Greenhouse Technology
Valid KY Course # 010641

Course Description: Greenhouse Technology provides instruction in greenhouse structures and greenhouse environment regulations. Plant growth and development and propagation are included as well as production and maintenance of bedding and container produced plants. Fundamental principles of vegetable production and commercial production of vegetable crops as well as marketing of horticulture products may be included. Content may be enhanced with appropriate technology. Leadership development will be provided through FFA. Each student will be expected to have a supervised agricultural experience program.

NATIONAL AFNR STANDARDS	**Content/Process** statements followed by # codes in **Bold = KOSSA Standards,** *Italic = Academic Expectations*
	Students will:
CS.02.03	• Demonstrate employability and social skills relative to the career cluster. **EA001, EA003, EA009, EA011,** *1.1, 2.36, 2.38*
PS.02.01	• Propose greenhouse structural designs and equipment. **ED001, EE001, OD001, OD002,** *1.1, 1.16, 2.10*
PS.02.01 PS.02.02	• Manipulate greenhouse environmental conditions. **OD002, OD003, OD005,** *2.3, 2.6, 2.8, 5.5*
PS.01.03	• Prepare soils and planting media. **OB001, OB002, OB004, OB005, OB006**, *2.22, 2.3, 2.4, 2.10*
PS.03.01	• Investigate plant processes and development. **OC003, OC004, AC005, AC002, AC003,** *2.3, 2.2, 2.4, 2.6*
PS.01.02	• Select plant propagation methods. **AC003, AC004, OC001, OC002,** *2.3, 2.2, 2.4, 2.6*
CS.03.01	• Implement bedding and vegetable crop production and management strategies. **OD001, OD002, 0D003,** *2.1, 2.3, 2.7, 2.8*
CS.09.01	• Formulate marketing plan for greenhouse plants and or vegetable crops. **OA001, OA002, OA003,** *2.33, 2.30, 2.2*
CS.06.01	• Demonstrate business and marketing procedures. **EC002, EC005, EC009, EC010,** *1.1, 2.3, 5.4, 5.5*
PS.03.03	• Maintain, operate and repair facilities and equipment. **OF002, OG009, OF001,** *1.1, 2.10, 2.3*
CS.07.01	• Develop and implement an integrated pest management plan. **OE001, OE002, OE003, OE004,** *2.2, 2.3, 2.4, 2.5*
CS.01.01	• Apply safety regulations and practices. **OG002, OG006, OG007,** *1.1, 2.3, 5.4, 5.5*
CS.02.03	• Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions. **EC002, EC003,** *1.11, 2.13, 2.18*
1A, CS.11.01	• Utilize activities of FFA as an integral component of course content and leadership development. **A015,** *1.12, 2.16, 2.37*
	• Apply science, math and communication skills within the technical content. **AB001, AB002, ED005,** *1.9, 1.0, 1.12*

CONNECTIONS

- PROGRAM OF STUDIES – REVISED 2006
- **KENTUCKY OCCUPATIONAL SKILL STANDARDS (KOSSA)-Horticulture**
- *ACADEMIC EXPECTATIONS*
- SECRETARY'S COMMISSION ON ACHIEVING NECESSARY SKILLS (SCANS)
- FFA CONNECTIONS: Greenhouse Impromptu, Diversified Horticulture Proficiency, Floriculture Proficiency, Nursery & Landscape CDE, Agriculture Marketing CDE

Course Title **Greenhouse Technology** Grade Levels 11-12 Credit Value 1

Description Greenhouse Technology provides instruction in greenhouse structures and greenhouse environment regulations. Plant growth and development and propagation are included as well as production and maintenance of bedding and container produced plants. Fundamental principles of vegetable production and commercial production of vegetable crops may be included. Content may be enhanced with appropriate technology. Leadership development will be provided through FFA. Each student will be expected to have a supervised agricultural experience program.

Prerequisites At least one course in the Horticulture pathway

Unit Title Introduction and Safety

Technical Content

1 - Demonstrate employability and social skills relative to the career cluster
11 - Apply safety regulation and practices
12 - Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions
13 - Utilize activities of FFA as in integral component of course content and leadership development

KY Academic Standards (Big Idea)

Career Awareness, Exploration, Planning - Vocational Studies
Career awareness, exploration and planning gives students the opportunity to discover the various career areas that exist and introduce them to the realities involved with the workplace. Many factors need to be considered when selecting a career path and preparing for employment. Career awareness, exploration and planning will enable students to recognize the value of education, learn how to plan for careers and integrate academic subjects.

Consumer Decisions - Vocational Studies
Individual and families need to make consumer decisions due to the numerous products/services on the market, multiple advertising techniques, and the need to make responsible financial management decisions. Accessing and assessing consumer information, comparing and evaluating products and services, provides basis for making effective consumer decisions. Consumer decisions influence the use of resources and the impact they have on the community and environment.

Economics - Social Studies
Economics includes the study of production, distribution and consumption of goods and services. Students need to understand how their economic decisions affect them, others, the nation and the world. The purpose of economic education is to enable individuals to function effectively both in their own personal lives and as citizens and participants in an increasingly connected world economy. Students need to understand the benefits and costs of economic interaction and interdependence among people, societies, and governments.

Employability Skills - Vocational Studies
Employability skills will focus on student's competencies with their work habits and academic/technical skills that will impact an individual's success in school and workplace. School-to-work transition skills will help students develop interpersonal skills and positive work habits.

Geography - Social Studies
Geography includes the study of the five fundamental themes of location, place, regions, movement and human/environmental interaction. Students need geographic knowledge to analyze issues and problems to better understand how humans have interacted with their environment over time, how geography has impacted settlement and population, and how geographic factors influence climate, culture, the economy and world events. A geographic perspective also enables students to better understand the past and present and to prepare for the future.

Personal Wellness (Health Education) - Practical Living
Wellness is maximum well-being or total health. Personal wellness is a combination of physical, mental, emotional, spiritual and social well-being. It involves making behavioral choices and decisions each day that promote an individual's physical well-being, the prevention of illnesses and diseases and the ability to remain, physically, mentally, spiritually, socially and emotionally healthy.

Research, Inquiry/Problem-Solving and Innovation - Technology
Students understand the role of technology in research and experimentation. Students engage technology in developing solutions for solving problems in the real world. Students will use technology for original creation and innovation.

Safety and Ethical/Social Issues - Technology
Students understand safe and ethical/social issues related to technology. Students practice and engage in safe, responsible and ethical use of technology. Students develop positive attitudes toward technology use that supports lifelong learning, collaboration, personal pursuits and productivity.

English/Language Arts Standards

CC.9-10.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CC.9-10.L.1.b Conventions of Standard English: Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

CC.9-10.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.9-10.L.2.a Conventions of Standard English: Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.
CC.9-10.L.2.b Conventions of Standard English: Use a colon to introduce a list or quotation.
CC.9-10.L.2.c Conventions of Standard English: Spell correctly.
CC.9-10.SL.1.a Comprehension and Collaboration: Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
CC.9-10.W.1.d Text Types and Purposes: Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CC.9-10.W.1.e Text Types and Purposes: Provide a concluding statement or section that follows from and supports the argument presented.
CC.11-12.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CC.11-12.L.1.a Conventions of Standard English: Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.
CC.11-12.L.1.b Conventions of Standard English: Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American English) as needed.
CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CC.9-10.R.I.1 Key Ideas and Details: Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CC.9-10.R.I.2 Key Ideas and Details: Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

Technical Literacy Standards

Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.
Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon or contact

21st Century Skills and Knowledge

Collaboration

Communication

Environmental Literacy

Financial, Economic, Business and Entrepreneurial Literacy

Global Awareness

Health Literacy

Information Literacy

Media Literacy

ICT (Information, Communications, and Technology) Literacy

KOSSA Standards

1001.OG.1 Clean and maintain hand tools
1001.OH.2 Identify immediate and real costs of an accident
1001.OH.3 Identify hazardous substances in the workplace
1001.OH.4 Comply with established safety practices
1001.OH.6 Maintain a clean and safe work facility
1001.OH.1 Follow anti-theft and security procedures
1001.OH.5 Identify fire exits and fire fighting equipment
1001.EN.2 Follow safety guidelines in the workplace
1001.EN.1 Assume responsibility for safety of self and others
1001.EN.3 Manage personal health and wellness
1001.AA.3 Communicate and follow directions/procedures
1001.OE.4 Distinguish environmental issues (e.g., surface or ground water, government regulations, water testing, EPA)

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Describe the importance and value of the greenhouse industry	file "greenhouses_in_Kentucky" file "Greenhouses_in_Kentucky_Questions" UK Extension Bulletin on Greenhouse, Importance, Products, Financials in Kentucky and questions to go along with Bulletin
Research and evaluate careers related to plant and land science and describe skills necessary to gain employment	File "Careers in Agriculture wheel notes" File "Careers Research Project" Students will take notes using the Careers in Agriculture wheel notes and prepare a poster to present selected career
Implement a comprehensive SAE plan with connections to a desired career path	Files SAE Contract SAE Yearly SMART Goals IntroToSAEsGuide.pdf IntroToSAEGuideQuiz Record_Book_Calendar1 SAE_Introduction_to_SAE_Programs SAE_Contract Link www.theaet.com
Identify hazards associated with the greenhouse industry and ways to ensure a safe workplace	Files: greenhousesafety.ppt Pesticide_Storage_Active_Learning locked_dry_and_safe Powerpoint on Greenhouse safety with an activity on proper storage of horticulture chemicals. Have students perform a chemical safety storage audit checklist on your greenhouse and/ or Ag room.

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Prerequisites At least one course in the Horticulture pathway

Unit Title Greenhouse Structures and Environmental Conditions

Technical Content

2 - Propose greenhouse structural designs and equipment

3 - Manipulate greenhouse environmental conditions

KY Academic Standards (Big Idea)

Research, Inquiry/Problem-Solving and Innovation - Technology

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English/Language Arts Standards

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CC.9-10.L.2.b Conventions of Standard English: Use a colon to introduce a list or quotation.

CC.9-10.L.2.c Conventions of Standard English: Spell correctly.

CC.9-10.SL.1.a Comprehension and Collaboration: Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

CC.11-12.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

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CC.11-12.L.1.b Conventions of Standard English: Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American English) as needed.

CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technical Literacy Standards

Integration of Knowledge and Ideas 7. Integrate quantitative and technical

Integration of Knowledge and Ideas 9. Compare and contrast

Mathematics Standards

CC.9-12.G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*

CC.9-12.G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*

CC.9-12.G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*

21st Century Skills and Knowledge

Collaboration

Communication

Creativity and Innovation

Creativity and Innovation

KOSSA Standards

1001.OE.2 Regulate environmental factors for plant growth
1001.OE.5 Interpret weather patterns and data

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Identify common greenhouse structures and describe the advantages and disadvantages of each	File: Structure Greenhouse Mini-Poster Presentation Assignment Greenhouse Structure Notes Chart Students will create a mini-poster that depicts the characteristics of one common greenhouse structure along with its advantages and disadvantages.
Identify common greenhouse benching designs, materials, and the importance of space efficiency	file: Planning for Greenhouse Benching Students will calculate the most effective benching system for a 30'x60' greenhouse based on flat size and benching options.
Identify greenhouse environmental control systems, their function, costs, and benefits	file: Environmental Controls Map Depending upon your greenhouse's heating and cooling system, walk students through its function and have them create a map of the parts and their functions.
Identify common greenhouse irrigation methods and their advantages/disadvantages	file: FertilizerCalculations pdf Students will walk through example fertilizer calculations in this Cornell University Bulletin and practice additional calculations.
Identify tools for automating greenhouse processes	file:Greenhouse Automation Proposal Students will use hummert.com to select two automation systems to install in your schools's greenhouse. Students will select the products to purchase and list use, cost and benefits.

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Prerequisites At least one course in the Horticulture pathway

Unit Title Growing Media and Plant Nutrition

Technical Content

4 - Prepare soils and planting media

5 - Investigate plant processes and development

KY Academic Standards (Big Idea)

Research, Inquiry/Problem-Solving and Innovation - Technology

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English/Language Arts Standards

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CC.9-10.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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Technical Literacy Standards

Integration of Knowledge and Ideas 7. Integrate Quantitative or technical analysis

Integration of Knowledge and Ideas 9. Compare and Contrast treatments

Key Ideas and Details 1. Cite specific textual evidence

Mathematics Standards

CC.9-12.S.IC.6 Evaluate reports based on data.*

21st Century Skills and Knowledge

Collaboration

Communication

KOSSA Standards

1001.OC.6 Demonstrate the use of different soil mixes and growing media
1001.OC.2 Analyze soil samples
1001.OC.5 Analyze site according to soil type, slope, and drainage
1001.OC.1 Collect soil samples

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Identify desirable properties of media and how they impact plant growth	file: soil media properties lab students will participate in a lab to examine the importance of water holding capacity AND air space / porosity
Identify common growing media components and describe their functions and impact on plant growth	file: Lab Exercise for Components of Growing Media Students will examine the major components of soil and test their effectiveness
Identify micro and macro-nutrients necessary for plant growth and development	file: Class activity for essential plant nutrients students will research all 17 essential plant nutrients and create a chart with symbols, relative % and function
Describe the relationship between soil pH and nutruent availability and the process for providing adjustments to growing media	file: Activity for nutrient availability students will research pH and nutrient availability and look into deficiencies of the nutrient. Uses the pH availability chart.
Classify fertilizers based on available nutruents; Identify advantages of varied types of fertilizers	File: Lab Exercise for Types of Fertilizers Students will research and develop a presentation to ID common fertilizers, list pros and cons, and list when then the fertilizer would be used.
Select types of fertilizers based on specific situations; Demonstrate proper application method of fertilizers	file: Lab Exercise for Selecting and Applying Fertilizers Student practice calculations using a backpack sprayer

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Prerequisites At least one course in the Horticulture pathway

Unit Title Plant Propagation

Technical Content

5 - Investigate plant processes and development
6 - Select plant propagation methods
7 - Implement bedding and vegetable crop production and management strategies

KY Academic Standards (Big Idea)

Research, Inquiry/Problem-Solving and Innovation - Technology

Students understand the role of technology in research and experimentation. Students engage technology in developing solutions for solving problems in the real world. Students will use technology for original creation and innovation.

Unity and Diversity (Biological Science) - Science

All matter is comprised of the same basic elements, goes through the same kinds of energy transformations, and uses the same kinds of forces to move. Living organisms are no exception. At the high school level, an in-depth study of the specialization and chemical changes occurring at the cellular level builds upon the foundational ideas developed earlier to investigate deoxyribonucleic acid (DNA) and effects of alterations in DNA for an individual organism as well as for a species. Emphasis at every level should be placed upon the understanding that while every living thing is composed of similar small constituents that combine in predictable ways, it is the subtle variations within these small building blocks that account for both the likenesses and differences in form and function that create the diversity of life.

English/Language Arts Standards

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CC.9-10.L.2.c Conventions of Standard English: Spell correctly.
CC.9-10.SL.1.a Comprehension and Collaboration: Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
CC.9-10.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CC.11-12.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
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CC.11-12.L.1.b Conventions of Standard English: Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American English) as needed.
CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.11-12.SL.4 Presentation of Knowledge and Ideas: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.
CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technical Literacy Standards

Key Ideas and Details 1. Cite specific evidence to support
Key Ideas and Details 3. Follow Precisely a complex
Integration of Knowledge and Ideas 9. Compare and Contrast

21st Century Skills and Knowledge

Collaboration

Communication

KOSSA Standards

1001.OA.5 Analyze the process of plant growth and development
1001.OA.6 Be aware of biotechnology and it's uses in the horticulture production
1001.OD.1 Propagate specific plant materials
1001.OD.2 Label propagation material
1001.OA.4 Investigate sexual and asexual reproduction of plants including tissue culture

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Label the parts of a seed and describe functions	file: Parts of a seed PDF Parts of a seed Worksheet Students will label the parts of a monocot and dicot seed using the CAERT chapter as reference
Determine the factors involved in seed germination and the impact on rate of germination	file: Measuring Seed Germination Rate Lab Students will plant seeds and measure the temperatures and its effects on seed germination rate
Distinguish the major methods of asexual propagation and select appropriate method for situations	file: Pothos Cutting ppt Students will learn the background on pothos and prepare a lab to record the data of cuttings and growth
Identify the process and benefits of micropropagation	file: Plant Micropropagation using African violet Students will use aseptic methods to propagate African Violet using tissue culture

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Prerequisites At least one course in the Horticulture pathway

Unit Title Crop Production and Management

Technical Content

7 - Implement bedding and vegetable crop production and management strategies

KY Academic Standards (Big Idea)

Financial Literacy - Vocational Studies

Financial literacy provides knowledge so that students are responsible for their personal economic well-being. As consumers, individuals need economic knowledge as a base for making financial decisions impacting short and long term goals throughout one's lifetime. Financial literacy will empower students by providing them with the knowledge, skills and awareness needed to establish a foundation for a future of financial responsibility and economic independence.

Research, Inquiry/Problem-Solving and Innovation - Technology

Students understand the role of technology in research and experimentation. Students engage technology in developing solutions for solving problems in the real world. Students will use technology for original creation and innovation.

English/Language Arts Standards

CC.9-10.SL.1 Comprehension and Collaboration: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

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CC.9-10.L.2.c Conventions of Standard English: Spell correctly.

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CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

CC.11-12.SL.4 Presentation of Knowledge and Ideas: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.

CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technical Literacy Standards

Key Ideas and Details 2. Determine Central idea

Integration of Knowledge and Ideas 7. Integrate quantitative

21st Century Skills and Knowledge

Collaboration

Communication

Flexibility and Adaptability

Leadership and Responsibility

KOSSA Standards

1001.OA.7 Explain the use of applied genetics in horticulture
1001.OC.4 Adjust fertility and pH from analysis
1001.OD.3 Watering requirements of specific plants
1001.OD.4 Fertility requirements of specific plants
1001.OE.1 Determine production cost for a given crop
1001.OE.3 Schedule production and harvest for a given crop
1001.OA.5 Analyze the process of plant growth and development

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Develop a yearly production schedule for a specific crop	File: Poinsettia Scheduling 2013 2012 cal 2013 cal Students will read Ecke's Poinsettia schedule for 2013 and create a poinsettia schedule for the 2012 - 2013 growing season on calendar.
Generate a plan for the production of annual bedding plants	file: greenhouse spring crop production 2012 cal 2013 cal Students will generate a production schedule for a selected plant and include all planting dates and chemical applications dates along with lighting and temperature adjustments.
Generate a plan for the production of specialty crops such as poinsettas, easter lillies, mums, etc.	file: Poinsettia Scheduling 2013 Mums KY Production 2012 cal 2013 cal Students will develop a specific planting schedule for mums or poinsettias and record all important information on production dates, growing temperatures and applications of chemicals.

Develop a production budget for specific crops	file: Spring Flower Selection Project Students will accomplish a 7 step assignment to research and select various annuals develop planting arraignments for various baskets, planters and flats calculate the correct amount of soil to order based on a annual bedding plant season's needs arrange planting blueprints calculate total production budget process plug orders from different suppliers

Course Title **Greenhouse Technology** Grade Levels 11-12 Credit Value 1

Description Greenhouse Technology provides instruction in greenhouse structures and greenhouse environment regulations. Plant growth and development and propagation are included as well as production and maintenance of bedding and container produced plants. Fundamental principles of vegetable production and commercial production of vegetable crops may be included. Content may be enhanced with appropriate technology. Leadership development will be provided through FFA. Each student will be expected to have a supervised agricultural experience program.

Prerequisites At least one course in the Horticulture pathway

Unit Title Integrated Pest Management

Technical Content

10 - Maintain, operate and repair facilities and equipment
11 - Apply safety regulation and practices

KY Academic Standards (Big Idea)

Interdependence (Unifying Concepts) - Science

It is not difficult for students to grasp the general notion that species depend on one another and on the environment for survival. But their awareness must be supported by knowledge of the kinds of relationships that exist among organisms, the kinds of physical conditions that organisms must cope with, the kinds of environments created by the interaction of organisms with one another and their physical surroundings, and the complexity of such systems At the high school level, the concept of an ecosystem should bring coherence to the complex array of relationships among organisms and environments that students have encountered. Students growing understanding of systems in general will reinforce the concept of ecosystems. Stability and change in ecosystems can be considered in terms of variables such as population size, number and kinds of species, productivity and the effect of human intervention.

Personal Wellness (Health Education) - Practical Living

Wellness is maximum well-being or total health. Personal wellness is a combination of physical, mental, emotional, spiritual and social well-being. It involves making behavioral choices and decisions each day that promote an individual's physical well-being, the prevention of illnesses and diseases and the ability to remain, physically, mentally, spiritually, socially and emotionally healthy.

Research, Inquiry/Problem-Solving and Innovation - Technology

Students understand the role of technology in research and experimentation. Students engage technology in developing solutions for solving problems in the real world. Students will use technology for original creation and innovation.

English/Language Arts Standards

CC.9-10.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CC.9-10.L.1.b Conventions of Standard English: Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.
CC.9-10.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.9-10.L.2.a Conventions of Standard English: Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.
CC.9-10.L.2.b Conventions of Standard English: Use a colon to introduce a list or quotation.
CC.9-10.L.2.c Conventions of Standard English: Spell correctly.
CC.9-10.SL.1.a Comprehension and Collaboration: Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
CC.9-10.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CC.11-12.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CC.11-12.L.1.a Conventions of Standard English: Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.
CC.11-12.L.1.b Conventions of Standard English: Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American English) as needed.
CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technical Literacy Standards

Integration of Knowledge and Ideas 7 Integrate quantitative
Integration of Knowledge and Ideas 8 Assess the extent
Integration of Knowledge and Ideas 9. Compare and contrast

Mathematics Standards

CC.9-12.G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*
CC.9-12.S.IC.6 Evaluate reports based on data.*

21st Century Skills and Knowledge

Collaboration

Communication

Environmental Literacy

Health Literacy

KOSSA Standards

1001.OF.1 Determine proper pesticide for given symptoms
1001.OF.2 Demonstrate safe handling and storage of pesticides
1001.OF.3 Calculate, mix, and apply pesticides
1001.OF.4 Monitor for plant damage

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Differentiate between major greenhouse pest and their impact	file: Common Greenhouse Pest Powerpoint and deck card students will research an assigned pest, and through presentation will teach their classmates about various other pest and make a note guide like a deck of cards
Formulate plan to eliminate a given pest from a greenhouse	file: Pest Management Plant Students form a plan to eradicate a greenhouse pest
Utilize proper PPE based on risk of practice	file: personal protective equipment in horticulture Students will label PPE equipment on a outline of a person
Select appropriate pesticide for a given situation and apply appropriately	file: Integrated Pest Management in Action students will use an IPM website to see three different sides of IPM; Applicator, Homeowner, Educator

Course Title **Greenhouse Technology** Grade Levels 11-12 Credit Value 1

Description Greenhouse Technology provides instruction in greenhouse structures and greenhouse environment regulations. Plant growth and development and propagation are included as well as production and maintenance of bedding and container produced plants. Fundamental principles of vegetable production and commercial production of vegetable crops may be included. Content may be enhanced with appropriate technology. Leadership development will be provided through FFA. Each student will be expected to have a supervised agricultural experience program.

Prerequisites At least one course in the Horticulture pathway

Unit Title Marketing and Business Principles

Technical Content

8 - Formulate marketing plan for greenhouse plants and/or vegetable crops

9 - Demonstrate business and marketing procedures

KY Academic Standards (Big Idea)

Career Awareness, Exploration, Planning - Vocational Studies

Career awareness, exploration and planning gives students the opportunity to discover the various career areas that exist and introduce them to the realities involved with the workplace. Many factors need to be considered when selecting a career path and preparing for employment. Career awareness, exploration and planning will enable students to recognize the value of education, learn how to plan for careers and integrate academic subjects.

Communication/Technology - Vocational Studies

Special communication and technology skills are needed for success in schooling and in the workplace. Students will be able to express information and ideas using a variety of technologies in various ways.

Consumer Decisions - Vocational Studies

Individual and families need to make consumer decisions due to the numerous products/services on the market, multiple advertising techniques, and the need to make responsible financial management decisions. Accessing and assessing consumer information, comparing and evaluating products and services, provides basis for making effective consumer decisions. Consumer decisions influence the use of resources and the impact they have on the community and environment.

Economics - Social Studies

Economics includes the study of production, distribution and consumption of goods and services. Students need to understand how their economic decisions affect them, others, the nation and the world. The purpose of economic education is to enable individuals to function effectively both in their own personal lives and as citizens and participants in an increasingly connected world economy. Students need to understand the benefits and costs of economic interaction and interdependence among people, societies, and governments.

Employability Skills - Vocational Studies

Employability skills will focus on student's competencies with their work habits and academic/technical skills that will impact an individual's success in school and workplace. School-to-work transition skills will help students develop interpersonal skills and positive work habits.

Financial Literacy - Vocational Studies

Financial literacy provides knowledge so that students are responsible for their personal economic well-being. As consumers, individuals need economic knowledge as a base for making financial decisions impacting short and long term goals throughout one's lifetime. Financial literacy will empower students by providing them with the knowledge, skills and awareness needed to establish a foundation for a future of financial responsibility and economic independence.

Research, Inquiry/Problem-Solving and Innovation - Technology

Students understand the role of technology in research and experimentation. Students engage technology in developing solutions for solving problems in the real world. Students will use technology for original creation and innovation.

Safety and Ethical/Social Issues - Technology

Students understand safe and ethical/social issues related to technology. Students practice and engage in safe, responsible and ethical use of technology. Students develop positive attitudes toward technology use that supports lifelong learning, collaboration, personal pursuits and productivity.

English/Language Arts Standards

CC.9-10.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CC.9-10.L.1.b Conventions of Standard English: Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

CC.9-10.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

CC.9-10.L.2.a Conventions of Standard English: Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.

CC.9-10.L.2.b Conventions of Standard English: Use a colon to introduce a list or quotation.

CC.9-10.L.2.c Conventions of Standard English: Spell correctly.

CC.9-10.R.I.1 Key Ideas and Details: Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CC.9-10.SL.1.a Comprehension and Collaboration: Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
CC.9-10.W.1.d Text Types and Purposes: Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CC.9-10.W.1.e Text Types and Purposes: Provide a concluding statement or section that follows from and supports the argument presented.
CC.9-10.W.2.b Text Types and Purposes: Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
CC.11-12.L.1 Conventions of Standard English: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CC.11-12.L.1.a Conventions of Standard English: Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.
CC.11-12.L.1.b Conventions of Standard English: Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American English) as needed.
CC.11-12.L.2 Conventions of Standard English: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CC.11-12.SL.2 Comprehension and Collaboration: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CC.11-12.W.7 Research to Build and Present Knowledge: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technical Literacy Standards

Key Ideas and Details 3. Follow precisely a complex
Text Types and Purposes 2. a. INtroduce a topic, oraganize

Mathematics Standards

CC.9-12.S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).*

21st Century Skills and Knowledge

Collaboration
Communication
Creativity and Innovation
Critical Thinking and Problem Solving
Financial, Economic, Business and Entrepreneurial Literacy
ICT (Information, Communications, and Technology) Literacy
Initiative and Self-Direction
Leadership and Responsibility
Productivity and Accountability
Social and Cross-Cultural Skills

KOSSA Standards

1001.OI.3 Interpret the impact of the horticultural industry on local, state, national, and international economy
1001.OB.1 Develop a marketing plan
1001.OB.2 Address customer questions about products and services
1001.OB.3 Demonstrate the sales process
1001.OI.1 Distinguish roles and responsibilities of government agencies
1001.OI.2 Keep up-to-date through industry associations and trade journals

Learning Targets	Sample Learner Activities - Click in the box to go to Activities
Compare various types of greenhouse businesses	file: Greenhouse Business - additional source Types of greenhouse Businesses For this activity, you will invite a guest speaker into the classroom or make a poster to show the different types of greenhouse businesses.
Generate a business/marketing plan for greenhouse and/or vegetable crops	file: Developing a business Plan for a Horticulture Company Students will research and develop a business plan for a horticulture or greenhouse business.
Design a greenhouse structure to best meet needs of producer	file: Establishing a Greenhouse Business Student will research and develop a greenhouse business based on location, property, and plant to grow
Develop a budgeting plan for the sale of plants in a greenhouse	file: Schedule of start up funds students will track and record greenhouse supplies and purchases to determine wholesale and retail price of finished items.
Demonstrate principles of effective customer service	file: Ag Sales CDE, Customer Service Modeling Students can use the National FFA CDE contest to reinforce effective customer service.