Indiana Department of Education
Academic Standards Content Framework

HORTICULTURAL SCIENCE

Horticultural Science is a two semester course that provides students with a background in the field of horticulture. Coursework includes hands-on activities that encourage students to investigate areas of horticulture as it relates to the biology and technology involved in the production, processing, and marketing of horticultural plants and products. Students are introduced to the following areas of horticulture science: reproduction and propagation of plants, plant growth, growth media, management practices for field and greenhouse production, marketing concepts, production of plants of local interest, greenhouse management, floral design, and pest management. Students participate in a variety of activities including extensive laboratory work usually in a school greenhouse.

Horticulture Science prepares students for many careers in agriculture, and more specifically horticulture science. These careers include but are not limited to: Arborist, Florist, Greenhouse Manager, Hydroponics Producer, Irrigation Specialist, Nursery Manager, and Viticulturist.

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 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
- Pathway Assessment: Dual credit course final exam
- This course is aligned with postsecondary courses for Dual Credit

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 and ornamental 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
HS-1.5	Differentiate between the major groups of horticultural plants: herbaceous and woody, annual, biennial and perennial, temperate and tropical
HS-1.6	Identify the common plant species used in horticulture
HS-1.7	Describe the basic functions of plants parts and how plants adapt to the environment

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

HS-2.12	Demonstrate knowledge of the environmental factors involved in ornamental plant production including soils, water, and pests
HS-2.13	Characterize the types of environments involved in horticulture: greenhouse and indoor environments

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
HS-4.8	Describe and be able to reproduce the production of tree fruits, small fruits, flowers, and nursery plants

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

Domain - Plant Propagation

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

Standards

HS-6.1	Evaluate 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	Describe the fundamentals of plant breeding and how it applies to ornamental plants.
HS-6.8	Conduct test associated with seed germination rates, viability and vigor.

Domain - Floriculture

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

Standards

HS-7.1	Evaluate design principles of a floral arrangement
HS-7.2	Identify and use tools and equipment specific to the floral industry
HS-7.3	Apply principles and elements of design that form the basis of artistic impression.
HS-7.4	Practice plant care for cut floral designs and other floral products.
HS-7.5	Evaluate methods of plant preservation techniques.
HS-7.6	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	Evaluate the nature and scope of natural resources in agriculture, society, and the economy
HS-8.2	Describe career opportunities and means to achieve those opportunities in natural resources
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	Communicate clearly, effectively, and with reason through speaking, writing, visuals, and active listening in formal and informal settings
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