Delaware Department of Education

CTE & STEM Office

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Dover, DE 19901

Phone: 302.735.4015

 Submit via email to: CTE.STEM@doe.k12.de.us

**DELAWARE CTE PROGRAM OF STUDY APPLICATION**

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| LOCAL EDUCATION AGENCY INFORMATION  |
| **Local Education Agency (LEA):** |
| **School(s) where the Program of Study will be Located:** | **Program of Study Start Date:**  |
| **LEA CTE Coordinator Name:** **Phone:** **E-Mail Address:**  |
| **Career Cluster Title:**Agriculture, Food, and Natural Resources  | **Career Pathway Title:**Natural Resources Systems  | **Program of Study Title:**Natural Resource Management |
| **CTE Program of Study Course Titles & Sequence:**1. Introduction to Natural Resources (INR)
2. Principles of Environmental Science (PES)
3. To be determined by the Local Education Agency (LEA) – select one of the following courses: Environmental & Natural Resource Stewardship (ENRS) or AP Environmental Science (ES)
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| **CTE Program of Study Request:**[x]  State-model CTE Program of Study[ ]  Local CTE Program of Study |
| ASSURANCES & SIGNATURES |
| CTE Program of Study approval and funding is contingent upon the following assurances:1. The LEA will comply with Delaware Administrative Code, 14 DE Admin. 525, Requirements for Career and Technical Education Programs and the Delaware State Plan for the Carl D. Perkins Career and Technical Education Act of 2006;
2. The LEA will submit CTE program data as required by the Delaware Department of Education;
3. All teachers are certified in the appropriate CTE area and participate in program specific professional learning;
4. The LEA will convene and engage a program advisory committee for the purposes of program development, implementation, and continuous improvement;
5. All students have equal access to the program of study as well as early career/early college options;
6. Career and Technical Student Organizations are integral components of the program of study;
7. The LEA will maintain safe facilities and equipment aligned with the program of study goals; and
8. A process for continuous improvement has been established, which includes a model of evaluation and program improvement.
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| LEA CTE Coordinator Signature: Date: |
| LEA Chief School Officer Signature: Date: |

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| PROGRAM ADVISORY COMMITTEE MEMBER INFORMATION |
| Complete the list of program advisory committee members. Program of study representatives should include, but are not limited to: CTE and academic teachers, CTE/curriculum district coordinators, school counselors, business and industry representatives, labor representatives, and post-secondary partners. Community stakeholders including parents and students can also be considered. *Attach additional information if applicable*. |
| Name: Title:            |
| Affiliation:      |
| Address:      |
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| Area of Expertise:      |
| Representing: [ ]  Business/Industry[ ]  Secondary Education[ ]  Post-Secondary Education[ ]  Community/Other |
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| Area of Expertise:      |
| Representing: [ ]  Business/Industry[ ]  Secondary Education[ ]  Post-Secondary Education[ ]  Community/Other |
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| LABOR MARKET DEMAND |
| Certify that a labor market needs analysis has been completed for the proposed CTE program of study. Attach the [*Labor Market Information (LMI) Review*](http://www.doe.k12.de.us/Page/435) document. |
| Access the [*Labor Market Information (LMI) Review*](http://www.doe.k12.de.us/Page/435) document. [x]  The LEA certifies that regional, state, and local labor market data have been reviewed to assure a demand exists for the POS occupations and that the number of POS completers will not significantly exceed this demand. Department of Labor data are available and/or documented. Supporting evidence of supply and demand is submitted with this proposal. [ ]  No data exist for POS due to a unique labor market demand. Supporting evidence of demand is submitted with this proposal. Evidence may include, but is not limited to: real-time labor market information, documentation of national, regional, state, or local labor trends, or letters from employers or workforce agencies documenting projected employment specific to the career pathway.  |

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| ACADEMIC AND TECHNICAL SKILL STANDARDS |
| List the academic, technical, and workplace skills and knowledge used to develop the program of study. |
| **Title and source of academic standards:** [Common Core State Standards (CCSS)](http://www.corestandards.org/) The Common Core State Standards (CCSS) are national standards that set clear college- and career-ready expectations for kindergarten through 12th grade in English language arts/literacy and Mathematics. The standards help to ensure that students graduating from high school are prepared to take credit bearing introductory courses in two- or four-year college programs and enter the workforce. The standards were developed by the nation's governors and education commissioners, through their representative organizations, the National Governors Association Center for Best Practices (NGA) and the Council of Chief State School Officers (CCSSO). Teachers, parents, school administrators, and experts from across the country provided input into the development of the standards. The implementation of the Common Core, including how the standards are taught, the curriculum developed, and the materials used to support teachers as they help students reach the standards, is led entirely at the state and local levels. For more information on CCSS, please visit the link above.[Next Generation Science Standards (NGSS)](http://www.nextgenscience.org/) The Next Generation Science Standards (NGSS) are national standards for science that lay out the disciplinary core ideas, science and engineering practices, as well as crosscutting concepts that students should master in preparation for college and careers. The standards were developed through a state-led effort that was managed by Achieve. The development of the NGSS involved the National Research Council (NRC), the National Science Teachers Association (NSTA), the American Association for the Advancement of Science (AAAS), and other critical partners such as K–12 teachers, state science and policy staff, higher education faculty, scientists, engineers, cognitive scientists, and business leaders. For more information on the NGSS, please visit the link above.  |
| **Title and source of technical skill standards:**[Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards](https://www.ffa.org/thecouncil/afnr)These standards are intended to shape the design of an agricultural education program including: 1) Classroom and laboratory instruction; 2) Work-based learning experiences such as Supervised Agricultural Experience (SAE) Programs and internships; and 3) Career and Technical Student Organization (CTSO) experiences through organizations such as the National FFA Organization. For more information on the AFNR standards, please visit the link above. |
| **Title and source of workplace or other skill standards, as applicable:**[Common Career Technical Core (CCTC)](http://www.careertech.org/CCTC)The Common Career Technical Core (CCTC) are national standards for Career & Technical Education (CTE) that help inform the establishment of state standards and/or programs of study. The CCTC were developed by educators, school administrators, representatives from business and industry, faculty from higher education, as well as workforce and labor markets economists. The CCTC includes a set of standards for each of the sixteen (16) Career Clusters and the corresponding Career Pathways that help to define what students should know and be able to do after completing instruction in the Natural Resource Management program of study. Within the Natural Resource Management program of study, the CCTC standards for the Agriculture, Food, and Natural Resource (AFNR) Career Cluster have been embedded in each course. The program has students apply the CCTC AFNR standards, specifically the Natural Resource Systems Career Pathway standards. For more information on the CCTC, please visit the link above.[Career Ready Practices (CRP)](http://www.careertech.org/career-ready-practices)The Career Ready Practices (CRP) are a component of the CCTC framework and includes twelve (12) statements that address the knowledge, skills, and dispositions that are important to becoming career ready. The CRP describes the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline, or level of education and should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a career pathway. Within the Natural Resource Management program of study, the CRP statements are embedded throughout the program to ensure students display the appropriate workplace and soft skills required to be successful in a career. For more information on the CRP, please visit the link above.[The National FFA Organization](https://www.ffa.org/home)The National FFA Organization (FFA) develops students’ potential for premier leadership, personal growth, and career success through agricultural education. FFA instruction focuses on: developing competent and assertive agricultural leaders; increasing awareness of the global and technological importance of agriculture and its contribution to our well-being; strengthening the confidence of agricultural students in themselves and their work; promoting the intelligent choice and establishment of an agricultural career; encouraging achievement in supervised agricultural experience programs; encouraging wise management of economic, environmental and human resources of the community; developing interpersonal skills in teamwork, communications, human relations and social interaction; building character and promotes citizenship, volunteerism and patriotism; promoting cooperation and cooperative attitudes among all people; promoting healthy lifestyles; encouraging excellence in scholarship.  |

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| EARLY CAREER AND EARLY COLLEGE OPPORTUNITIES |
| Identify CTE program of study early career opportunities, industry-recognized certifications and licenses, options for early college credit, two- and four-year degree and certification program alignment, and the technical skill attainment measures for the program of study. *Attach articulation/dual enrollment agreement(s)*. |
| **Describe early career opportunities (i.e. work-based learning experiences and industry-mentored projects):** The Natural Resource Management program Students participating in this program will be prepared to enter into careers in: Natural Science, Microbiology, Water Resource Management, Wastewater Engineering, Environmental Protection, Soil & Plant Science, Environmental Engineering, Geoscience, and Precision Agriculture. Local business partners and agencies work with educators by serving on advisory boards and as mentors to provide a real-world connection to Natural Resource Systems coursework. Work-based learning experiences and industry-mentored projects are included in each course and will be reviewed with the LEA Program Advisory Council (PAC) to further identify opportunities to engage the community. The Supervised Agriculture Experience (SAE) program provides students with the opportunity to consider multiple careers and occupations, demonstrate workplace behavior, develop skills within the natural resource systems, and apply academic and occupational skills in the workplace or a simulated workplace environment. Supervised Agriculture Experience (SAE) programs are classified in six different categories: Ownership/Entrepreneurship, Placement/Internship, Research, Exploratory, School-Based Enterprise, or Service Learning. |
| **List industry-recognized certifications and/or licenses, as appropriate (include the partner organization and credential):**   [Pesticide Applicator Certification – Private Applicators](https://agriculture.delaware.gov/pesticide-management/pesticide-applicator-certification/)The Pesticide Applicators Certification – Private Applicators Certification enables individuals to purchase and apply “Restricted Use” pesticides, produce an agricultural commodity, and apply pesticides on their own land or the land of their employer.  |
| **Describe early college credit options (i.e. advanced placement, dual enrollment, transcripted and/or articulated credit, credit by exam, pre-apprenticeship, other) and options for two- and four-year degree and/or certification program alignment (attach articulation/dual enrollment agreement). The partner organization and hours of credit earned should be included, as applicable:**The Department of Education is currently negotiating articulation agreements with Delaware Technical Community College, Delaware State University, and the University of Delaware.  |
| **List technical skill attainment measures for the program of study (i.e. industry recognized certification or license, advanced placement, dual enrollment, transcripted and/or articulated credit, dual enrollment, credit by exam):**[x]  Certification/credentialing exam (specify): [Pesticide Applicator Certification – Private Applicators](https://agriculture.delaware.gov/pesticide-management/pesticide-applicator-certification/)    [ ]  Licensing exam (specify):      [ ]  Nationally recognized exam (specify):      [ ]  Advanced standing (specify): Delaware Technical Community College (DTCC) - TBD Delaware State University (DSU) - TBD University of Delaware (UD) - TBD[ ]  Other (specify):       |

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| POS OVERVIEW, COURSE DESCRIPTIONS, END-OF-COURSE, AND PROGRAM ASSESSMENTS |
| Provide a CTE program of study overview that broadly describes the program and student expectations. Identify end-of-program assessment(s) and opportunities for students to participate in early college and early career experiences. List each course title in the CTE program of study. Provide an overview of each course and define what students should know and be able to demonstrate upon completion of each level. Identify appropriate end-of-course assessment(s).  |
| **CTE Program of Study Overview:** The Natural Resource Management program of study is a three (3) course Career & Technical Education (CTE) instructional program designed to provide students with exposure to topics in conservation management and maintenance of natural resources. Students learn responsible stewardship practices of air, soil, water, land, fish, and wildlife resources for economic, recreation, and health purposes. Students utilize a variety of classroom and laboratory activities supplemented through supervised agricultural experiences and leadership programs and activities. Students participating in this program will be prepared to enter into career fields that focus on one or more of the following areas: Natural Science, Microbiology, Water Resource Management, Wastewater Engineering, Environmental Protection, Soil & Plant Science, Environmental Engineering, Geoscience, and Precision Agriculture.* **Introduction to Natural Resources (INR)** introduces the interactions of living and nonliving systems on earth. Topics include the nature of science, ecology, water quality, chemical interactions, weather and climate, energy, and resource management as well as exploration of career opportunities on a local, state and national level. Laboratory exercises reinforce curriculum and provide students the opportunity to apply data analysis to their observations. Students are introduced to the foundational leadership skills, responsibility, and cooperation needed to be a successful and productive citizen through a school-based agricultural education three-component model which includes FFA activities, Supervised Agricultural Experience programs, and career and leadership development events.
* **Principles of Environmental Science (PES)** provides students with the opportunity to apply conservation principles to preserve the environment, natural resources, and ecosystems. Students learn proper soils and land use practices, the impact of chemicals in the environment, and how to test water and air quality. Students understand societal issues relating to the environment as well as land use and waste management. Classroom and laboratory activities are supplemented through supervised agricultural experiences and leadership programs. Students develop leadership skills, increase levels of responsibility, and engage in cooperative activities through FFA activities, Supervised Agricultural Experience programs, and career and leadership development events through a school-based three-component agricultural education model.
* **Environmental & Natural Resource Stewardship (ENRS)** immerses students in the concepts of sustainability related to agriculture production, land ownership and civic green space. Students investigate earth systems and resources, the living world, population dynamics, land and water use, energy resources and consumption, pollution, and global changes through discussion and debate. Students learn how to implement production and marketing practices that are profitable and environmentally sound while meeting the needs of both the present and future generations. Students practice ownership and community involvement. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems as well as business enterprises. Students apply skills gained through Supervised Agricultural Experience programs, FFA leadership activities, and career and leadership development events to better serve the community through a school-based three-component agricultural education model.
* **AP Environmental Science (ES)** provides students with the scientific principles and methods required to understand the interrelationships of the natural world, identify and analyze environmental problems that are natural and human-made, evaluate risks associated with these problems, and examine alternative solutions for resolving or preventing these issues. Students apply their knowledge of the environment to current environmental issues in their own communities. Students apply skills gained through Supervised Agricultural Experience programs, FFA leadership activities, and career and leadership development events to better serve the community through a school-based three-component agricultural education model.
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| **End-of-Program Assessment(s):**[x]  Certification/credentialing exam (specify): [Pesticide Applicator Certification – Private Applicators](https://agriculture.delaware.gov/pesticide-management/pesticide-applicator-certification/)[ ]  Licensing exam (specify):      [ ]  Nationally recognized exam (specify):      [ ]  Other (specify):       |
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| **Course title:**Introduction to Natural Resources (INR) |
| **Course description (include prerequisites):**Introduction to Natural Resources (INR)introduces the interactions of living and nonliving systems on earth. Topics include the nature of science, ecology, water quality, chemical interactions, weather and climate, energy, and resource management as well as exploration of career opportunities on a local, state and national level. Laboratory exercises reinforce curriculum and provide students the opportunity to apply data analysis to their observations. Students are introduced to the foundational leadership skills, responsibility, and cooperation needed to be a successful and productive citizen through a school-based agricultural education three-component model which includes FFA activities, Supervised Agricultural Experience programs, and career and leadership development events.  |
| **Course knowledge and skills (what students will know and be able to do):**By the end of this course students will:1. Summarize the components that compromise all ecosystems and their flow of energy.
2. Analyze the interference of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and assess the dependence of organisms on nonliving components.
3. Analyze and evaluate how biodiversity develops through evolution, natural selection, and adaptation.
4. Explain the importance of biodiversity to ecosystem function.
5. Devise strategies to enhance the function of an ecosystem and the availability of natural resources by increasing biodiversity of native, nonnative, cultural and invasive species.

 1. Classify and examine natural resources and ecosystem functions to enable protection, conservation, enhancement, and management of a specific geographical region through regulatory compliancy.
2. Apply ecological concepts and principles to the management of living organisms, atmospheric conditions, and aquatic and terrestrial habitats.
3. Explain the purpose of laws and the public and private agencies related to natural resource management; describe how laws are enforced; and determine the impact water regulations, game laws, historic preservation laws and environmental policy have on environmental improvement.
4. Develop, implement, and evaluate natural resource management plans to ensure sustainable production and processing of natural resources such as forests using cartographic skills, tools, and technologies such as Google Earth and remote sensing units.
5. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources through evaluation of various conservation and improvement plans that affect aquatic, atmospheric, and terrestrial habitats.
6. Explore career opportunities and skill development in agricultural fields including interpersonal relationships, effective communication, public speaking, goal setting, and job attainment techniques, through exposure to chapter, state, and national FFA leadership and career experiences.
7. Discover opportunities within the FFA such as FFA degrees and awards, leadership experiences, and Career Development Events, by examining the history, structure, and mission of the National FFA Organization.
8. Develop record keeping skills, goal setting and reflection, fiscal responsibility, and personal time management through the development and implementation of a Supervised Agricultural Experience (SAE).
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| **End-of-Course Assessment(s):**[x]  Teacher designed assessment[ ]  LEA designed assessment[ ]  Certification/credentialing exam (specify):      [ ]  Licensing exam (specify):      [ ]  Nationally recognized exam (specify):      [x]  Other (specify): Supervised Agricultural Experience (SAE Program)     |
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| **Course title:**Principles of Environmental Science (PES) |
| **Course description (include prerequisites):**Principles of Environmental Science (PES) provides students with the opportunity to apply conservation principles to preserve the environment, natural resources, and ecosystems. Students learn proper soils and land use practices, the impact of chemicals in the environment, and how to test water and air quality. Students understand societal issues relating to the environment as well as land use and waste management. Classroom and laboratory activities are supplemented through supervised agricultural experiences and leadership programs. Students develop leadership skills, increase levels of responsibility, and engage in cooperative activities through FFA activities, Supervised Agricultural Experience programs, and career and leadership development events through a school-based three-component agricultural education model.Prerequisite: Introduction to Natural Resources (INR) |
| **Course knowledge and skills (what students will know and be able to do):** By the end of this course students will:1. Analyze field samples and interpret laboratory results utilizing scientific instruments.
2. Assess proposed solutions to environmental issues, problems and applications using the scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
3. Develop a business or Best Management Plan (BMP) for solid waste disposal that considers the associated environmental hazards, economic realities, and social concerns.
4. Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater in compliance with environmental rules and regulations.
5. Evaluate examples of wastewater and/or septic waste for its potential to cause environmental, economic, and social issues.
6. Compare and contrast the impact of conventional and alternative energy sources on the environment.
7. Perform assessments of environmental conditions using sampling equipment, machinery, and technology to evaluate biogeochemical conditions.
8. Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade).
9. Research and summarize how perception and regulation of environmental service systems has changed over time by examining the impacts of important historical figures, organizations, and governmental bodies which oversee current legislation.
10. Develop goals and design a plan to examine further career skill attainment in areas of effective communication, technical writing, content skill execution, and agricultural advocacy through advanced opportunities in chapter, state, and national FFA leadership and career development experiences.
11. Reflect and further develop recordkeeping, goal reflection, fiscal accountability, and time management skills, as well as assess and apply for advanced degrees through the continuation and advancement of a Supervised Agricultural Experience.
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| **End-of-Course Assessment(s):**[x]  Teacher designed assessment[ ]  LEA designed assessment[ ]  Certification/credentialing exam (specify):      [ ]  Licensing exam (specify):      [ ]  Nationally recognized exam (specify):      [x]  Other (specify): Supervised Agricultural Experience (SAE Program)     |
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| **Course title:**Environmental & Natural Resource Stewardship |
| **Course description (include prerequisites):**Environmental & Natural Resource Stewardship (ENRS)immerses students in the concepts of sustainability related to agriculture production, land ownership and civic green space. Students investigate earth systems and resources, the living world, population dynamics, land and water use, energy resources and consumption, pollution, and global changes through discussion and debate. Students learn how to implement production and marketing practices that are profitable and environmentally sound while meeting the needs of both the present and future generations. Students practice ownership and community involvement. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems as well as business enterprises. Students apply skills gained through Supervised Agricultural Experience programs, FFA leadership activities, and career and leadership development events to better serve the community through a school-based three-component agricultural education model.Prerequisite: Principles of Environmental Science (PES) |
| **Course knowledge and skills (what students will know and be able to do):** By the end of this course students will:1. Conduct laboratory exercises that focus on sustainability and preservation of resources pertaining to earth systems in areas such as water, soil and air quality (e.g., Coriolis Effect and atmospheric circulation, chemical and physical characteristics of soils, agricultural land use).
2. Interpret environmental laws and policies; evaluate the impacts of laws, policies, practices and initiatives in business and trade groups associated with environmental service systems, (e.g., Clean Air Act, EISA, Clean Water Act, Superfund) and evaluate the effect of environmental laws and policies on wildlife, human population, the environment, and economics.
3. Research the impact of population dynamics on the regulation of environmental service systems and evaluate how changes will impact future human health and pollution (e.g., population growth and decay, age structures, demographic transitions, population distributions).
4. Understand and be able to convey the role of responsible and informed public land ownership plays in public perception.
5. Research how social views and movements (e.g., zero-waste philosophy, carbon footprints, recycling) have impacted the implementation and need for regulation of environmental service systems.
6. Examine and describe ecosystem structures and functions (e.g., biogeochemical cycling, energy flow, biodiversity, ecosystem fluctuations).
7. Explain the effects and challenges of sustainable land and water use in agriculture, forestry, rangeland management, mining, fishing, and other general land use for commercial and or residential development.
8. Describe and explain various sources of energy use and consumption (e.g., energy efficiency, fossil fuels, hydroelectric power, nuclear energy, renewable energy, and energy conservation).
9. Describe and explain various pollution types and their impacts on the environment and the economy (e.g., air, water, noise, solid waste), while developing potential solutions to their remediation or pre-developed strategies.
10. Describe the potential global changes that occur naturally or via human impact that affect the future of life on the planet.

1. Communicate using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings through coherent written, oral, and visual methods to highlight career interests in addition to seeking employment or work based learning opportunities.
2. Utilize skills gained in areas of communication, writing, content skill execution, ethical decision making, and agricultural and personal advocacy through execution of the SAE and advanced opportunities in chapter, state, and national FFA leadership to apply for and earn upper level FFA Degrees, Awards and make college and career choices.
 |
| **End-of-Course Assessment(s):**[x]  Teacher designed assessment[ ]  LEA designed assessment[ ]  Certification/credentialing exam (specify):      [ ]  Licensing exam (specify):      [ ]  Nationally recognized exam (specify):      [x]  Other (specify): Supervised Agricultural Experience (SAE Program)  |

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| **Course title:**AP Environmental Science (ES) |
| **Course description (include prerequisites):**AP Environmental Science (ES) provides students with the scientific principles and methods required to understand the interrelationships of the natural world, identify and analyze environmental problems that are natural and human-made, evaluate risks associated with these problems, and examine alternative solutions for resolving or preventing these issues. Students apply their knowledge of the environment to current environmental issues in their own communities. Students apply skills gained through Supervised Agricultural Experience programs, FFA leadership activities, and career and leadership development events to better serve the community through a school-based three-component agricultural education model.Prerequisites: Principles of Environmental Science (PES), Algebra, and Biological Sciences*© 2014 The College Board. Visit the College Board on the Web:* [*www.collegeboard.org*](http://www.collegeboard.org) |
| **Course knowledge and skills (what students will know and be able to do):** By the end of this course students will:1. Analyze and interpret experimental data and mathematical calculations; identify environmental problems; and critically examine various solutions for resolving or preventing environmental problems by evaluating the associated ecological risks and human health risks.
2. Describe science as a method of learning more about the world; demonstrate how science constantly changes the way we understand the world; describe earth systems and analyze the effect of natural resources and earth system components on the living world; analyze how the atmosphere impacts weather and climate; explain global water resources and how they are used; and explain soil formation and soil dynamics.
3. Describe ecosystem structures and the dynamics of species interactions; explain how energy conversions underlie all ecological processes; demonstrate how energy flows through systems; explain ecosystem diversity and change; analyze how the Earth itself is one interconnected system; demonstrate how natural systems change over time and space; and explain how biogeochemical systems vary in ability to recover from disturbances.
4. Analyze how humans impact the environment; describe how technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment; describe how environmental problems have a cultural and social context; describe how the role of cultural, social, and economic factors is vital to the development of solutions; explain why human survival depends on developing practices that will achieve sustainable systems; and describe the multiple uses of land and water and how the uses affect ecosystems differently.
5. Describe the different sources and forms of energy; explain the Laws of Thermodynamics; and demonstrate how energy cannot be created.
6. Describe the different forms of pollution; analyze forms of pollution and the effect on the environment, human health, and the economy; explain cultural eutrophication; describe groundwater pollution and how to maintain and test water quality; demonstrate the steps in water purification; describe the process of sewage treatment; and explain the Clean Water Act and other relevant laws.
7. Describe the Stratospheric Ozone; explain global warming and its effects; and explain the causes of habitat loss, how it can be maintained through conservation, and the relevant laws and treaties that exist in relation to the loss of biodiversity.
8. Utilize skills gained in areas of communication, writing, content skill execution, ethical decision making, and agricultural and personal advocacy through execution of the SAE and advanced opportunities in chapter, state, and national FFA leadership to apply for and earn upper level FFA Degrees, Awards and make college and career choices. (CRP.10, ABS.02)
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| **End-of-Course Assessment(s):**[ ]  Teacher designed assessment[ ]  LEA designed assessment[ ]  Certification/credentialing exam (specify):      [ ]  Licensing exam (specify):      [x]  Nationally recognized exam (specify): College Board Assessment: AP Environmental Science[x]  Other (specify): Supervised Agriculture Experience (SAE) Program |

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| PROGRAM OF STUDY CURRICULUM |
| Identify the method of technical and academic curriculum development (adopted, adapted, or developed in accordance with guidance from the program advisory committee).  |
| **POS technical and academic curriculum will be:**[x]  Adopted (specify source): State Model Program[ ]  Adapted (specify source):      [ ]  Developed locally (describe):      [ ]  Other (specify):       |

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| TEACHER CERTIFICATION |
| Provide valid teacher certification(s), candidate experience, pre-requisite and requisite licensure or certification requirement(s) for POS teachers. |
| **POS teacher requirements include:**[x]  Teacher certification(s) (list): AgriScience Education or Skilled and Technical Sciences (STS) In Natural Resource Systems[x]  Candidate experience (describe): Candidate may have experience in maintaining, or protecting areas such as forests, forested areas, woodlands, wetlands, and rangelands through such activities as raising and transporting seedlings; combating insects, pests, and diseases harmful to plant life; building structures to control water, erosion, and leaching of soil; or planning, directing, or coordinating activities in such fields as life sciences, physical sciences, mathematics, statistics, and research and development in these fields. Candidates may also have experience in collecting and analyzing biological data to determine the environmental effects of present and potential use of land and water habitats; investigating the growth, structure, development, and other characteristics of microscopic organisms, such as bacteria, algae, or fungi; or applying theory and principles of environmental engineering to modify, test, and operate equipment and devices used in the prevention, control, and remediation of environmental problems, including waste treatment and site remediation, under the direction of engineering staff or scientist. For more information, please see the Bureau of Labor Statistics: Miscellaneous Management and Management Support Occupations, Biological/Life Science, and Forestry and Conservation. [ ]  Pre-requisite professional licensure or certification requirement(s) (list):      [ ]  Requisite professional licensure or certification requirement(s) (list):      [ ]  Professional Licensure or Certification Credit Equivalency (list): Delaware Nutrient Management Certification *(6 credit hours)*; Certified Nursery Professional Exam *(3 credit hours)*[ ]  Other (describe):       |

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| VALUE-ADDED OPPORTUNITIES |
| List extended early career and college credit opportunities available during the student’s senior year. Document transition services, cooperative learning experiences, additional dual enrollment, or other.  |
| **Opportunities for extended and accelerated learning include:**[ ]  Cooperative education (describe):      [ ]  Structured internship (describe):      [ ]  Dual enrollment (list):      [ ]  Advanced Placement (list):      [ ]  Transition services (describe):      [ ]  Other (describe):       |

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| CAREER AND TECHNICAL STUDENT ORGANIZATIONS |
| Indicate the Career and Technical Student Organization (CTSO) affiliation by checking the appropriate box. |
| [x]  FFA |

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| PROGRAM OF STUDY MATRIX |
| Complete the program of study matrix to demonstrate the alignment of academic and technical courses, culminating early career and/or early college experiences. Identify appropriate certification and licensure options, opportunities for obtaining early college credit (courses with articulated or dual enrollment credit agreements should be appropriately designated within the matrix), the post-secondary program sequence, and potential career options. *Attach the Program of Study Matrix*. |
| Access the [Program of Study Matrix](http://www.doe.k12.de.us/domain/384).  |

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| DEPARTMENT OF EDUCATION PROGRAM OF STUDY APPROVAL |
| The following section will be completed by staff from the Delaware Department of Education, CTE & STEM Office and reported to the LEA as part of the CTE program of study approval process. |
| **Date Delaware CTE Program of Study Application Received:**      |
| **Local Education Agency (LEA):**     **School(s):**      | **Program of Study Start Date:**      |
| **LEA CTE Coordinator Name:** **Phone:** **E-Mail Address:**                    |
| **Career Cluster Title:**Agriculture, Food, and Natural Resources / 1 | **Career Pathway Title:**Natural Resources Systems / 1.05 | **Program of Study Title:**Natural Resource Management / 1.05603 |
| **CTE Program of Study Course Titles & Sequence:**1. Introduction to Natural Resources (INR) / 1.05603011 / 2
2. Principles of Environmental Science (PES) / 1.05603022 / 3
3. To be determined by the Local Education Agency (LEA) – select one of the following courses: Environmental & Natural Resource Stewardship (ENRS) / 1.05603033 / 3

or AP Environmental Science (ES) / 1.05603043 / 3 |
| **CTE Concentrator/Completer Course Titles:**Concentrator Course: Principles of Environmental Science (PES) / 1.05603022Completer Course: To be determined by the Local Education Agency (LEA) – select one of the following courses: Environmental & Natural Resource Stewardship (ENRS) / 1.05603033 or AP Environmental Science (ES) / 1.05603043 |
| **CTE Program of Study Request:**[x]  State-model CTE Program of Study[ ]  Local CTE Program of Study |
| **CTE Program of Study Attachments:**[ ]  Labor Market Information (LMI) Review;[ ]  Articulation/Dual Enrollment Agreement(s); and[ ]  Program of Study Matrix. |
| DDOE CTE & STEM Director Signature: Date: |
| DDOE Chief Academic Officer Signature: Date: |