Colorado Environmental Science Course Scope and Sequence

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| **Course Name** | **Introduction to Agriculture & Environmental Systems** | **Course Details**<br><br>**Course = 0.50 Carnegie Unit Credit** | This is one of two level 1 course options to begin the Environmental Science pathway. |
| **Course Description** | Students will complete hands-on activities, projects, and problems that simulate actual concepts and situations found in the environmental science field, allowing students to build content knowledge and technical skills. Students will investigate areas of environmental science including ecosystem management, sustainable agriculture, energy choices, and pollution. | | |
| **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 | CTE or Academic Standard Alignment | Competency / Performance Indicator | Outcome / Measurement | CTSO Integration |
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| **1. Biodiversity** | ESS.3.0 Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology<br><br>HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.<br><br>HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* | ESS.03.04 Apply microbiology principles to environmental service systems<br>*RST.11.-12.1*<br>*WHST.9-10.2*<br>*WHST.11-12.2*<br>*WHST. 9-10.5*<br>*WHST.9-10.9*<br>*WHST.11-12.9*<br><br>*MA.HS.F-BF.A*<br><br>ESS.03.05 Apply ecology principles to environmental services systems.<br>*RST.9-10.8*<br>*RST.11-12.1*<br>*RST.11-12.7* | ESS.03.04.01.a Describe the microbial biodiversity found in soil and summarize the contribution of microbial biodiversity to the physical and chemical characteristics of soil.<br><br>ESS.03.04.01.b Assess how activities of microorganisms in soil affect environmental service systems and ecosystem biodiversity.<br><br>ESS.03.05.01.a Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.<br><br>ESS.03.05.01.b Calculate the amount of biodiversity in a given area using an appropriate method (e.g. quadrat assessment, transect measurement, etc) | |

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| | HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*<br><br>HS-ESS3-3.Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.<br><br>ESS.02 Evaluate the impact of public policies and regulations on environmental service systems. | *RST.11-12.8*<br>*WHST.9-10.2*<br>*WHST.11-12.2*<br>*WHST.9-10.9*<br>*WHST.11-12.9*<br><br>*MA.HS.N.Q.A*<br><br>ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems. | ESS.03.05.02.a Examine and explain the role played by habitats on environmental service systems.<br><br>ESS.03.05.02.b. Assess the impact of the current rate of habitat loss on environmental service systems.<br><br>ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems.<br><br>ESS.02.01.01.b Analyze the structure associated with environmental service systems<br><br>ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems.<br><br>ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems. | |
| **2. Energy** | ESS.04 Demonstrate the operation of environmental service system (e.g. pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation)<br><br>HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of | ESS4.04 Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.<br>*RST.11-12.1*<br>*RST.11-12.8*<br>*WHST.9-10.5*<br>*WHST.11-12.5*<br>*WHST.9-10.7*<br>*WHST11-12.7* | ESS.04.04.01.a Research conventional energy sources and list conservation measures to reduce the impact on environmental service systems.<br><br>ESS.04.04.01.b Assess the advantages and disadvantages of conventional energy sources in regards to environmental service systems.<br><br>ESS.04.04.02a Research alternative energy sources and describe the motivations for | |

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| | energy in aerobic and anaerobic conditions<br><br>ESS.02 Evaluate the impact of public policies and regulations on environmental service systems. | *RST11-12.2*<br>*RST.11-12.9*<br>*WHST.11-12.9*<br><br>*MA.HS.N.Q.A*<br><br>ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems. | seeking alternatives to conventional energy sources as they relate to environmental monitoring.<br><br>ESS.04.04.02.b Identify advantages and disadvantages of alternative energy sources as they pertain to environmental service systems.<br><br>ESS.04.04.03.a Examine the factors that affect energy consumption and describe how these factors are related to environmental monitoring.<br><br>ESS.04.04.03.b Analyze and document the main categories of energy consumption.<br><br>ESS.04.04.04.a Research the impact on environmental service systems that occurs because of energy consumption.<br><br>ESS.04.04.04.b Analyze and document the most significant impacts that energy consumption has on environmental monitoring.<br><br>ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems.<br><br>ESS.02.01.01.b Analyze the structure associated with environmental service systems<br><br>ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems.<br><br>ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems. | |
| **3. Agricultural Systems** | AG. 01 Analyze how issues, trends, technologies, and public policies impact systems in the AFNR career cluster. | AG1.5 Explain the impact of sustainability on AFNR activities and practices.<br><br>AG 1.6 Recognize the historical, social, cultural, and potential | | |

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| | BS.01 Assess factors that have influenced the evolution of biotechnology in agriculture (e.g. historical events, societal trends, ethical and legal implications, etc)<br><br>NR.03 Develop plans to ensure sustainable production and processing of natural resources.<br><br>Ag. 04 Demonstrate stewardship of natural resources in AFNR activities.<br><br>PL.03 Propagate, culture, and harvest plants and plant products based on current industry standards.<br><br>ESS.02 Evaluate the impact of public policies and regulations on environmental service systems. | applications of biotechnology of AFNR activities.<br><br>BS.01.02 Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g. health, safety, environmental issues, etc)<br><br>NRS.03.01 Plan for the production, harvesting, processing, and/or use of natural resources in a responsible and sustainable manner.<br><br>Ag.04.01 Demonstrate evidence of interest and concern for natural resource stewardship.<br><br>Ag.04.02 Explain the environmental considerations of decision making in AFNR management<br><br>PL.03.08 Apply principles and practices of sustainable agriculture plant production.<br><br>ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems. | ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems.<br><br>ESS.02.01.01.b Analyze the structure associated with environmental service systems<br><br>ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems.<br><br>ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems. | |
| **4. Pollution** | ESS.4.0 Demonstrate the operation of environmental service systems (e.g. pollution control, water | ESS.4.01 Use pollution control measures to maintain a safe facility and environment. | ESS.04.01.01.a Identify and distinguish types of pollution and distinguish between point source and nonpoint source pollution. | |

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| | treatment, wastewater treatment, solid waste management, and energy conservation)<br><br>ESS.02 Evaluate the impact of public policies and regulations on environmental service systems. | <br><br>ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems. | ESS.04.01.01.b Assess how industrial and nonindustrial pollution has damaged the environment.<br><br>ESS.04.01.02.a Research ways in which pollution can be managed and prevented and propose solutions to meet the needs of local systems.<br><br>ESS.04.01.02.b Conduct tests to determine the presence and extent of pollution.<br><br>ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems.<br><br>ESS.02.01.01.b Analyze the structure associated with environmental service systems<br><br>ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems.<br><br>ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems. | |
| **5. Issue Analysis** | ESS.2.0 Evaluate the impact of public policies and regulations on environmental service system operations.<br><br>HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. | ESS. 2.02 Compare and contrast the impact of current trends on regulation of environmental service systems (e.g. climate change, population growth, international trade, etc.) | ESS.02.02.01.a Research and categorize the purpose, implementation, and impact of greenhouse gas emission policies (e.g. cap-and-trade, emission offsetting, zero-emissions, carbon-neutrality, carbon sequestration, etc)<br><br>ESS.02.02.01.b Assess the effectiveness and impact of greenhouse gas emission policies.<br><br>ESS.02.02.02.a Research the impact of environmental service systems regulations on international trade.<br><br>ESS.02.02.02.b Analyze how environmental service systems regulations can both negatively and positively affect international trade. | |

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| | ESS.02 Evaluate the impact of public policies and regulations on environmental service systems. | ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems. | ESS.02.02.03.a Examine and summarize the impact that population growth has on environmental service systems.<br><br>ESS.02.02.03.b Analyze the correlation between increased population size and the need for regulation of environmental service systems.<br><br>ESS.02.02.04.a Research current policies related to fracking and shale oil gas.<br><br>ESS.02.02.04.b Assess whether current policies related to fracking and shale oil gas sufficiently address the needs of environmental service systems.<br><br>ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems.<br><br>ESS.02.01.01.b Analyze the structure associated with environmental service systems<br><br>ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems.<br><br>ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems. | |
| **6. ESI Research** | AG. 01 analyze how issues, trends, technologies, and public policies impact systems in the AFNR career cluster.<br><br>ES.01 Use analytical procedures and instruments to manage environmental service systems.<br><br>NR.01 Plan and conduct natural resource management activities that apply logical, reasoned, and | AG01.02 Describe current issues impacting AFNR activities.<br><br>AG.01.03 Identify, organize alternatives, and evaluate public policy issues related to AFNR.<br><br>ESS 01.02 Analyze and interpret results of sample measurements.<br><br>NRS 01.05. Execute natural resource strategies and activities | | |

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| | scientifically based solutions to natural resource issues and goals.<br><br>NRS.02 Plan and analyze interrelationships between natural resources and humans needed to manage natural resource systems. | applying specific knowledge from the study of ecology and wildlife.<br><br>NRS.02.01 Examine natural resource topics using science concepts, processes, and research techniques. | | |

## 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 investigate environmental issues, evaluate public policies, analyze agricultural and natural resource systems, and develop solutions to environmental challenges through research projects and problem-solving activities.

**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 scientific and technical texts related to biodiversity, energy systems, agricultural sustainability, pollution, environmental policy, biotechnology, and natural resource management to develop environmental literacy and scientific understanding.
- 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 ecology, biodiversity, sustainability, environmental policy, pollution, energy systems, biotechnology, agriculture, and natural resource management.

**Standard 3: Writing and Composition**

- Prepared Graduate 7: Craft informational/explanatory texts using techniques specific to the genre.
    - Students produce scientific explanations, research reports, environmental analyses, policy evaluations, and technical documentation to communicate findings related to biodiversity, energy use, pollution, agriculture, and environmental systems.
- Prepared Graduate 9: Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.

    - Students develop and revise research reports, explanatory texts, policy analyses, and scientific investigations through planning, drafting, editing, and synthesis of information from multiple sources.

**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 conduct investigations into biodiversity, energy consumption, agricultural sustainability, pollution management, environmental policy, climate change, and natural resource systems by gathering, analyzing, and synthesizing information from scientific studies, technical texts, data sets, and environmental monitoring activities.

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