

Cybersecurity in Food and Agriculture

8074 36 weeks

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Course Description

Suggested Grade Level: 10 or 11 or 12

Prerequisites: 6302

In this course, students will focus on the evolving threats and security practices in the food and agricultural industries. Students will project future trends, research national and international policies and laws created to protect the nation's food supply, and explore careers related to cybersecurity in the various sectors of the food and agriculture industry.

Task Essentials Table

8074	Tasks/Competencies
<input checked="" type="checkbox"/>	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.
<input checked="" type="checkbox"/>	Participate in an SAE.
<input checked="" type="checkbox"/>	Identify the benefits and responsibilities of FFA membership.
<input checked="" type="checkbox"/>	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.
<input type="checkbox"/>	Apply for an FFA degree and/or an agricultural proficiency award.
<input checked="" type="checkbox"/>	Identify the Department of Homeland Security's (DHS) 16 critical infrastructure sectors.

+	Analyze the interdependence among the commercial facilities, financial services, and food and agriculture (FA) sectors.
+	Define <i>asset</i> .
+	Define <i>threat</i> .
+	Define <i>vulnerability</i> .
+	Define <i>risk</i> .
+	Compare food defense, food safety, and food security.
+	Explain intentional and unintentional food contamination and disruption.
+	Identify cybersecurity vulnerabilities and threats in animal production systems.
+	Explain cybersecurity vulnerabilities and threats in animal systems related to health.
+	Explain cybersecurity vulnerabilities in animal feed systems.
+	Identify cybersecurity vulnerabilities regarding pharmaceuticals.
+	Explain cybersecurity vulnerabilities in plant production systems.
+	Identify cybersecurity threats and risks in water sources.
+	Identify cybersecurity threats and risks related to power.
+	Identify cybersecurity threats related to chemicals.
+	Identify cybersecurity threats related to facilities.
+	Identify cybersecurity threats related to equipment.
+	Propose methods to ensure equipment (e.g., drones) is resistant to cyberattack.
+	Outline the risks associated with fuel supply disruption.
+	Explain the steps to identify false information on sensor-based systems.
+	Define <i>precision agriculture</i> (PA).
+	Describe the technologies used in precision agriculture and precision agronomics.
+	Synthesize data gathered using leading technology (e.g., GPS, GIS, cellular and wireless communication, software).
+	Identify facilities that engage in food processing.
○	Identify facilities that engage in beverage production.

+	Identify animal slaughtering and processing facilities.
+	Identify facilities engaged in the manufacture of food and feed for animals.
+	Explain how machinery and equipment maintenance plans can reveal cybersecurity intrusion.
+	Explain how animal, plant, soil, and/or mechanical test results can reveal cybersecurity intrusion.
+	Explain how point source and nonpoint source pollution can endanger food production capabilities.
+	Describe types of advertising media used by agricultural businesses.
+	Identify wholesale and retail distribution of agricultural and food products.
+	Identify agricultural products transportation systems.
+	Identify methods of distribution disruption.
+	Identify risks in labeling and barcodes.
+	Identify risks associated with agricultural food product storage facilities.
+	Explain how to create a secure customer relationship management (CRM) database.
+	Keep accurate business records.
+	Explain how cyber intrusion might affect an agricultural enterprise's budget.
+	Describe management controls used to secure information, operations, and prevent breaches of security.
+	Identify financial management tools and strategies related to cybersecurity.
+	Identify agricultural applications of leading technology (e.g., GPS, GIS, cellular and wireless communication, software).
+	Explain how the creation of records and correspondence, using word processing software, spreadsheets, databases, and email, exposes the creator to cyber threats.
+	Back up and restore files.
+	Identify methods of preventing importation of computer viruses.
+	Explain the basics of financial compliance.
+	Explain the effects of identity theft.
+	Explain the effects of intellectual property (IP) theft.
+	Predict indicators of commodity stock manipulation.

<input checked="" type="radio"/>	Research historical precedents of stock/credit manipulation.
<input checked="" type="radio"/>	Identify risks of cyberattacks on different producer coalitions.
<input checked="" type="radio"/>	Identify national and international cybersecurity laws and policies related to agricultural enterprises.
<input checked="" type="radio"/>	Identify regulatory, oversight, and industry organizations in the agriculture and food sectors.
<input checked="" type="radio"/>	Explain the Economic Espionage Act.
<input checked="" type="radio"/>	Explain the importance of the 2017 Securing our Agriculture and Food Act.
<input checked="" type="radio"/>	Identify the costs associated with litigation in cybersecurity cases.
<input checked="" type="radio"/>	Identify the advantages and disadvantages of the Internet of Things (IoT).
<input checked="" type="radio"/>	Research trends in automation and artificial intelligence (AI) control.
<input checked="" type="radio"/>	Research educational requirements for cybersecurity jobs in agriculture.
<input checked="" type="radio"/>	Identify careers associated with cybersecurity in agriculture.
<input type="radio"/>	Participate in a work-based learning opportunity related to cybersecurity in an agricultural enterprise.
<input checked="" type="radio"/>	Conduct research on cybersecurity in the food and agriculture industries.
<input checked="" type="radio"/>	Conduct an oral presentation on a subject related to cybersecurity in the food and agriculture industries, using presentation software.

Legend: Essential Non-essential Omitted

Note: Competencies 39-43 have been added to ensure compliance with federal legislation: National FFA Organization's Federal Charter Amendments Act (Public Law 116-7, <https://www.congress.gov/116/plaws/publ7/PLAW-116publ7.pdf>). All inquiries may be sent to cte@doe.virginia.gov. Students are provided opportunities for leadership, personal growth, and career success. Instruction is delivered through three major components: classroom and laboratory instruction, supervised agricultural experience (SAE) program, and student leadership (FFA).

Curriculum Framework

Task Number 39

Identify the role of supervised agricultural experiences (SAEs) in agricultural education.

Definition

Identification should include

- defining an SAE program as *an opportunity for students to consider multiple careers and occupations in the agriculture, food, and natural resources (AFNR) industries, learn expected workplace behavior, develop specific skills within an industry, and apply academic and occupational skills in the workplace or a simulated workplace environment*
- researching the Foundational SAE
 - career exploration and planning
 - personal financial planning and management
 - workplace safety
 - employability skills for college and career readiness
 - agricultural literacy
- researching the Immersion SAE
 - entrepreneurship/ownership
 - placement/internships
 - research (experimental, analytical, invention)
 - school business enterprises
 - service learning
- developing a plan to participate in an SAE, based on personal and career goals
- researching available awards and degrees, based on SAE participation.

Teacher resource: [SAE Resources](#), National Council for Agricultural Education

Process/Skill Questions

- What are examples of SAEs related to this course and in the AFNR industries?
- Where can a copy of the Virginia SAE Record Book be found?
- What is an Immersion SAE?
- How does a placement/internship SAE differ from an ownership/entrepreneurship SAE?
- How does an SAE provide relevant work experience and contribute to the development of critical thinking skills?
- How is the SAE an extended individualized instructional component of a student's Career Plan of Study?
- How can an SAE be used to provide evidence of student growth and participation in authentic, work-related tasks?
- What are the four types of SAEs?
- What are the advantages of participating in work-based learning experiences and projects?
- How does one choose an appropriate SAE in which to participate?

Task Number 40

Participate in an SAE.

Definition

Participation should include

- developing, completing, or continuing a plan to participate in an SAE as a work-based learning experience, based on personal and career goals
- documenting experience, connections, positions held, and competencies attained, using the *Virginia SAE Record Book*
- researching available awards and degrees, based on SAE participation.

Teacher resources:

[FFA SAE](#)

[The Agricultural Experience Tracker](#)

Process/Skill Questions

- What are the advantages of participating in work-based learning experiences and projects?
- How do SAEs help prepare students for the workforce?
- What are some examples of SAEs in AFNR?

Exploring Leadership Opportunities through FFA

Task Number 41

Identify the benefits and responsibilities of FFA membership.

Definition

Identification should include

- benefits
 - listing opportunities to participate in community improvement projects and career development events (CDEs) and leadership development events (LDEs)
 - exploring leadership development opportunities
- responsibilities
 - researching the responsibilities of FFA officers, committees, and members
 - locating resources that guide participation in FFA activities
 - explaining the FFA Creed, Motto, Salute, and mission statement
 - explaining the meaning of the FFA emblem, colors, and symbols
 - explaining significant events and the history of the organization.

Process/Skill Questions

- How does one become an FFA member?
- What is the FFA's mission and how does it accomplish its mission?
- What are the benefits and responsibilities of FFA membership?
- What five FFA activities are available through the local chapter?
- What are some significant events in FFA history? How have these events shaped membership over time?
- What is the FFA program of activities (POA), and how is it used?

Task Number 42

Describe leadership characteristics and opportunities as they relate to agriculture and FFA.

Definition

Description should include

- examples of successful leaders
- types of leadership
 - autocratic
 - participative
 - laissez-faire
 - servant
 - followership
- positive leadership qualities and traits of successful leaders
- opportunities for participating in leadership activities in FFA
- demonstrating methods for conducting an effective meeting.

Process/Skill Questions

- Who are some successful leaders in the agriculture industry?
- What qualities make a successful leader?
- What are leadership traits?
- What is the difference between positive and negative leadership?

Task Number 43

Apply for an FFA degree and/or an agricultural proficiency award.

Definition

Application should include

- identifying types of FFA degrees
 - Greenhand

- Chapter
- State
- American
- identifying proficiency award areas
 - entrepreneurship
 - placement
 - combined
 - agriscience research
- exploring CDEs and LDEs related to this course
- identifying all SAE criteria to be eligible for the award
- identifying the type of award
- applying for an FFA award.

Teacher resource: [FFA Agricultural Proficiency Awards](#)

Process/Skill Questions

- Where are the awards and their application criteria located?
- What are the benefits of winning an FFA award?
- What are the benefits and requirements of an FFA degree?
- What FFA awards are available?
- How does the FFA degree program reward FFA members in all phases of leadership, skills, and occupational development?
- What is the highest degree that can be conferred upon an FFA member at the national level?
- What are the requirements for a Greenhand FFA degree?

Understanding Cybersecurity in Food and Agriculture

Task Number 44

Identify the Department of Homeland Security's (DHS) 16 critical infrastructure sectors.

Definition

Identification should include the

- Chemical Sector
- Commercial Facilities Sector
- Communications Sector
- Critical Manufacturing Sector
- Dam Sector

- Defense Industrial Base Sector
- Emergency Services Sector
- Energy Sector
- Financial Services Sector
- Food and Agriculture Sector
- Government Facilities Sector
- Healthcare and Public Health Sector
- Information Technology Sector
- Nuclear Reactors, Materials, and Waste Sector
- Transportation Systems Sector
- Water and Wastewater Systems Sector.

Process/Skill Questions

- What are the 16 critical infrastructure sectors identified by the DHS?
- What overlaps exist among the 16 critical infrastructure sectors?
- What role does the agriculture industry play in each of these sectors?
- Why are certain sectors more vulnerable than others are to cyberattack?
- Why would these sectors need heightened protection over other government agencies?
- How can state agencies and/or each sector's industry leaders support the DHS in their mission?

Task Number 45

Analyze the interdependence among the commercial facilities, financial services, and food and agriculture (FA) sectors.

Definition

Analysis should include possibilities of large-scale revenue losses and catastrophic damage in the event of an attack or failure within one of these sectors.

Teacher Resource:

[Food and Agriculture Sector-Specific Plan](#)

Process/Skill Questions

- What are the similarities and differences between the Commercial Facilities, Financial Services, and Food and Agriculture (FA) Sectors?
- What are the different financial services in the agricultural industry?
- Who are the key stakeholders affected by an agriculture-focused cyberattack?
- What is the snowball effect for a massive cyberattack?
- What are the consequences of an attack or failure within one of Homeland Security's 16 infrastructure sectors, specifically in the agriculture industry?

Task Number 46

Define *asset*.

Definition

Definition should include what businesses seek to protect, such as

- people
- property
- information
 - tangible
 - databases
 - company records
 - intangible
 - reputation
 - proprietary information.

Teacher Resource:

[DHS Risk Lexicon](#)

Process/Skill Questions

- What is an *asset*?
- What is the difference between tangible and intangible assets?
- What are possible vulnerabilities regarding each of these assets?
- What is an example of a database that businesses may use to improve their record keeping?

Task Number 47

Define *threat*.

Definition

Definition should include anything that can exploit a vulnerability, intentionally or accidentally, and obtain, damage, or destroy an asset.

Process/Skill Questions

- What is a *threat*?
- What does it mean to be vulnerable?
- What is the difference between intentional and accidental exploitation?
- What is an example of a vulnerability in American history that resulted in damaged or destroyed assets?
- Why are threats harder to identify now than they were 15 years ago?
- What are examples of potential cyber threats to the agriculture industry?

Task Number 48

Define *vulnerability*.

Definition

Definition should include weaknesses or gaps in a security program that could be exploited to gain unauthorized access to an asset.

Process/Skill Questions

- What does *vulnerability* mean?
- What are weaknesses or gaps that could be exploited in a security program to gain unauthorized access to an asset?
- How is it possible to secure a system from all vulnerabilities?
- How can the next generation of the cybersecurity workforce be educated to be proactive in identifying vulnerabilities?
- What is the digital trilemma?

Task Number 49

Define *risk*.

Definition

Definition should include the potential for loss, damage, or destruction of an asset resulting from a threat exploiting a vulnerability.

Process/Skill Questions

- What is a *risk*?
- Who defines risk-- the stakeholder, government, or the consumer? Is risk objective or subjective?
- How are assets lost, damaged, or destroyed as a direct result of threats?
- What formula is used to determine risk?
- What is essential to understanding risks to assets?

Task Number 50

Compare food defense, food safety, and food security.

Definition

Comparison should include

- *food defense* as the effort to protect food against intentional contamination with the intent to harm public health or create economic disruption
- *food safety* as the effort to protect food against unintentional contamination
- *food security* as defined by the World Food Summit of 1996

- availability
- access
- utilization.

Process/Skill Questions

- What are the consequences of economic disruption?
- What methods are used to compromise food defense, safety, or security?

Task Number 51

Explain intentional and unintentional food contamination and disruption.

Definition

Explanation should include

- intentional contamination and disruption scenarios (e.g., food production as a tempting target for terrorists)
- unintentional contamination and disruption scenarios.

Process/Skill Questions

- What is intentional food contamination?
- How would a terrorist intentionally contaminate food?
- What resources are available to prevent intentional contamination?
- What is unintentional food contamination?
- What are examples of intentional contamination, and what are their effects?
- What are examples of unintentional contamination, and what are their effects?
- How do each of these scenarios disrupt food production and the agriculture industry?
- What are some food-contamination scares that have affected the U.S. markets?

Exploring Cybersecurity Vulnerabilities in Agricultural Production

Task Number 52

Identify cybersecurity vulnerabilities and threats in animal production systems.

Definition

Identification should include risk of

- data theft
- data manipulation in genetically engineered organisms (GEO)
- data manipulation regarding valuable animals and their breeding/health records.

Process/Skill Questions

- What is a GEO?
- What is an example of a genetically modified organism (GMO)?
- What security measures do chemical manufacturers typically have in place?
- What are the cybersecurity risks in relation to animals?
- Why is it so important to safeguard genetic data of modified animals?
- Where would an attacker look for vulnerabilities to access/manipulate GMO data?
- How can data regarding animal vaccinations, breeding, or ownership be manipulated?

Task Number 53

Explain cybersecurity vulnerabilities and threats in animal systems related to health.

Definition

Explanation should include

- intentional and unintentional threats and vulnerabilities
- mechanisms for early detection of health incidents
- biosurveillance (i.e., nationally coordinated disease surveillance programs)
- infrastructure vulnerability.

Process/Skill Questions

- What is the National Biosurveillance Integration Center (NBIC), and what is its role in protecting the nation's food supply?
- How is biosurveillance used at the local, state, and federal level?

Task Number 54

Explain cybersecurity vulnerabilities in animal feed systems.

Definition

Explanation should include

- potential contaminants
- mislabeling (intentional or unintentional)
- feed-ratio formulation
- input disruption
- distribution
- potential results of attack.

Teacher Resource:

[FeedCalculator](#)

Process/Skill Questions

- What critical sectors are affected by animal feed system breaches?
- What portion of an animal feed label is most vulnerable to mislabeling?
- How are feed rations formulated?
- How could cyberterrorist attacks disrupt feed distribution in the livestock industry?
- How could intentional or unintentional product mislabeling result in a large financial loss for a company?

Task Number 55

Identify cybersecurity vulnerabilities regarding pharmaceuticals.

Definition

Identification should include

- types of pharmaceuticals
 - vaccines
 - antibiotics
 - growth stimulants
 - steroids
 - biochemicals
- sources of disruption
- potential results of attack.

Process/Skill Questions

- How could cyberterrorism affect the pharmaceutical industry?
- What critical sectors are affected by pharmaceutical breaches?
- What would be the effects of a pharmaceutical attack on the livestock industry?
- What firewalls do pharmaceutical companies currently have in place?
- What are examples of growth stimulants, and in what agricultural industries are they used?

Task Number 56

Explain cybersecurity vulnerabilities in plant production systems.

Definition

Explanation should include

- fertilizer formulation and irregularities
- tracking GMOs
- risk of data theft and data manipulation in GEOs.

Process/Skill Questions

- Which critical sectors are affected by plant systems breaches?
- What are the three primary nutrients in commercial fertilizer?
- What are examples of foreign bodies that could be found in fertilizers?
- What are cybersecurity risks related to chemical and fertilizer manufacturing?
- What are the risks related to cybersecurity and GMOs?

Examining Potential Threats and Risks in Food and Agriculture

Task Number 57

Identify cybersecurity threats and risks in water sources.

Definition

Identification should include

- types of water sources
 - irrigation
 - municipal
 - reservoir/dam operation
 - freshwater supply
 - ground water/aquifers
 - surface water
- types of contaminants
- sources of disruption
- results of overuse.

Process/Skill Questions

- How can cyberterrorism be used to disrupt the water supply?

- Where are the vulnerabilities in water sources?
- What are some U.S. cities (over 5 million population) that depend on one major source of water?
- How is water a real-world potential threat to a nation's security?

Task Number 58

Identify cybersecurity threats and risks related to power.

Definition

Identification should include

- types of power sources
- sources of disruption
 - surges
 - blackouts and brownouts
- cyberattacks on substations, electricity distributors, market grids
- multi-pronged attacks
- potential results of attack.

Process/Skill Questions

- How can cyberterrorism affect the power grid?
- What critical sectors are affected by power breaches?
- What are the potential effects on the agriculture industry if faced with a long-term lack of power?

Task Number 59

Identify cybersecurity threats related to chemicals.

Definition

Identification should include

- examples of commonly used chemicals
 - fertilizers
 - pesticides
 - growth regulators
- production of chemicals
- safety systems for chemical production.

Process/Skill Questions

- What are the cybersecurity risks involved in the production of chemicals and fertilizers?
- What are some commonly used chemicals in the agricultural industry?
- What are some national security concerns regarding imports and exports?
- What security measures do chemical manufacturers typically have in place?

- How could a malicious actor manipulate chemicals used in agricultural production to cause harm?
- What is the snowball effect of a cyberattack aimed at chemical use/transportation?

Task Number 60

Identify cybersecurity threats related to facilities.

Definition

Identification should include

- access to facilities
- effects of control system manipulation
 - heating, ventilation, and air conditioning (HVAC)
 - water circulation
 - lighting
- security systems and protocols
- effects of contamination.

Teacher Resource:

[The Stuxnet Attack on Iran's Nuclear Plant](#)

Process/Skill Questions

- What are the weaknesses in various agricultural facilities?
- How can security in agricultural facilities be improved to decrease the threat of cyberterrorism?
- What is CAFO? What are the potential vulnerabilities in their support systems?
- What are some recent innovations to utilize system controls?

Task Number 61

Identify cybersecurity threats related to equipment.

Definition

Identification should include

- pumps
- irrigation systems
- drones
- automated equipment (e.g., tractors)
- ventilation
- intentional tampering.

Process/Skill Questions

- What types of farms utilize irrigation systems?
- What purpose would drones serve in the farming community?
- What are current FAA rules for drone use?
- How can drones be used to cause disruption in the agricultural industry?

Task Number 62

Propose methods to ensure equipment (e.g., drones) is resistant to cyberattack.

Definition

Proposal should include

- analysis of the current platform safeguards
- discussion of the platform's ability to upgrade
- presentation showing the steps required for the upgrade
- listing the advantages/disadvantages of upgrading

Process/Skill Questions

- How are drones used in agriculture?
- How can drones be made resistant to cyberattacks?
- What security system is in place with standard drones?
- Who should have access and control over high-value, next-generation machinery?
- What are the advantages and disadvantages of completely automating an agricultural system?

Task Number 63

Outline the risks associated with fuel supply disruption.

Definition

Explanation should include

- different types of fuels (e.g., propane, diesel)
- pipeline vulnerability.

Process/Skill Questions

- What are the different types of fuels used in agriculture?
- How are pipelines vulnerable to cyberattacks?
- What are the risks associated with fuel disruption?
- How do relations with foreign countries affect fuel supply?

Task Number 64

Explain the steps to identify false information on sensor-based systems.

Definition

Explanation should include the

- "dog that didn't bark" scenario
- "denial and deception" scenario
- "too good to be true" scenario.

Process/Skill Questions

- What is an example of a sensor-based system?
- What types of businesses would utilize sensor-based systems?
- What is the "dog that didn't bark" scenario?
- What is the "denial and deception" scenario?
- What is the "too good to be true" scenario?

Examining Precision Agriculture

Task Number 65

Define *precision agriculture* (PA).

Definition

Definition should include satellite farming or site-specific crop management (SSCM) as a farming management concept, based on observing, measuring, and responding to inter- and intra-field variability in crops.

Process/Skill Questions

- What is *precision agriculture*?
- What are the strengths of precision agriculture?
- What are the risks?
- What are the vulnerabilities?
- What are the assets affected?
- What is an example of site-specific application equipment used in agriculture? How does it work?
- What new precision technologies are available in agriculture production that were not available five years ago?
- What are the environmental benefits of site-specific application?

Task Number 66

Describe the technologies used in precision agriculture and precision agronomics.

Definition

Description should include

- high-precision positioning systems (e.g., GPS)
- sensors and remote sensing (e.g., drones)
- automated steering systems
- geomapping (e.g., yield, soil, scouting)
- variable-rate technology
- integrated electronic communications.

Teacher Resource:

[AGFUNDER NEWS: What is Precision Agriculture?](#)

Process/Skill Questions

- How is GPS used in precision agriculture?
- How can this technology be susceptible to cyber threats?
- What level of accuracy is needed in GPS equipment for agricultural applications?
- What is an example of data collected from remote-sensing equipment? How is the data used?
- What is the difference between agriculture and agronomics?
- What type of equipment would utilize automated steering systems?
- How can variable-rate technology affect the environment?

Task Number 67

Synthesize data gathered using leading technology (e.g., GPS, GIS, cellular and wireless communication, software).

Definition

Synthesis may include

- reading maps and locating areas
- interpreting data
- following commodity prices
- making predictions based on data.

Process/Skill Questions

- What types of data-gathering technologies are used in the agriculture industry?
- How are GPS and GIS used in agriculture?
- How has precision farming changed agricultural practices?

- What resources are available to follow commodity prices?
- How can one make predictions based on data and/or trends from the past?
- What are sources of commodity-pricing information?
- What are agricultural uses of cellular communications?

Exploring Cybersecurity in Agricultural Processing

Task Number 68

Identify facilities that engage in food processing.

Definition

Identification should include facilities that manufacture

- canned, pickled, and dried fruits and vegetables
- snack foods
- frozen foods
- bakery products
- confectioneries
- concentrates, syrups, condiments, and spices.

Process/Skill Questions

- What are the vulnerabilities of food-manufacturing facilities?
- What are the assets affected?
- What types of facilities process foods?
- What are the risks of cyberattacks to these facilities?
- What are the consequences of a breach of security in a food processing facility?

Task Number 69

Identify facilities that engage in beverage production.

Definition

Identification should include manufacturing of

- nonalcoholic beverages, including ice
- alcoholic beverages through the fermentation process
- distilled alcoholic beverages.

Process/Skill Questions

- What are the risks to beverage-manufacturing facilities?
- What are the vulnerabilities of beverage-manufacturing facilities?
- What are the assets affected?
- What is the fermentation process?
- What types of facilities process beverages?

Task Number 70

Identify animal slaughtering and processing facilities.

Definition

Identification should include facilities engaged in

- slaughtering animals
- preparing processed meats and meat byproducts
- rendering and/or refining animal fat, bones, and meat scraps
- cutting and packing of meats.

Process/Skill Questions

- What are the risks to animal slaughtering and processing facilities?
- What are the vulnerabilities of animal slaughtering and processing facilities?
- What are the assets affected?
- What are examples of meat byproducts?
- How is animal fat rendered?
- What types of facilities are used to slaughter and process livestock?
- What are the risks of these facilities with respect to a cyberattack?
- How much oversight does, or should, the USDA have over thwarting a scare (e.g., bovine spongiform encephalopathy [BSE], commonly known as mad cow disease) to preclude a public reaction?

Task Number 71

Identify facilities engaged in the manufacture of food and feed for animals.

Definition

Identification should include

- manufacture of feed for livestock, dairy, poultry, and specialty animals
- manufacture of grain and meat feed, supplements, concentrates, mixes, and other animal feed
- manufacture of pet food
- on-site feed mills
- off-site feed mills.

Process/Skill Questions

- What are the risks to animal food and feed manufacturing facilities?
- What are the vulnerabilities of animal food and feed manufacturing facilities?
- What are the assets affected?
- What effect would a cyberattack have on facilities engaged in the manufacture of feeds for livestock, dairy, poultry, and specialty animals?
- What is the difference between an on-site feed mill and an off-site feed mill?
- What is the benefit of an on-site feed mill?
- What are the cyberattack risks to these facilities?

Task Number 72

Explain how machinery and equipment maintenance plans can reveal cybersecurity intrusion.

Definition

Explanation should include

- functionality of equipment
- servicing requirements
- diagnostic manipulation
- the "dog that didn't bark" scenario
- bread and butter
- denial and deception
- "too good to be true" scenario.

Process/Skill Questions

- What are the risks associated with machinery and equipment?
- What are the vulnerabilities associated with machinery and equipment?
- What are the assets affected?
- What maintenance plans do farms have in place for their machinery and equipment?
- What elements would one include when creating a maintenance plan?
- How can machinery or equipment facilities be susceptible to cyberattacks?

Task Number 73

Explain how animal, plant, soil, and/or mechanical test results can reveal cybersecurity intrusion.

Definition

Explanation should include

- the identification of the parties who have access to the data before, during, and after the test
- the value of the data to an intruder

- at what point during testing, the data is at risk.

Process/Skill Questions

- What are the risks?
- What are the vulnerabilities?
- What are the assets affected?
- How would an animal, plant, soil and/or mechanical test reveal a cyber intrusion?

Task Number 74

Explain how point source and nonpoint source pollution can endanger food production capabilities.

Definition

Explanation should include

- identification of point source pollution
 - factories
 - sewage treatment facilities
 - pipes
 - ditches
- identification of nonpoint source pollution
 - land runoff
 - drainage
 - atmospheric drainage
 - possible solutions being explored (e.g., source ID systems).

Teacher Resource:

[United States EPA: What is Nonpoint Source?](#)

Process/Skill Questions

- What is point source and nonpoint source pollution?
- What are the major differences between the two?
- What is an example of atmospheric drainage?
- How are point source and nonpoint source pollution related to cybersecurity?
- How can point source and nonpoint source pollution endanger the nation's food supply?

Investigating Cybersecurity in Agricultural Marketing and Distribution

Task Number 75

Describe types of advertising media used by agricultural businesses.

Definition

Description should include

- radio
- television
- newspaper
- magazines and catalogs
- signs and billboards
- Internet and social media
- direct mailings.

Process/Skill Questions

- What are the most effective advertising media for different agricultural businesses?
- What is the most expensive advertising medium, and what is the least expensive?
- How can an advertising budget be determined?
- What are the objectives of advertising media?
- What are test plots? How do they help promote agricultural products?
- What social media avenues have proven to be effective for agribusiness advertising?
- How does agribusiness advertising differ from advertising in other industries?
- How have the Internet and social media changed advertising?
- What determines which form of advertising will be most beneficial for a business?
- Why is vigilance in advertisement security relevant considering microtargeted ads using massive data analytics?
- How would one protect brand-name recognition and targeted ads from disruption?
- What media (e.g., social media, radio) are most vulnerable to distortion from a bad actor?
- Who would target the advertising campaign of an agriculture company? Why?

Task Number 76

Identify wholesale and retail distribution of agricultural and food products.

Definition

Identification should include

- farm product wholesalers
- grain and field bean wholesalers
- livestock markets
- grocery and related product wholesalers
- food and beverage retailers

- supermarkets and grocery stores
- convenience stores
- specialty-food stores
- beer, wine, and liquor stores
- food-service and drinking facilities
- full-service restaurants
- limited-service food facilities
- bars, taverns, nightclubs, and cocktail lounges.

Process/Skill Questions

- What are the risks to distribution of agricultural and food products?
- What are the vulnerabilities to distribution of agricultural and food products?
- What are the assets affected?
- What is the effect of trade policies on growing and producing agricultural products?
- Where do various wholesalers buy their product(s)? To whom do they sell it?
- What is the difference between wholesale and retail distribution?

Task Number 77

Identify agricultural products transportation systems.

Definition

Identification should include

- road transport, including trucks, truck terminals, truck wash and disinfection facilities, highways, bridges, and tunnels
- rail transport, including rail tank cars, rail car loading/unloading terminals, rail car wash and disinfection facilities, rail rights-of-way, railroad bridges, and railroad tunnels
- maritime transport, including barges, loading/unloading piers, waterways, canals, and ports
- air transport, including aircraft and airports.

Process/Skill Questions

- What are the risks to agricultural products transportation systems?
- What are the vulnerabilities of agricultural products transportation systems?
- What are the assets affected?
- What type of products require maritime transport?
- How would disruption of maritime transport affect the food supply sector?
- What regulations are in place to ensure security while transporting goods via air?
- How might the risk of cyberattacks be elevated in global transportation vs. domestic transportation?

Task Number 78

Identify methods of distribution disruption.

Definition

Identification should include

- methods of distribution (i.e., transportation method)
- methods of disruption
 - denial of service
 - viruses
 - worms
 - malware
 - system hacking and data manipulation
 - hacking into supply routes and logistics management
- potential miscommunication issues in international trade
- false advertising.

Process/Skill Questions

- How are agricultural food products transported?
- How would false advertising pose a potential threat to the distribution sector?
- How is the transportation network susceptible to cyberattack?
- Why is it important to protect against false trade numbers?
- Why is product distribution dangerous in the era of self-driving technology?

Task Number 79

Identify risks in labeling and barcodes.

Definition

Identification should include

- improper labeling
- intentional manipulation of labels and barcodes
- consequences of product recalls.

Process/Skill Questions

- What are the economic and health consequences of mislabeling of products?
- What are the potential risks of large product recalls?
- What governing body is responsible for product recalls?
- How are consumers contacted regarding product recalls?

Task Number 80

Identify risks associated with agricultural food product storage facilities.

Definition

Identification should include

- types of facilities
 - bulk food
 - grain elevators
 - non-refrigerated bulk food storage
 - processed food storage facilities
 - non-refrigerated processed food storage
 - refrigerated food storage facilities
- access
- operations (e.g., climate controls).

Process/Skill Questions

- What are the risks of a cyberattack on an agricultural food product storage facility?
- Why would a malicious actor launch a cyberattack against a refrigeration system?

Task Number 81

Explain how to create a secure customer relationship management (CRM) database.

Definition

Explanation should include

- confidentiality, integrity, and availability (CIA) triad
- case studies (e.g., Target 2013, Equifax 2017).

Process/Skill Questions

- How can businesses ensure customer data confidentiality?
- What were the weaknesses in the Target (2013) and Equifax (2017) cyberattacks?

Maintaining Cybersecurity in Agricultural Business Management and Financing

Task Number 82

Keep accurate business records.

Definition

Recordkeeping should include

- hours worked
- expenses
- income
- dates and description of activities
- personnel contact information and other private data.

Process/Skill Questions

- Why is recordkeeping important?
- What skills are essential to keep accurate records?
- What are the similarities and differences between handwritten and computer-generated records? What are the advantages and disadvantages of both? Which system is vulnerable to cyber intrusion?
- What are software programs one can use to assist in keeping accurate records?
- What would happen if a business failed to keep accurate records?
- What are the cyber risks regarding business records?
- What are the vulnerabilities regarding business records?
- What are the assets affected?

Task Number 83

Explain how cyber intrusion might affect an agricultural enterprise's budget.

Definition

Explanation should include

- effects on short- and long-term goals
- effects on a plan for managing capital and resources over a short- and long-term period.

Process/Skill Questions

- What types of items fall into the short-term budget category, and what types of items fall into the long-term budget category?
- What resources are available to help prepare a budget for an agricultural enterprise?
- What are strategies to help adhere to a budget? Why is this important?
- What items would fall into discretionary income?
- How can a budget help prepare for unexpected expenses?

Task Number 84

Describe management controls used to secure information, operations, and prevent breaches of security.

Definition

Description should include setting a security policy to

- ensure individual accountability
 - user authentication
 - auditing account services
 - internal
 - external
- ensure separation of duty
 - user authorization
 - access control mechanisms.

Process/Skill Questions

- What are the assets that could be affected by a security breach?
- Why are password protocols critical in preventing security breaches?
- Why is it important to secure information?
- What are some consequences of failure to develop policies and appropriate controls to ensure the availability of computer-based systems?

Task Number 85

Identify financial management tools and strategies related to cybersecurity.

Definition

Identification should include

- saving
- investing
- calculating compound and simple interest
- borrowing (e.g., credit cards, student loans, mortgages)
- guarding against identity theft
- obtaining a personal credit report and checking one's credit score on a regular basis.

Process/Skill Questions

- What is identity theft?
- How can one guard against identify theft at a personal and business level?
- What is the importance of conducting a cybersecurity readiness audit?
- How often should one perform an audit? Should an audit be performed in-house or by an external team?
- What are the risks regarding financial management tools?

- What are the vulnerabilities of financial management tools?
- What are the assets affected?

Task Number 86

Identify agricultural applications of leading technology (e.g., GPS, GIS, cellular and wireless communication, software).

Definition

Identification should include

- discussion of different technologies and their functions
- various uses of technologies.

Process/Skill Questions

- What are examples of technology used in agribusiness?
- What is the purpose of a GPS?
- What technology advances could benefit agribusiness in the future?
- How have technologies increased efficiency in agribusiness?

Task Number 87

Explain how the creation of records and correspondence, using word processing software, spreadsheets, databases, and email, exposes the creator to cyber threats.

Definition

Explanation should include

- vulnerabilities of using spreadsheets and databases for recordkeeping
- vulnerabilities of using word processing and email for correspondence.

Process/Skill Questions

- What is the importance of conducting a cybersecurity readiness audit?
- What are the risks?
- What are the vulnerabilities?
- What are the assets affected?
- How are spreadsheets used in agribusiness?
- Why is etiquette important when corresponding via email?
- How can one identify software suited to agribusiness needs?
- How are databases used in agribusiness?
- When is email more appropriate for communication than speaking in person or via telephone?

Task Number 88

Back up and restore files.

Definition

Backing up and restoring should include

- adopting the process of routinely saving and backing up work
- using alternative methods for saving work (e.g., remote servers, portable drives, web servers, online/cloud storage [e.g., Google Drive, Dropbox])
- retrieving data from backup files and restoring it to the computer.

Process/Skill Questions

- What are the risks of backing up and restoring files?
- What are the vulnerabilities of backing up and restoring files?
- What are the assets affected?
- Why is it important to back up work?
- What are examples of methods/media used to back up work?
- What are the consequences of failing to back up work?
- How can one ensure that saved work is secure?
- How can data be restored on a computer?

Task Number 89

Identify methods of preventing importation of computer viruses.

Definition

Identification should include types of viruses and software protection.

Teacher Resource:

[Cybersecurity Best Practices Guide](#)

Process/Skill Questions

- What are examples of computer viruses?
- How can one prevent the spread of computer viruses?
- What tools are available to clean viruses from computers?
- How are computer viruses transferred from computer to computer?
- How does one determine if free virus protection software is safe?
- How often should virus protection be upgraded?
- How does one select the best virus protection software?

Task Number 90

Explain the basics of financial compliance.

Definition

Explanation should include

- adhering to the regulations of state and federal government oversight agencies (e.g., IRS)
- creating an audit trail to guard against cyber threats.

Process/Skill Questions

- What does the term *financial compliance* mean?
- What are the various state and federal government agencies that oversee financial compliance?
- How might these agencies use personal or corporate tax returns to red-flag inconsistencies or track cyberattacks on the financial standing of a business?
- How often should an audit be conducted in a business?
- Who would conduct an audit for a business?

Task Number 91

Explain the effects of identity theft.

Definition

Explanation should include Farm Credit case studies.

Process/Skill Questions

- What is *identity theft*?
- How might one obtain an individual's personal information?
- What is the process for reporting identity theft?
- What are the potential effects of identity theft on an individual and on a business?
- How can one guard against identify theft at a personal and business level?

Task Number 92

Explain the effects of intellectual property (IP) theft.

Definition

Explanation should include

- definition of *intellectual property*
- individual contributions to corporate development, issues of ownership
- long-term effects (e.g., massive revenue losses, cascade effect)
- short-term effects (e.g., lawsuits).

Process/Skill Questions

- What is *intellectual property*?
- What are the possible issues of ownership surrounding IP?
- What is the cascade effect?
- Why would a cybercriminal use malware to steal agricultural IP? At what point does it become a crime?
- How does the theft of IP lead to the production of counterfeit goods, pirated software, and loss of trade secrets?

Task Number 93

Predict indicators of commodity stock manipulation.

Definition

Identification should include

- manipulation of supply and demand curves
- manipulation of trade data
- futures and securities contract activities.

Process/Skill Questions

- What is a *commodity*?
- What is the result of supply/demand curve manipulation?
- What are the indicators of commodity stock manipulation?

Task Number 94

Research historical precedents of stock/credit manipulation.

Definition

Research should include

- price gouging of necessities in times of natural disasters
- 2008 financial crisis
- Dodd-Frank Wall Street Reform and Consumer Protection Act.

Process/Skill Questions

- What are several examples of natural disasters in American history?
- What is the Dodd-Frank Wall Street Reform and Consumer Protection Act?
- What caused the 2008 financial crisis?
- How did the 2008 financial crisis differ from the 1929 crash?

Task Number 95

Identify risks of cyberattacks on different producer coalitions.

Definition

Identification should include examples of producer coalitions such as

- cooperatives (e.g., National Milk Producers Federation)
- livestock associations
- risks (e.g., market share price manipulations, purchasing power of cooperatives, producer identity theft).

Process/Skill Questions

- What are the benefits of a producer coalition?
- Who would benefit from being part of a producer coalition?
- What are the possible risks of cyberattacks on producer coalitions?
- How much of the cost to protect producer coalitions should be borne by the private sector?
- What steps should be implemented to screen new subscribers to an intra-organizational network?

Identifying Cybersecurity Laws Related to the Food and Agriculture Industry

Task Number 96

Identify national and international cybersecurity laws and policies related to agricultural enterprises.

Definition

Identification should include information related to

- national law
- international law
- privacy policies
- intellectual property
- cybercrime
- homeland security
- the National Conference of State Legislatures (NCSL) Agriculture Task Force.

Teacher Resource:

[The National Law Review: President Trump Signs the “Securing our Agriculture and Food Act”](#)

Process/Skill Questions

- What are the FDA, the Office of Criminal Investigations (OCI), and the USDA’s Office of the Inspector General (OIG), respectively, responsible for when evaluating threat information?
- How does the National Counterterrorism Center (NCTC) respond to threats in the Food and Agriculture Sector?
- Why are OCI and OIG agents involved in the Joint Terrorism Task Force (JTTF)?
- What is the FBI’s role in the enforcement of national and international cybersecurity laws and policies?

Task Number 97

Identify regulatory, oversight, and industry organizations in the agriculture and food sectors.

Definition

Identification should include

- federal agriculture and food agencies (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], Animal Plant and Health Inspection Service [APHIS], and other federal extension services)
- state, local, and regional agriculture and food agencies (e.g., public health departments, Virginia Department of Agriculture and Consumer Services [VDACS], and other agricultural extension services)
- agriculture and food industry organizations (e.g., farmers' associations, ranchers' associations)
- international agriculture and food organizations (e.g., World Health Organization [WHO], Global Outbreak and Response Network [GOARN], International Food Safety Authorities Network [INFOSAN], Food and Agriculture Organization [FAO-UN], and other international organizations).

Process/Skill Questions

- What federal agencies have a role in ensuring cybersecurity within the United States?
- What federal agencies regulate agriculture at the production level?
- What are examples of regulations for which each identified federal agency is responsible?
- What state agencies regulate agriculture at the production level?
- What are examples of regulations for which each identified state agency is responsible?
- How do state and federal agencies’ roles and responsibilities differ?
- How often are laws amended at the state level and at the federal level?
- What state and private sector representatives work with local law enforcement to ensure that threat information is shared with federal officials?

Task Number 98

Explain the Economic Espionage Act.

Definition

Explanation should include

- the definition of *economic espionage*
- case studies
- punishment for a federal crime.

Teacher Resource:

[Economic Espionage Act of 1996](#)

Process/Skill Questions

- What is the Economic Espionage Act (EEA)?
- Which U.S. State Congress enacted the EEA?
- What event triggered the introduction of the EEA to final passage? What, if any, groups were opposed to the EEA?

Task Number 99

Explain the importance of the 2017 Securing our Agriculture and Food Act.

Definition

Explanation should include acknowledgement of funding for

- a strategic partnership program in agroterrorism initiative creating homeland security fusion centers structure for sharing cyber and physical threats related to agriculture
- the creation of the National Bio and Agro-defense Facility (NBAF), a \$1.25B facility located at Kansas State University, for research and development in animal health, biosciences, and food safety research.

Process/Skill Questions

- What is the 2017 Securing our Agriculture and Food Act?
- Who is responsible for funding it?
- What were the results of its creation?

Task Number 100

Identify the costs associated with litigation in cybersecurity cases.

Definition

Identification may include cases at the state or federal level.

Process/Skill Questions

- What are the public costs associated with litigation in cybersecurity cases?
- What are examples of relevant federal cases and associated verdicts or precedents?
- What were the causes and effects of the Equifax data breach?

Investigating Future Trends in Agricultural Cybersecurity

Task Number 101

Identify the advantages and disadvantages of the Internet of Things (IoT).

Definition

Identification should include

- advantages
 - convenience
 - instant information
 - increased connectivity
 - feeling of safety
 - economic advantages
- disadvantages
 - increased vulnerability to hacking.

Process/Skill Questions

- How does the IoT increase vulnerability?
- How could the IoT disrupt life?
- How will the IoT affect agriculture?

Task Number 102

Research trends in automation and artificial intelligence (AI) control.

Definition

Research should include automation and AI functioning as

- curator

- advisor
- orchestrator.

Process/Skill Questions

- What is artificial intelligence control?
- What are the differences among a curator, an advisor, and an orchestrator?
- What are the current trends in automation and artificial intelligence control?
- When is it ethical to automate agricultural jobs if it would put a large percentage of farmers and laborers out of work?
- Why is full automation risky?

Exploring Opportunities for Employment in Cybersecurity

Task Number 103

Research educational requirements for cybersecurity jobs in agriculture.

Definition

Research should include

- bachelor's degree in a computer-related field
- credentials (e.g., Cisco Certified Network Associate [CCNA])
- key skills (e.g., analytical, written and verbal communication, problem-solving).

Process/Skill Questions

- What are the educational requirements for jobs in cybersecurity?
- What are the key skills needed for someone wishing to pursue a career in cybersecurity?
- What are some college-level courses relevant to the study of cybersecurity?
- What colleges offer courses of study related to cybersecurity careers?

Task Number 104

Identify careers associated with cybersecurity in agriculture.

Definition

Identification should include

- 16 federal intelligence agencies
- state and local opportunities
- international trade organizations
- companies specializing in agricultural products
- software engineers
- data scientists.

Process/Skill Questions

- What state and local agencies have career opportunities in cybersecurity?

Task Number 105

Participate in a work-based learning opportunity related to cybersecurity in an agricultural enterprise.

Definition

Participation could include

- supervised agricultural experiences (SAEs)
- internship
- job shadowing
- mentorship
- service learning
- cooperative education
- registered apprenticeship to establish student-industry partnerships.

Process/Skill Questions

- What are some work-based learning opportunities related to cybersecurity?
- How are work-based learning opportunities beneficial?

Task Number 106

Conduct research on cybersecurity in the food and agriculture industries.

Definition

Conducting research should include

- choosing a topic
- identifying reliable sources (e.g., universities, extension programs)
- exploring different sources
- summarizing findings.

Process/Skill Questions

- How does one determine which website(s) to use for research?
- What are legal issues regarding the use of website content?
- How can one evaluate the credibility of web resources?
- What are some reliable and trustworthy resources for agricultural research?
- What are other sources of information in addition to the Internet?

Task Number 107

Conduct an oral presentation on a subject related to cybersecurity in the food and agriculture industries, using presentation software.

Definition

Conducting a presentation should include

- assigned topic
- electronic presentation, using graphics and other visual enhancements
- elements of effective public speaking (e.g., voice level, posture, eye contact).

Process/Skill Questions

- What are examples of presentation software?
- What are the characteristics of an effective public speaker?
- Why should electronic equipment be tested prior to a presentation?
- How can one become a more effective speaker?
- How does one determine the proper length of a presentation?
- What types of information should not be included in a professional presentation?
- Why should one consider the audience prior to preparing a presentation?

SOL Correlation by Task

39	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.	English: 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
40	Participate in an SAE.	English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8
41	Identify the benefits and responsibilities of FFA membership.	English: 10.5, 10.6, 10.7, 10.8, 11.5, 11.6, 11.7, 11.8, 12.5, 12.6, 12.7, 12.8
42	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.	English: 10.5, 11.5, 12.5 History and Social Science: VUS.8, VUS.9, VUS.10, VUS.11, WHII.8, WHII.10, WHII.11
43	Apply for an FFA degree and/or an agricultural proficiency award.	English: 10.5, 11.5, 12.5

44	Identify the Department of Homeland Security's (DHS) 16 critical infrastructure sectors.	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.12, VUS.14, WHII.15
45	Analyze the interdependence among the commercial facilities, financial services, and food and agriculture (FA) sectors.	English: 10.5, 11.5, 12.5
46	Define <i>asset</i> .	English: 10.3, 11.3, 12.3
47	Define <i>threat</i> .	English: 10.3, 11.3, 12.3
48	Define <i>vulnerability</i> .	English: 10.3, 11.3, 12.3
49	Define <i>risk</i> .	English: 10.3, 11.3, 12.3
50	Compare food defense, food safety, and food security.	English: 10.5, 11.5, 12.5
51	Explain intentional and unintentional food contamination and disruption.	English: 10.5, 11.5, 12.5
52	Identify cybersecurity vulnerabilities and threats in animal production systems.	English: 10.5, 11.5, 12.5
53	Explain cybersecurity vulnerabilities and threats in animal systems related to health.	English: 10.5, 11.5, 12.5
54	Explain cybersecurity vulnerabilities in animal feed systems.	English: 10.5, 11.5, 12.5
55	Identify cybersecurity vulnerabilities regarding pharmaceuticals.	English: 10.5, 11.5, 12.5
56	Explain cybersecurity vulnerabilities in plant production systems.	English: 10.5, 11.5, 12.5
57	Identify cybersecurity threats and risks in water sources.	English: 10.5, 11.5, 12.5
58	Identify cybersecurity threats and risks related to power.	English: 10.5, 11.5, 12.5
59	Identify cybersecurity threats related to chemicals.	English: 10.5, 11.5, 12.5
60	Identify cybersecurity threats related to facilities.	English: 10.5, 11.5, 12.5
61	Identify cybersecurity threats related to equipment.	English: 10.5, 11.5, 12.5
62	Propose methods to ensure equipment (e.g., drones) is resistant to cyberattack.	English: 10.5, 11.5, 12.5
63	Outline the risks associated with fuel supply disruption.	English: 10.5, 11.5, 12.5
64	Explain the steps to identify false information on sensor-based systems.	English: 10.5, 11.5, 12.5
65	Define <i>precision agriculture (PA)</i> .	English: 10.3, 11.3, 12.3
66	Describe the technologies used in precision agriculture and precision agronomics.	English: 10.5, 11.5, 12.5
67	Synthesize data gathered using leading technology (e.g., GPS, GIS, cellular and wireless communication, software).	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.1, VUS.1, WHII.1 Mathematics: AFDA.8, PS.1*, PS.8* Science: BIO.1, CH.1, ES.1
68	Identify facilities that engage in food processing.	English: 10.5, 11.5, 12.5
69	Identify facilities that engage in beverage production.	English: 10.5, 11.5, 12.5
70	Identify animal slaughtering and processing facilities.	English: 10.5, 11.5, 12.5

71	Identify facilities engaged in the manufacture of food and feed for animals.	English: 10.5, 11.5, 12.5
72	Explain how machinery and equipment maintenance plans can reveal cybersecurity intrusion.	English: 10.5, 11.5, 12.5
73	Explain how animal, plant, soil, and/or mechanical test results can reveal cybersecurity intrusion.	English: 10.5, 11.5, 12.5
74	Explain how point source and nonpoint source pollution can endanger food production capabilities.	English: 10.5, 11.5, 12.5
75	Describe types of advertising media used by agricultural businesses.	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.1, GOVT.6, GOVT.8, GOVT.9, GOVT.16, VUS.1, VUS.10, VUS.11, VUS.13, VUS.14
76	Identify wholesale and retail distribution of agricultural and food products.	English: 10.5, 11.5, 12.5
77	Identify agricultural products transportation systems.	English: 10.5, 11.5, 12.5
78	Identify methods of distribution disruption.	English: 10.5, 11.5, 12.5
79	Identify risks in labeling and barcodes.	English: 10.5, 11.5, 12.5
80	Identify risks associated with agricultural food product storage facilities.	English: 10.5, 11.5, 12.5
81	Explain how to create a secure customer relationship management (CRM) database.	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.16
82	Keep accurate business records.	English: 10.5, 11.5, 12.5
83	Explain how cyber intrusion might affect an agricultural enterprise's budget.	English: 10.5, 11.5, 12.5
84	Describe management controls used to secure information, operations, and prevent breaches of security.	English: 10.5, 11.5, 12.5
85	Identify financial management tools and strategies related to cybersecurity.	English: 10.5, 11.5, 12.5 Mathematics: A.1, A.4, COM.1, COM.7
86	Identify agricultural applications of leading technology (e.g., GPS, GIS, cellular and wireless communication, software).	English: 10.5, 11.5, 12.5
87	Explain how the creation of records and correspondence, using word processing software, spreadsheets, databases, and email, exposes the creator to cyber threats.	English: 10.5, 11.5, 12.5
88	Back up and restore files.	English: 10.5, 11.5, 12.5
89	Identify methods of preventing importation of computer viruses.	English: 10.5, 11.5, 12.5
90	Explain the basics of financial compliance.	English: 10.5, 11.5, 12.5
91	Explain the effects of identity theft.	English: 10.5, 11.5, 12.5
92	Explain the effects of intellectual property (IP) theft.	English: 10.3, 10.5, 11.5, 12.5
93	Predict indicators of commodity stock manipulation.	English: 10.5, 11.5, 12.5
94	Research historical precedents of stock/credit manipulation.	English: 10.8, 11.8, 12.8
95	Identify risks of cyberattacks on different producer coalitions.	English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8

96	Identify national and international cybersecurity laws and policies related to agricultural enterprises.	English: 10.5, 10.8, 11.5, 11.8, 12.5 History and Social Science: GOVT.12
97	Identify regulatory, oversight, and industry organizations in the agriculture and food sectors.	English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8 History and Social Science: GOVT.14, GOVT.15
98	Explain the Economic Espionage Act.	English: 10.3, 11.3, 12.3
99	Explain the importance of the 2017 Securing our Agriculture and Food Act.	English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8
100	Identify the costs associated with litigation in cybersecurity cases.	English: 10.5, 11.5, 12.5
101	Identify the advantages and disadvantages of the Internet of Things (IoT).	English: 10.5, 11.5, 12.5
102	Research trends in automation and artificial intelligence (AI) control.	English: 10.8, 11.8, 12.8
103	Research educational requirements for cybersecurity jobs in agriculture.	English: 10.8, 11.8, 12.8
104	Identify careers associated with cybersecurity in agriculture.	English: 10.5, 11.5, 12.5
105	Participate in a work-based learning opportunity related to cybersecurity in an agricultural enterprise.	English: 10.1, 11.1, 12.1
106	Conduct research on cybersecurity in the food and agriculture industries.	English: 10.8, 11.8, 12.8
107	Conduct an oral presentation on a subject related to cybersecurity in the food and agriculture industries, using presentation software.	English: 10.1, 11.1, 12.1 Mathematics: COM.12

Teacher Resource

[AFA CyberPatriot](#) is the National Youth Cyber Education Program created by the Air Force Association to inspire K-12 students toward careers in cybersecurity or other science, technology, engineering, and mathematics (STEM) disciplines critical to our nation's future. At the core of the program is the National Youth Cyber Defense Competition, the nation's largest cyber defense competition that puts high school and middle school students in charge of securing virtual networks.

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- Cloud Essentials Certification Examination
- IC3 Digital Literacy Certification Examination
- IT Fundamentals+ Certification Examination
- Microsoft Technology Associate (MTA) Examinations
- Security Pro Certification Examination
- Security+ Certification Examination

Concentration sequences: *A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.*

- Cybersecurity Fundamentals (6302/36 weeks)
- Cybersecurity in Food and Agriculture, Advanced (8075/36 weeks)

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	Occupations
Agribusiness Systems	Agricultural Commodity Broker Agricultural Economist

Career Cluster: Business Management and Administration	
Pathway	Occupations
Administrative Support	Administrative Assistant Computer Operator Data Entry Specialist Information Assistant Legal Assistant Management Analyst
Business Information Management	Account Executive Administrative Assistant Applications Integrator Budget Analyst Chief Executive Officer Communications Equipment Operator Computer Support Specialist

Career Cluster: Business Management and Administration	
Pathway	Occupations
	Cost Analyst Customer Service Representative Data Entry Specialist Database Analyst Desktop Publisher Executive Assistant Financial Analyst Front Office Assistant Information Assistant Legal Assistant Maintenance Technician Management Analyst Market Research Analyst Marketing Manager Records Processing Assistant Software Test Engineer Systems Analyst Technical Writer Word Processor
General Management	Management Analyst
Human Resources Management	Compliance Officer
Operations Management	Administrative Services Manager Billing Manager Chief Operating Officer General Manager Internet Entrepreneur Management Analyst

Career Cluster: Education and Training	
Pathway	Occupations
Teaching and Training	Training Consultant/Training Specialist

Career Cluster: Government and Public Administration	
Pathway	Occupations
National Security	Combat Specialty Officer Cyber Defense Analyst Military Enlisted Personnel Military Intelligence Specialist Military Officer Special Forces Personnel
Public Management and Administration	Government Accountant/Auditor
Regulation	Compliance Officer Cyber Crime Investigator Environmental Compliance Inspector Financial Analyst Financial Manager Privacy Compliance Manager

Career Cluster: Government and Public Administration	
Pathway	Occupations
Revenue and Taxation	Compliance Officer Financial Analyst Financial Manager

Career Cluster: Information Technology	
Pathway	Occupations
Information Support and Services	Account Executive Administrative Assistant Applications Integrator Communications Equipment Operator Computer Numerical Control Programmer (CNC Programmer) Computer Support Specialist Computer Systems Engineer, Architect Customer Service Representative Data Entry Specialist Data Modeler Database Administrator Database Analyst Executive Assistant Geographic Information Systems (GIS) Technician Information Systems Analyst Information Systems Security Developer Information Systems Security Manager Instructional Coordinator Internet Entrepreneur Maintenance Technician Network Systems and Data Communication Analyst Software Test Engineer Systems Analyst Technical Writer Word Processor
Network Systems	Computer and Information Systems Administrator Computer Operator Computer Security Specialist Computer Software Engineer Computer Support Specialist Computer Systems Engineer, Architect Database Analyst Information Security Analyst Network and Computer Systems Administrator Network Architect Network Systems and Data Communication Analyst Radio, TV Broadcast Technician Software Test Engineer Sound Engineering Technician Systems Analyst Telecommunications Equipment Installer, Repairer Telecommunications Specialist
Programming and Software Development	Applications Integrator Computer Software Engineer Informatics Nurse Specialists Multimedia Artist, Animator

Career Cluster: Information Technology	
Pathway	Occupations
	Network Systems and Data Communication Analyst Programmer Project Manager Software Applications Engineer Software Test Engineer Systems Analyst Web Developer
Web and Digital Communications	Applications Integrator Computer Support Specialist Computer Systems Engineer, Architect Game Designer, Programmer Graphic Designer Instructional Coordinator Multimedia Artist, Animator Project Manager Radiologic Technologist, Radiographer Software Test Engineer Systems Analyst Web Developer Webmaster

Career Cluster: Law, Public Safety, Corrections and Security	
Pathway	Occupations
Legal Services	Cyber Legal Advisor

Career Cluster: Manufacturing	
Pathway	Occupations
Manufacturing Production Process Development	Network Designer Precision Inspector, Tester, or Grader Production Manager Programmer SPC (Statistical Process Control) Coordinator
Quality Assurance	Calibration Technician Precision Inspector, Tester, or Grader Quality Control Technician SPC (Statistical Process Control) Coordinator

Career Cluster: Science, Technology, Engineering and Mathematics	
Pathway	Occupations
Engineering and Technology	Computer Hardware Engineer Computer Programmer Computer Software Engineer

Career Cluster: Transportation, Distribution and Logistics	
Pathway	Occupations
Logistics Planning and Management Services	Logistics Analyst Logistics Engineer Logistics Manager

Pathway	Occupations
Logistics Planning and Management Services	Logistics Analyst Logistics Engineer Logistics Manager