

# Horticulture Science





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The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Horticulture Science Program of Study. The academic standards in this document are theoretical and performance-based. The standards contain content from Colorado, Maryland, Tennessee, and Texas and were validated by D.C. business and industry partners. All content is used with permission.

In addition to academic standards, OSSE has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and Work-Based Learning resources and requirements by course level.

This document is intended for use by educational administrators and practitioners. A similar document is available for each state-approved CTE Program of Study.



# Horticulture Science

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Course Descriptions: Horticulture Science		
Course Level	Course Information	Description
Level I	<b>Principles of Agriculture, Food, and Natural Resources</b> <b>OSSEID:</b> 5010201 <b>Grades:</b> 9-12 <b>Prerequisite:</b> None <b>Credit:</b> 1	Principles of Agriculture, Food, and Natural Resources will allow students to develop knowledge and skills regarding career and educational opportunities, personal development, globalization, industry standards, details, practices, and expectations. To prepare for careers in agriculture, food, and natural resources, students must attain academic skills and knowledge in agriculture. To prepare for success, students need opportunities to learn, reinforce, experience, apply, and transfer their knowledge and skills in various settings.
Level II	<b>Horticulture Science</b> <b>OSSEID:</b> 5010202 <b>Grades:</b> 10-12 <b>Prerequisite:</b> Principles of Agriculture, Food, and Natural Resources <b>Credit:</b> 1	Horticultural Science is designed to develop an understanding of common horticultural management practices as they relate to food and ornamental plant production. To prepare for careers in horticultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticulture and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer knowledge and skills in various settings.
Level III	<b>Greenhouse Management and Natural Resources</b> <b>OSSEID:</b> 5010203 <b>Grades:</b> 11-12 <b>Prerequisite:</b> Energy and Natural Resource Technology <b>Credit:</b> 1	Advanced Energy and Natural Resource Technology is designed to explore the interdependency of the public and natural resource systems related to energy production. In addition, renewable, sustainable, and environmentally friendly practices will be explored. To prepare for careers in the field of energy and natural resource systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to energy and natural resources and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills, and technologies in various settings.



<b>Level IV</b>	<b>Practicum in Architectural Design</b> <b>OSSEID:</b> 5010204 <b>Grades:</b> 12 <b>Prerequisite:</b> Advanced Energy and Natural Resource Technology <b>Credit:</b> 1	Practicum in Agriculture, Food, and Natural Resources is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in various locations appropriate to the nature and level of experiences, such as employment, independent study, internships, assistantships, mentorships, or laboratories. To prepare for careers in agriculture, food, and natural resources, students must attain academic skills and knowledge, acquire technical knowledge and skills related to the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills, and technologies in various settings.
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## Industry Certifications

## Work-Based Learning Examples and Resources

Level I Course	Level II Course	Level III Course	Level IV Course
<b>Career Exploration</b> Industry Visits Guest Speakers Participate in a CTSO	<b>Career Awareness</b> <i>All of Level I, plus:</i> Postsecondary Visits Program- Specific Site Tours Mock Interviews	<b>Career Preparation</b> <i>All of Level I and II, plus:</i> Job Shadow Paid/Unpaid Internships	<b>Career Preparation</b> Paid/Unpaid Internships Apprenticeships

**Several resources are available to help instructors meet the Level I and Level II WBL requirements, including:**

**Career Coach DC** (<http://careercoachdc.emsicc.com>). Online site designed to help students find and connect to a career pathway by providing the most current local data on wages, employment, job postings, and associated education and training. The resource includes a Career Assessment for students.

**Nepriis** (<https://dc.nepriis.com/>). Connects educators and learners with a network of industry professionals virtually, bringing real-world relevance and career exposure to all students. Nepriis also provides a skills-based volunteering platform for business and industry professionals to extend their educational outreach.

**Virtual Job Shadow** (<https://virtualjobshadow.com>). Provides interactive tools which empower students to discover, plan, and pursue their dreams. Rich video library presents a “day in the life of” view for thousands of occupations.



## Labor Market Information Definitions and Data

Career and Technical Education programs of study in the District of Columbia must meet at least one of the High Wage, High Skill, and In-Demand definitions below to be considered appropriate for our students and the regional labor market. These definitions were created in collaboration with Career and Technical Education leaders from District of Columbia LEA's, the University of the District of Columbia Community College, and national guidance from Research Triangle International (RTI) and Education Northwest. Additionally, previous work was consulted from researchers at MIT's Labor Wage Index Project and the DC CTE Task Force's 2012 Strategic Plan for the District of Columbia.

Indicator	Definition	Data for the Architectural Design Program of Study (source: EMSI, August 2021)
<p><b>High Wage</b></p>	<p>Those occupations that have a 25<sup>th</sup> percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the District of Columbia, and/or leads to a position that pays at least the median hourly or annual wage for the Washington, DC, metropolitan statistical area.</p> <p><i>Note: A 25<sup>th</sup> percentile hourly wage of \$20.49 or greater is required to meet this definition.</i></p>	<p><b>Standard Occupational Code (SOC):</b> 19-1029.00 Biological Scientists, All Other</p> <p><b>Hourly Wages</b>  <b>25<sup>th</sup> Percentile:</b> \$36.92  <b>50<sup>th</sup> Percentile:</b> \$50.09  <b>75<sup>th</sup> Percentile:</b> \$63.95</p>
<p><b>High Skill</b></p>	<p>Those occupations located within the Washington, DC, metropolitan statistical area with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate's degree, or higher.</p>	<p><b>Typical Entry-Level Education:</b> Bachelor's degree</p>
<p><b>In-Demand</b></p>	<p>Those occupations in the Washington, DC, metropolitan statistical area having more than the median number of total (<b>growth plus replacement</b>) annual openings over a five-year period.</p> <p><i>Note: An occupation is required to have an annual growth plus replacement rate of 105 openings, or greater, between 2020-25 to meet this definition.</i></p>	<p><b>Annual Openings:</b> 410</p>



**Model Six-Year Plan: Horticulture Science.**

**College:** University of the District of Columbia Community College

**Program/CIP:**

**Plan:**

**Entity:** Office of the State Superintendent of Education

**Career Cluster:** Agriculture, Food, and Natural Resources

**Program of Study:** Horticulture Science

High School					College			
Subject	9 <sup>th</sup> Grade	10 <sup>th</sup> Grade	11 <sup>th</sup> Grade	12 <sup>th</sup> Grade	Semester I	Semester II	Semester III	Semester IV
English (4)	English I	English II	English III	English IV				
Math (4)	Algebra I	Geometry	Algebra II	Math				
Science (4)	Biology	Lab Science	Lab Science	Science				
Social Studies (4)	World History and Geography I: Middle Ages	World History and Geography II: Modern World	U.S. History	U.S. Government (.5) and D.C. History (.5)				
Health (.5) and Physical Ed (1)	Health (.5) Physical Ed (.5)	Physical Ed (.5)						
World Languages (2)			World Language I	World Language II				
Art (.5)		Art (.5)						
Music (.5)		Music (.5)						
Elective / Major Courses	Principles of Agriculture, Food, and Natural Resources	Horticulture Science	Greenhouse Operation and Management	Practicum in Agriculture, Food, and Natural Resources				
<b>Total possible college credits completed in high school: XX</b>					<b>Credit hours required to complete the AAS program: XX</b>			



## Course Standards

### Principles of Agriculture, Food, and Natural Resources

1. **General requirements.** This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education instruction provides students with industry-aligned content, challenging academic standards, and relevant technical knowledge to further their education and succeed in current or emerging professions.
  - B. The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
  - C. Principles of Agriculture, Food, and Natural Resources will allow students to develop knowledge and skills regarding career and educational opportunities, personal development, globalization, industry standards, details, practices, and expectations. To prepare for careers in agriculture, food, and natural resources, students must attain academic skills and knowledge in agriculture. To prepare for success, students need opportunities to learn, reinforce, experience, apply, and transfer their knowledge and skills in various settings.
  - D. Students will participate in at least two Career Exploration Work-Based Learning experiences in this course, which might include guest speakers and workplace tours relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry.**  
**The student is expected to:**
    1. identify career development, education, and entrepreneurship opportunities in the field of agriculture, food, and natural resources;
    2. apply competencies related to resources, information, interpersonal skills, problem-solving, critical thinking, and systems of operation in agriculture, food, and natural resources;
    3. demonstrate knowledge of personal and occupational safety, environmental regulations, and first-aid policy in the workplace;
    4. analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and
    5. identify careers in agriculture, food, and natural resources with required aptitudes in science, technology, engineering, mathematics, language arts, and social studies.



- B. The student develops a supervised agriculture experience program. The student is expected to:**
1. plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;
  2. apply proper record-keeping skills as they relate to the supervised agriculture experience;
  3. participate in youth leadership opportunities to create a well-rounded experience program; and
  4. produce and participate in a local program of activities using a strategic planning process.
- C. The student analyzes concepts related to global diversity. The student is expected to:**
1. compare and contrast global agricultural markets, currency, and trends; and
  2. evaluate marketing factors and practices that impact the global markets.
- D. The student explains the historical, current, and future significance of the agriculture, food, and natural resources industry. The student is expected to:**
1. define the scope of agriculture;
  2. analyze the scope of agriculture, food, and natural resources and its effect upon society;
  3. evaluate significant historical and current agriculture, food, and natural resources developments;
  4. identify potential future scenarios for agriculture, food, and natural resources systems, including global impacts;
  5. describe how emerging technologies and globalization impacts agriculture, food, and natural resources; and
  6. compare and contrast issues impacting agriculture, food, and natural resources such as biotechnology, employment, safety, environment, and animal welfare issues.
- E. The student analyzes the structure of agriculture, food, and natural resources leadership in organizations. The student is expected to:**
1. develop and demonstrate leadership skills and collaborate with others to accomplish organizational goals and objectives;
  2. develop and demonstrate personal growth skills and collaborate with others to accomplish organizational goals and objectives; and
  3. demonstrate democratic principles in conducting effective meetings.
- F. The student demonstrates appropriate personal and communication skills. The student is expected to:**
1. demonstrate written and oral communication skills appropriate for formal and informal situations such as prepared and extemporaneous presentations; and
  2. demonstrate effective listening skills appropriate for formal and informal situations.
- G. The student applies appropriate research methods to agriculture, food, and natural resources topics. The student is expected to:**
1. discuss major research and developments in the fields of agriculture, food, and natural resources;
  2. use a variety of resources for research and development; and
  3. describe scientific methods of research.
- H. The student applies problem-solving, mathematical, and organizational skills in order to maintain financial and logistical records. The student is expected to:**
1. develop a formal business plan; and
  2. develop, maintain, and analyze records.



- I. **The student uses information technology tools to access, manage, integrate, and create information related to agriculture, food, and natural resources. The student is expected to:**
1. apply technology applications such as industry-relevant software and Internet applications;
  2. use collaborative, groupware, and virtual meeting software;
  3. analyze the benefits and limitations of emerging technology such as online mapping systems, drones, and robotics; and
  4. explain the benefits of computer-based and mobile application equipment in agriculture, food, and natural resources.
- J. **The student develops technical knowledge and skills related to soil systems. The student is expected to:**
1. identify the components and properties of soils;
  2. identify and describe the process of soil formation; and
  3. conduct experiments related to soil chemistry.
- K. **The student develops technical knowledge and skills related to plant systems. The student is expected to:**
1. describe the structure and functions of plant parts;
  2. discuss and apply plant germination, growth, and development;
  3. describe plant reproduction, genetics, and breeding;
  4. identify plants of importance to agriculture, food, and natural resources; and
  5. use tools, equipment, and personal protective equipment common to plant systems.
- L. **The student develops technical knowledge and skills related to animal systems. The student is expected to:**
1. describe animal growth and development;
  2. identify animal anatomy and physiology;
  3. identify and evaluate breeds and classes of livestock; and
  4. explain animal selection, reproduction, breeding, and genetics.
- M. **The student describes the principles of food products and processing systems. The student is expected to:**
1. evaluate food products and processing systems;
  2. determine trends in world food production;
  3. discuss current issues in food production; and
  4. use tools, equipment, and personal protective equipment common to food products and processing systems.
- N. **The student safely performs basic power, structural, and technical system skills in agricultural applications. The student is expected to:**
1. identify major areas of power, structural, and technical systems;
  2. use safe and appropriate laboratory procedures and policies;
  3. create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;
  4. identify building materials and fasteners; and
  5. use tools, equipment, and personal protective equipment common to power, structural, and technical systems.



- O. **The student explains the relationship between agriculture, food, and natural resources and the environment.**  
**The student is expected to:**
1. use technology as a tool to research, organize, evaluate, and communicate information;
  2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to function in a knowledge economy successfully;
  3. demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Horticultural Science

1. **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - B. The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
  - C. Horticultural Science is designed to develop an understanding of common horticultural management practices as they relate to food and ornamental plant production. To prepare for careers in horticultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticulture and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer knowledge and skills in various settings.
  - D. Students will participate in at least two Career Awareness Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. identify career development and entrepreneurship opportunities in the field of horticulture;
    2. apply competencies related to resources, information, interpersonal skills, and systems of operation in horticulture;
    3. demonstrate knowledge of personal and occupational safety practices in the workplace;
    4. identify employer expectations and appropriate work habits; and
    5. demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership.
  - B. **The student develops a supervised agriculture experience program. The student is expected to:**
    1. plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;
    2. apply proper record-keeping skills as they relate to the supervised agriculture experience;
    3. participate in youth leadership opportunities to create a well-rounded experience program; and
    4. produce and participate in a local program of activities using a strategic planning process.



- C. **The student develops technical skills associated with the management and production of horticultural plants. The student is expected to:**
1. classify horticultural plants based on physiology for taxonomic and other classifications;
  2. manage the horticultural production environment;
  3. propagate and grow horticultural plants;
  4. create a design using plants that demonstrates an application of design elements and principles;
  5. design and establish landscapes;
  6. describe the processes of fruit, nut, and vegetable production; and
  7. demonstrate proper pruning techniques.
- D. **The student identifies structures and physiological processes used in plant production. The student is expected to:**
1. examine unique plant properties to identify and describe functional differences in plant structures, including roots, stems, flowers, leaves, and fruit;
  2. differentiate between monocots and dicots and male and female plants;
  3. germinate seeds and transplant seedlings; and
  4. demonstrate asexual propagation techniques.
- E. **The student manages and controls common pests of horticultural plants. The student is expected to:**
1. identify common horticultural pests and pathogens;
  2. demonstrate safe practices in selecting, applying, storing, and disposing of chemicals; and
  3. explain parts of a pesticide label.
- F. **The student demonstrates marketing and management skills used in the operation of horticultural businesses. The student is expected to:**
1. identify and maintain hand and power tools and equipment;
  2. select appropriate tools and equipment;
  3. demonstrate safe use of tools and equipment;
  4. identify options and opportunities for business ownership; and
  5. analyze the role of small business in free enterprise.
- G. **The student develops technology skills. The student is expected to:**
1. use technology as a tool to research, organize, evaluate, and communicate information;
  2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to function in a knowledge economy successfully;
  3. demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Greenhouse Operation and Production

1. **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Horticulture Science. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
  - B. The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
  - C. Greenhouse Operation and Production is designed to develop an understanding of greenhouse production techniques and practices. To prepare for careers in horticultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticultural systems and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills, and technologies in various settings.
  - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which might include paid or unpaid internship experiences relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. identify career development and entrepreneurship opportunities in the field of greenhouse operations and production;
    2. apply competencies related to resources, information, interpersonal skills, problem-solving, and critical thinking in greenhouse operations and production;
    3. examine licensing, certification, and legal requirements to maintain compliance with industry requirements;
    4. demonstrate knowledge of personal and occupational health and safety practices in the industry;
    5. identify employers' expectations and appropriate work habits; and
    6. demonstrate characteristics of good citizenship such as advocacy, stewardship, and community leadership.
  - B. **The student develops a supervised agriculture experience program. The student is expected to:**
    1. plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;
    2. apply proper record-keeping skills as they relate to the supervised agriculture experience;
    3. participate in youth leadership opportunities to create a well-rounded experience program; and
    4. produce and participate in a local program of activities using a strategic planning process.



- C. **The student identifies and classifies plants used in greenhouse production. The student is expected to:**
1. classify greenhouse plants according to taxonomy systems;
  2. develop knowledge of plant anatomical structures and functions for plant identification; and
  3. develop plant classifications based on cropping schedules and market demand for greenhouse crops.
- D. **The student identifies and investigates different greenhouse structures and construction factors. The student is expected to:**
1. select greenhouse coverings;
  2. compare greenhouse styles and construction materials;
  3. analyze the costs associated with greenhouse construction;
  4. evaluate greenhouse site orientation and construction concerns;
  5. integrate other growing structures such as cold frames, hotbeds, lath houses, and potting sheds; and
  6. investigate local, state, and national regulations affecting greenhouse operations.
- E. **The student identifies and assesses environmental conditions within the greenhouse. The student is expected to:**
1. investigate environmental factors controlled in the greenhouse;
  2. determine and calculate factors used in heating and cooling a greenhouse;
  3. investigate the effects of greenhouse climate conditions such as ventilation, carbon dioxide generation, and humidity on plant growth in the greenhouse;
  4. explore the importance of light quality, quantity, and duration on the production of greenhouse crops; and
  5. compare open and closed environmental systems in the greenhouse, such as misting beds or hydroponics.
- F. **The student identifies, operates, and maintains greenhouse environmental and mechanical controls. The student is expected to:**
1. explain how to operate and maintain heating, cooling, and ventilation systems in a greenhouse;
  2. explain how to operate and maintain electrical systems in a greenhouse; and
  3. explain how to operate and maintain various water systems in a greenhouse.
- G. **The student propagates greenhouse crops. The student is expected to:**
1. analyze different methods of propagating greenhouse crops using sexual and asexual propagation methods;
  2. propagate greenhouse crops using various methods such as using seeds, seedlings, plugs, cuttings, and tissue culture; and
  3. investigate physiological conditions that affect plant propagation, such as seed dormancy and root initiation.
- H. **The student identifies and investigates greenhouse crop production factors. The student is expected to:**
1. explain and demonstrate the chemical and physical differences in greenhouse media components;
  2. compare greenhouse growing mixes for factors such as drainage and nutrient-holding capacity;
  3. compare and contrast different containers, benches, and other production equipment used in greenhouse crop production;
  4. evaluate different methods of watering greenhouse crops;
  5. analyze the effect of nutrients on greenhouse plant growth;
  6. diagnose common nutrient deficiency symptoms found in greenhouse crops; and
  7. develop fertilization plans that address greenhouse crop needs and environmental impacts.



- I. **The student investigates pest identification and control methods in the greenhouse environment. The student is expected to:**
1. assess insect, pathogen, and weed infestations in a greenhouse;
  2. implement Integrated Pest Management in controlling an insect, pathogen, or weed problem;
  3. use appropriate greenhouse pesticide application techniques and equipment;
  4. research chemicals used to regulate plant growth in the greenhouse; and
  5. examine pesticide labeling and safety data sheets.
- J. **The student performs greenhouse management business procedures. The student is expected to:**
1. market greenhouse crops;
  2. transport greenhouse crops;
  3. analyze materials, labor, and administrative costs related to greenhouse production;
  4. analyze methods used to maintain crop quality during marketing and transport; and
  5. prepare a production schedule for a greenhouse crop.
- K. **The student develops technology skills. The student is expected to:**
1. use technology as a tool to research, organize, evaluate, and communicate information;
  2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to function in a knowledge economy successfully;
  3. demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Practicum in Agriculture, Food, and Natural Resources

1. **General requirements.** This course is recommended for students in Grades 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Agriculture, Food, and Natural Resources Career Cluster. Prerequisite: Advanced Energy and Natural Resources (Energy and Natural Resource Technology POS) or Greenhouse Operation and Management (Horticulture Science POS).
2. **Introduction.**
  - A. Career and technical education instruction provides students with industry-aligned content, challenging academic standards, and relevant technical knowledge to further their education and succeed in current or emerging professions.
  - B. The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
  - C. Practicum in Agriculture, Food, and Natural Resources is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experiences such as employment, independent study, internships, assistantships, mentorships, or laboratories. To prepare for careers in agriculture, food and natural resources, students must attain academic skills and knowledge, acquire technical knowledge and skills related to the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.
  - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which includes paid or unpaid internship, pre-apprenticeship, or apprenticeship experiences relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. adhere to policies and procedures;
    2. demonstrate positive work behaviors and attitudes, including punctuality, time management, initiative, and cooperation;
    3. apply constructive criticism and critical feedback from supervisor and peers;
    4. apply ethical reasoning to a variety of situations in order to make ethical decisions;
    5. complete tasks with high standards to ensure quality products and services;
    6. model professional appearance, including using appropriate dress, grooming, and personal protective equipment; and
    7. comply with practicum setting safety rules and regulations to maintain safe and healthful working conditions and environments.



- B. The student develops a supervised agriculture experience program. The student is expected to:**
1. plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;
  2. apply proper record-keeping skills as they relate to the supervised agriculture experience;
  3. participate in youth leadership opportunities to create a well-rounded experience program; and
  4. produce and participate in a local program of activities using a strategic planning process.
- C. The student applies concepts of critical thinking and problem solving. The student is expected to:**
1. analyze elements of a problem to develop creative and innovative solutions;
  2. analyze information to determine value to the problem-solving task;
  3. compare and contrast alternatives using a variety of problem-solving and critical-thinking skills; and
  4. conduct technical research to gather information necessary for decision making.
- D. The student demonstrates leadership and teamwork skills to accomplish goals and objectives. The student is expected to:**
1. analyze leadership characteristics in relation to trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation;
  2. demonstrate teamwork skills through working cooperatively with others to achieve tasks;
  3. demonstrate teamwork processes that promote team-building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;
  4. demonstrate responsibility for shared group and individual work tasks;
  5. establish and maintain effective working relationships in order to accomplish objectives and tasks;
  6. demonstrate effective working relationships using interpersonal skills in order to accomplish objectives and tasks;
  7. negotiate and work cooperatively with others using positive interpersonal skills; and
  8. demonstrate respect for individuals, including those from different cultures, genders, and backgrounds, and value for diversity.
- E. The student demonstrates oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:**
1. apply appropriate content knowledge, technical concepts, and vocabulary when analyzing information and following directions;
  2. employ verbal skills when obtaining and conveying information;
  3. review, use, and apply informational texts, Internet sites, or technical materials for occupational tasks;
  4. evaluate the reliability of information from informational texts, Internet sites, or technical materials and resources;
  5. interpret verbal and nonverbal cues and behaviors to enhance communication;
  6. apply active listening skills to obtain and clarify information; and
  7. facilitate effective written and oral communication using academic skills.



- F. The student develops management skills for agricultural resources. The student is expected to:**
1. discuss the importance of agricultural and natural resources to individuals and society;
  2. develop long-range land, water, and air quality management plans;
  3. practice equipment maintenance procedures;
  4. analyze the cost and maintenance of tools, equipment, and structures used in agriculture;
  5. describe and develop marketing strategies for agricultural and natural resources;
  6. decide between replacement, maintenance, repair, and reconditioning of agricultural vehicles and machinery; and
  7. describe and perform hazard analysis and follow safety laws.
- G. The student demonstrates technical knowledge and skills required to pursue a career in the Agriculture, Food, and Natural Resources Career Cluster. The student is expected to:**
1. develop advanced technical knowledge and skills related to the personal, occupational objective;
  2. evaluate strengths and weaknesses in technical skill proficiency;
  3. explain the principles of safe operation of tools and equipment related to the practicum; and
  4. pursue opportunities for licensure or certification related to chosen career path.
- H. The student documents technical knowledge and skills. The student is expected to:**
1. create a professional portfolio to include information such as:
    - a. attainment of technical skill competencies;
    - b. licensures or certifications;
    - c. recognitions, awards, and scholarships;
    - d. extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;
    - e. abstract of key points of the practicum;
    - f. resume;
    - g. samples of work; and
    - h. evaluation from the practicum supervisor.
  2. present the portfolio to interested stakeholders.
- I. The student develops technology skills. The student is expected to:**
1. use technology as a tool to research, organize, evaluate, and communicate information;
  2. use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to function in a knowledge economy successfully;
  3. demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.