

PLANT AND SOIL SCIENCE

Plant and Soil Science is a two semester course that provides students with opportunities to participate in a variety of activities including laboratory and field work. Coursework includes hands-on learning activities that encourage students to investigate areas of plant and soil science. Students are introduced to the following areas of plant and soil science: plant growth, reproduction and propagation, photosynthesis and respiration, diseases and pests of plants and their management, biotechnology, the basic components and types of soil, soil tillage, and conservation.

Plant and Soil Science prepares students for many careers in agriculture, and more specifically, plant and soil sciences. These careers include but are not limited to agriculture technician, agricultural inspector, agronomist, agronomic services, farm manager, plant breeder, plant pathologist, and soil and water specialist.

Course Specifications

- DOE Code: 5170
- Recommended Grade Level: Grade 9-12
- Recommended Prerequisites: Introduction to Agriculture, Food and Natural Resources
- Credits: 1 credit per semester, maximum of 2 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

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.

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 - Classifying

Core Standard 1 Students classify agricultural plants according to taxonomy systems.

Standards

- PSS-1.1 Explain systems used to classify plants
- PSS-1.2 Compare, contrast, and classify agricultural plants according to the hierarchical classification system, life cycles, plant use and as monocotyledons or dicotyledons
- PSS-1.3 Describe the morphological characteristics used to identify agricultural plants

Domain - Plant Reproduction

Core Standard 2 Students analyze the germination of seeds and plant reproduction to successfully grow and propagate plants.

Standards

- PSS-2.1 Explain pollination, cross-pollination and self-pollination of flowering plants
- PSS-2.2 Diagram the process of plant fertilization
- PSS-2.3 Design and implement a plan to control the pollination of plants
- PSS-2.4 Demonstrate planting techniques and provide favorable conditions for seed germination
- PSS-2.5 Conduct tests associated with seed germination rates, viability and vigor

Domain - Environmental Factors

Core Standard 3 Students evaluate the environmental factors affecting plant growth to productively cultivate plants.

Standards

- PSS-3.1 Describe the effects air, temperature, and water have on plant metabolism and growth
- PSS-3.2 Determine the optimal air, temperature and water conditions for plant growth
- PSS-3.3 Design, implement and evaluate a plan to maintain optimal conditions for plant growth
- PSS-3.4 Describe the qualities of light that affect plant growth
- PSS-3.5 Describe and evaluate plant responses to light color, intensity and duration

Core Standard 4 Students differentiate plant cell parts and functions as they apply to cell physiology and reproduction.

Standards

- PSS-4.1 Identify structures in a typical plant cell and summarize the function of plant cell organelles
- PSS-4.2 Diagram a typical plant cell and identify plant cell organelles and their functions
- PSS-4.3 Compare and contrast mitosis and meiosis

Domain - Plant Structure and Function

Core Standard 5 Students establish knowledge of plant parts and functions to successfully cultivate plants for the food, fiber, and natural resource industry.

Standards

- PSS-5.1 Identify the components, the types and the functions of plant roots
- PSS-5.2 Identify the components and the functions of plant stems
- PSS-5.3 Describe the processes of translocation
- PSS-5.4 Discuss external leaf morphology and the functions of leaves
- PSS-5.5 Explain how leaves capture light energy and allow for the exchange of gases
- PSS-5.6 Identify the components of a flower, the functions of a flower and the functions of flower components
- PSS-5.7 Apply the knowledge of flower structures to plant breeding, production and use
- PSS-5.8 Explain the functions and components of seeds and fruit
- PSS-5.9 Apply the knowledge of seed and fruit structures to plant culture and use

Domain - Energy Synthesis

Core Standard 6 Students apply and adapt photosynthesis and respiration in plants to make decisions on plant production.

Standards

- PSS-6.1 Explain the basic process of photosynthesis and its importance to life on Earth
- PSS-6.2 Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis
- PSS-6.3 Distinguish between the light-dependent and light-independent reactions that occur during photosynthesis and apply the knowledge to plant management
- PSS-6.4 Explain cellular respiration and its importance to plant life
- PSS-6.5 Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration

Domain - Plant Pests

Core Standard 7 Students establish pest control measures to minimize the impact on agronomic crops.

Standards

- PSS-7.1 Identify types of plant pests and disorders
- PSS-7.2 Identify major local weeds, insect pests and infectious and noninfectious plant diseases
- PSS-7.3 Describe damage caused by plant pests and diseases

- PSS-7.4 Diagram the life cycles of major plant pests and diseases
- PSS-7.5 Describe pest control strategies associated with integrated pest management
- PSS-7.6 Describe types of pesticide controls and modes of action
- PSS-7.7 Employ pest management strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed
- PSS-7.8 Explain risks and benefits associated with the materials and methods used in plant pest management
- PSS-7.9 Evaluate environmental and consumer concerns regarding pest management strategies

Domain - Sustainable Agriculture Systems

Core Standard 8 Students apply principles and practices of cropping systems to plant production to recommend the ideal system for their local community.

Standards

- PSS-8.1 Identify the current topics in crop production and the role those topics play in the management & production of agronomic crops
- PSS-8.2 Assess the importance of long-term impacts on sustainable agriculture systems in relation to global food security
- PSS-8.3 Evaluate the various methods of land preparation and seeding based on soil and plant characteristics
- PSS-8.4 Research and summarize production methods focused on soil management (e.g., crop rotation, cover crops, etc.)
- PSS-8.5 Analyze the alignment of modern technologies used in production systems (e.g. precision agriculture, gene editing technologies, etc.)
- PSS-8.6 Describe sustainable agriculture practices and how they relate to conventional agricultural practices
- PSS-8.7 Compare and contrast the differing management techniques related to environmental factors & their effect on plants.
- PSS-8.9 Evaluate practices in support of sustainable agriculture

Domain - Crop Fertilization

Core Standard 9 Students connect soil nutrients and soil management to promote healthy plant growth

Standards

- PSS-9.1 Identify the essential nutrients in the soil for plant growth and development and their major functions

- PSS-9.2 Calculate the content of N-P-K in a fertilizer container from information on the package and calculate the amount of nitrogen needed for an acre of a crop using a selected nitrogen source
- PSS-9.3 Describe nutrient deficiency symptoms and recognize environmental causes of nutrient deficiencies

Domain - Soil Properties

Core Standard 11 Students analyze the physical properties of soil to determine crop selection, cropping drainage, and soil conservation.

Standards

- PSS-10.1 Explain the process of soil formation through weathering
- PSS-10.2 Demonstrate techniques used to identify soil types
- PSS-10.3 Report examples of how humans are dependent upon soil, directly or indirectly, for their food, clothing and shelter
- PSS-10.4 Describe how the basic components and physical qualities of a soil influence its possible uses

Domain - Soil Water

Core Standard 12 Students evaluate soil and water relationships to encourage optimum plant growth

Standards

- PSS-12.1 Identify the categories of soil water
- PSS-12.2 Discuss how soil drainage and water holding capacity can be improved
- PSS-12.3 Assess the physical qualities of the soil that determine its potential for filtration of groundwater supplies and the likelihood of flooding
- PSS-12.4 Describe properties of watersheds and identify the boundaries of local watersheds
- PSS-12.4 Describe properties of watersheds and identify the boundaries of local watersheds

Domain - Soil Conservation Practices

Core Standard 13 Students apply and adapt the soil conservation practices necessary to keep soil productive

Standards

- PSS-13.1 Propose management practices and cropping systems when given features and land capabilities that would help improve the usefulness of the land
- PSS-13.2 Analyze effects of water and mechanical practices on erosion
- PSS-13.3 Explain how the programs and services provided by conservation agencies contribute to successful soil management
- PSS-13.4 Calculate soil loss using current models

PSS-13.5 Measure slope and explain the relationship between steepness of slope and erosion

Domain - Soil Fertility and Health

Core Standard 14 Students will connect physical, chemical, and biological properties that make up soil health to impacts on yield and water quality.

Standards

- PSS-14.1 Assess and describe the short- and long- term effects production methods have on soil
- PSS-14.2 Identify key indicators of soil health
- PSS-14.3 Describe the biodiversity (earthworms, nematodes, and microorganisms) found in soil and the contribution to soil health
- PSS-14.4 Describe factors that contribute to soil compaction and its effects on plants and productivity
- PSS-14.5 Contrast pH and cation exchange capacity between different soil types

Domain - Careers

Core Standard 15 Students examine the scope of career opportunities in and the importance of agriculture to the economy.

Standards

- PSS-15.1 Evaluate the nature and scope of plant and soil sciences in agriculture, society, and the economy
- PSS-15.2 Describe career opportunities and means to achieve those opportunities in plant and soil sciences
- PSS-15.3 Identify how key organizational structures and processes affect organizational performance and the quality of products and services
- PSS-15.4 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 16 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

- PSS-16.1 Communicate clearly, effectively, and with reason through speaking, writing, visuals, and active listening in formal and informal settings

- PSS-16.2 Recognize and explain the role of the FFA in the development of leadership, education, employability, communications and human relations skills
- PSS-16.3 Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment
- PSS-16.4 Acquire the skills necessary to positively influence others
- PSS-16.5 Develop a skill set to enhance the positive evolution of the whole person

Domain - Supervised Agriculture Experience

Core Standard 17 Students validate the necessity of a Supervised Agricultural Experience (SAE) program as a critical component to a well-rounded agricultural education.

Standards

- PSS-17.1 Explain the nature of and become familiar with those terms related to an SAE program
- PSS-17.2 Explore the numerous possibilities for an SAE program which a student might develop
- PSS-17.3 Develop an individual SAE program and implementation plan for record keeping skills