

HORTICULTURAL SCIENCE

Horticultural Science is a two semester course designed to give students a background in the field of horticulture and its many career opportunities. It addresses the biology and technology involved in the production, processing, and marketing of horticultural plants and products. Topics covered include: reproduction and propagation of plants, plant growth, growth media, management practices for field and greenhouse production, marketing concepts, production of plants of local interest, and pest management. Students participate in a variety of activities including extensive laboratory work usually in a school greenhouse.

Course Specifications

- DOE Code: 5132
- Recommended Grade Level: Grade 9-12
- Recommended Prerequisites: Introduction to Agriculture, Food and Natural Resources
- Credits: 1-3 credit(s) per semester, maximum of 2 semesters, maximum of 6 credits
- Fulfills a Life Science or Physical Science requirement for the General Diploma only or counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit
 - IVY Tech
 - AGRI 116 – Survey of Horticulture
 - Vincennes University
 - HORT 105 –Landscape Horticulture

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in FFA, the CTSO for this area.

Content Standards

Domain - Plant Classification, Anatomy, and Physiology

Core Standard 1 Students apply knowledge of plant classification, plant anatomy and plant physiology to the production and management of plants.

Standards

- HS-1.1 Classify agricultural plants according to taxonomy systems
- HS-1.2 Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems
- HS-1.3 Apply knowledge of plant physiology and energy conversion to plant systems
- HS-1.4 Recognize nomenclature, anatomy, and plant physiology related to horticultural plants (VU-HORT 105)
- HS-1.5 Differentiate between the major groups of horticultural plants: herbaceous and woody, annual and perennial, temperate and tropical (IvT-AGRI 116)
- HS-1.6 Identify the common plant species used in horticulture (IvT-AGRI 116)
- HS-1.7 Describe the basic functions of plants parts and how plants adapt to the environment (IvT-AGRI 116)

Domain - Environmental Factors, Nutrients and Growth Media

Core Standard 2 Students prepare and implement a plant management plan that addresses the influence of environmental factors, nutrients and soil on plant growth.

Standards

- HS-2.1 Describe factors to be considered in selecting a greenhouse heating, cooling, and ventilation system
- HS-2.2 Explain how heat, humidity, and gases affect greenhouse crops and photosynthesis
- HS-2.3 Explain the importance of light intensity and duration and the effects on plant growth
- HS-2.4 Compare and contrast an open and a closed environmental system
- HS-2.5 Describe the desired characteristics of an ideal growing medium
- HS-2.6 Evaluate different methods of watering plants and determine the appropriate method for individual plants
- HS-2.7 Explain the aspect of growth influenced by each of the essential elements
- HS-2.8 Describe the deficiency symptoms of the major plant nutrients
- HS-2.9 Explain the techniques of soil sampling and relate this process to testing the growing medium and interpreting the results to recommend fertilizer applications and pH treatment
- HS-2.10 Discuss the uses of chemicals to regulate plant growth
- HS-2.11 Analyze soils and soil fertility related to horticultural plants (VU-HORT 105)
- HS-2.12 Demonstrate knowledge of the environmental factors involved in ornamental plant production including soils, water, and pests (IvT-AGRI 116)
- HS-2.13 Characterize the types of environments involved in horticulture: greenhouse and indoor environments (IvT-AGRI 116)

Domain - Management Practices

Core Standard 3 Students establish management practices for field, greenhouse production.

Standards

- HS-3.1 Explain the differences between field production, nursery and greenhouse production and the plants produced in each
- HS-3.2 Plan a project for growing and marketing horticultural crops
- HS-3.3 Identify parts of a greenhouse and describe interior layouts best suited for different plants
- HS-3.4 Describe the differences in the levels of marketing and the marketing options available to horticulture producers
- HS-3.5 Address the challenges of packaging and shipping of horticultural products
- HS-3.6 Explain the benefits of wholesale and retail marketing for a particular product
- HS-3.7 Describe the processes used to maintain plant quality during the marketing process
- HS-3.8 Describe the structures, equipment, and material used in the production of horticultural crops
- HS-3.9 Design a strategy for implementing fruit or vegetable production

Domain – Production and Maintenance Practices

Core Standard 4 Students establish production and maintenance practices for field and greenhouse production.

- HS-4.1 Generate a plan to water plants according to selected scheduled times and requirements
- HS-4.2 Address the maintenance and overwintering storage of horticultural crops for various climates
- HS-4.3 Explain the procedures used to harvest and handle field grown horticultural crops
- HS-4.4 Compare accepted and new practices used in growing horticultural crops
- HS-4.5 Explain hydroponics and describe the specific challenges that must be overcome for successful yields
- HS-4.6 Address the purposes of pruning and tools needed as well as specific practices for each major type of fruit and nut tree
- HS-4.7 Recognize and explain plant design, installation, and maintenance (VU-HORT 105)
- HS-4.8 Describe and be able to reproduce the production of tree fruits, small fruits, flowers, and nursery plants (VU-HORT 105)

Domain - Integrated Pest Management

Core Standard 5 Students integrate an environmentally sound pest management system for healthy plant production.

Standards

- HS-5.1 Discuss the common pests of horticultural plants and describe the damage inflicted to the plants
- HS-5.2 Explain the different categories of plant diseases for flowers, vegetables, lawns, trees and shrubs
- HS-5.3 Examine the methods used to control plant pests and identify the advantages and disadvantages of each
- HS-5.4 Identify safe use of pesticides and proper first aid procedures for pesticide poisoning
- HS-5.5 Discuss the physiological principles of herbicides and relate the action to aspects of plant growth

- HS-5.6 Explain the classification of herbicides and discuss the appropriate uses for each type
- HS-5.7 Interpret the impact of current state and federal regulations on pest control measures.
- HS-5.8 Apply and adapt knowledge of integrated pest management (VU-HORT 105)

Domain - Plant Propagation

Core Standard 6 Students apply methods of plant propagation for plant reproduction.

Standards

- HS-6.1 Explain sexual and asexual reproduction and discuss the long term benefits and problems
- HS-6.2 Demonstrate sowing techniques and provide favorable conditions for seed germination
- HS-6.3 Describe the methods used to overcome seed dormancy
- HS-6.4 Explain the methods of asexual propagation and identify which species and varieties are best suited to each method
- HS-6.5 Describe the uses of synthetic rooting hormones and explain the varying need for such supplementation
- HS-6.6 Develop a schedule for plant propagation to meet seasonal production demands
- HS-6.7 Explain modern plant propagation techniques and how they are applied to different plant groups (IvT-AGRI 116)
- HS-6.8 Describe the fundamentals of plant breeding and how it applies to ornamental plants (IvT-AGRI 116)

Domain - Floriculture

Core Standard 7 Students learn, practice, and apply skills needed in the floriculture industry.

Standards

- HS-7.1 Apply design principals to a floral arrangement
- HS-7.2 Identify and use tools and equipment specific to the floral industry
- HS-7.3 Create table deigns, body flowers, and floral displays
- HS-7.4 Practice plant care for floral products
- HS-7.5 Apply marketing strategies for floral products

Domain - Careers

Core Standard 8 Students examine the scope of career opportunities in and the importance of agriculture to the economy.

Standards

- HS-8.1 Define and explore horticultural agriculture and horticultural agribusinesses and their role in the economy
- HS-8.2 Evaluate and explore the horticultural career opportunities in agriculture
- HS-8.3 Identify how key organizational structures and processes affect organizational performance and the quality of products and services
- HS-8.4 Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society

Domain - Leadership

Core Standard 9 Students validate the necessity of leadership skills development in conjunction with participation in The National FFA Organization (FFA) as a critical component to a well rounded agricultural

education.

Standards

- HS-9.1 Acquire and demonstrate communication skills such as writing, public speaking, and listening while refining oral, written, and verbal skills
- HS-9.2 Recognize and explain the role of the FFA in the development of leadership, education, employability, communications and human relations skills
- HS-9.3 Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment
- HS-9.4 Acquire the skills necessary to positively influence others
- HS-9.5 Develop a skill set to enhance the positive evolution of the whole person

Domain - Supervised Agriculture Experience

Core Standard 10 Students validate the necessity of a Supervised Agricultural Experience (SAE) program as a critical component to a well rounded agricultural education.

Standards

- HS-10.1 Explain the nature of and become familiar with those terms related to an SAE program
- HS-10.2 Explore the numerous possibilities for an SAE program which a student might develop
- HS-10.3 Develop an individual SAE program and implement record keeping skills

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

- 11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- 11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

- 11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.
- 11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- 11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or

discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Idea

- 11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- 11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- 11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

- 11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

- 11-12.WT.1 Write arguments focused on *discipline-specific content*.
- 11-12.WT.2 Write informative/explanatory texts, including technical processes.
- 11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

- 11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- 11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

- 11-12.WT.7 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.
- 11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources,

using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation

11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.