c Discuss the advantages and	

				disadvantages of common types of irrigation systems	
				PLSC.05.03.d Develop a model demonstrating common irrigation methods in Colorado	
Unit 14: Precision Ag. Applications in Irrigation	3%	PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.	PS.03.04. Apply principles and practices of sustainable agriculture to plant production. <u>SCIENCE: SC.HS.3.9</u>	PS.03.04.01.b. Analyze the alignment of modern technologies used in production systems (e.g., precision agriculture, GE crops, etc.) with USDA sustainable practices criteria.	

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 design, install, operate, troubleshoot, and evaluate irrigation systems, monitor water application efficiency, and develop irrigation management solutions 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 irrigation system specifications, soil moisture and water quality reports, irrigation scheduling resources, equipment manuals, and water management publications to understand efficient agricultural water use and irrigation system performance.

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 irrigation scheduling, evapotranspiration, soil-water relationships, irrigation efficiency, pumps, pipelines, valves, sprinklers, drip irrigation, and water conservation to communicate effectively in irrigation management settings.

Standard 3: Writing and Composition

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

Students evaluate irrigation methods, scheduling practices, equipment selection, and water conservation strategies, defending recommendations using field observations, irrigation performance data, and scientific evidence.

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

Students develop irrigation management plans, irrigation schedules, maintenance procedures, water conservation plans, and technical reports explaining irrigation system operation and efficient water 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 irrigation technologies, soil-water relationships, crop water requirements, irrigation scheduling methods, water conservation strategies, and system performance to develop evidence-based irrigation management plans that maximize water use efficiency and agricultural productivity.

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