**§130.21. Advanced Plant and Soil Science (One Credit).**

(a) General requirements. This course is recommended for students in Grade 12. Recommended prerequisite: a

minimum of one credit from the courses in the Agriculture, Food, and Natural Resources cluster.

(b) Introduction.

(1) Plant and Soil Science provides a way of learning about the natural world. Students should know

how plant and soil science has influenced a vast body of knowledge, that there are still

applications to be discovered, and that plant and soil science is the basis for many other fields of

science.

(2) Investigations, laboratory practices, and field exercises will be used to develop an understanding

of current plant and soil science.

(3) This course is designed to prepare students for careers in the food and fiber industry. Students will

learn, reinforce, apply, and transfer their knowledge in a scientific setting.

(c) Knowledge and skills.

(1) The student, for at least 40% of instructional time, conducts field experiments, laboratory

investigations, or approved supervised experience programs using safe, environmentally

appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations; and

(B) demonstrate an understanding of the use and conservation of resources and proper

disposal and recycling of spent resources.

(2) The student analyzes plant and soil science as related to plant and soil relationships affecting the production of food and fiber. The student is expected to:

(A) recognize the importance and interrelationships of soil and plants; and

(B) practice soil and plant evaluation as it applies to agricultural and urban settings.

(3) The student demonstrates the employability characteristics of a successful employee. The student is expected to: (A) identify career development and entrepreneurship opportunities in the field of plant systems; (B) apply competencies related to resources, information, interpersonal skills, and systems of operation in plant systems;

(C) demonstrate knowledge of personal and occupational safety practices in the workplace;

And (D) identify employer expectations, appropriate work habits, and good citizenship skills.

(4) The student develops an advanced supervised experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research,

either experimental or analytical; improvement; supplementary; laboratory-based; or

other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised

experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program

in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

*Adopted to be effective August 23, 2010.*

(5) The student develops scenarios for advances in plant and soil science. The student is expected to:

(A) design, conduct, and complete research in a laboratory or field activity to solve problems

in plant and soil science;

(B) use charts, tables, and graphs to prepare written summaries of results and data obtained in

a laboratory or field activity;

(C) organize, analyze, evaluate, make inferences, and predict trends from resulting data; and

(D) communicate valid outcomes and solutions.

(6) The student explains the relationship of biotic and abiotic factors within habitats and ecosystems.

The student is expected to:

(A) identify native plants, assess their role in an ecosystem, and compare them to plants in

other ecosystems;

(B) make observations and compile data about fluctuations in abiotic cycles and evaluate

their effects on local ecosystems;

(C) evaluate the impact of human activity such as methods of pest control, hydroponics, and

sustainable agriculture on ecosystems; and

(D) predict how the introduction, removal, or re-introduction of an organism may affect the

food chain and existing populations.

(7) The student analyzes soil science as related to food and fiber production. The student is expected

to:

(A) explain soil formation;

(B) evaluate the properties and nature of soils;

(C) recognize the importance of conservation of soil and agencies involved in conservation;

(D) perform soil management practices such as tillage trials and sustainable soil management;

and

(E) practice soil evaluations as related to experiential activities such as land judging.

(8) The student describes the relationship between resources within environmental systems. The

student is expected to:

(A) summarize methods of land use and management;

(B) identify sources, use, quality, and conservation of water;

(C) explore the use and conservation of renewable and non-renewable resources;

(D) analyze and evaluate the economic significance and interdependence of components of

the environment;

(E) evaluate the impact of human activity and technology on soil fertility and productivity;

(F) analyze and describe the effects on environments by events such as fire, hurricanes,

deforestation, mining, population growth, and urban development; and

(G) explain how regional changes in the environment may have a global effect.

(9) The student describes the origin and use of water in a watershed. The student is expected to:

(A) identify sources and calculate the amount of water in a watershed, including ground and

surface water;

(B) research and identify the type of water used in a watershed;

(C) analyze water quality in a watershed; and

*Adopted to be effective August 23, 2010.*

(D) identify and use methods to evaluate water quantity available in a watershed.

(10) The student maps the process of soil formation as influenced by weathering, including erosion

processes due to water, wind, and mechanical factors influenced by climate. The student is

expected to:

(A) illustrate the role of weathering in soil formations;

(B) distinguish chemical weathering from mechanical weathering; and

(C) identify geological formations that result from differing weathering processes.

(11) The student describes the dynamics of a watershed. The student is expected to:

(A) identify the characteristics of a local watershed such as average annual rainfall, runoff

patterns, aquifers, location of water basins, and surface reservoirs; and

(B) analyze the impact of floods, drought, irrigation, urbanization, and industrialization in a

watershed.

(12) The student explains how petroleum energy resources affect agriculture. The student is expected

to:

(A) research and describe the origin of fossil fuels such as coal, oil, and natural gas;

(B) analyze issues regarding the use of fossil fuels and other non-renewable energy sources

or alternative energy sources; and

(C) analyze the significance and economic impact of the use of fossil fuels and alternative

energy sources.

(13) The student evaluates components of plant science as it relates to crop production. The student is

expected to:

(A) analyze plant physiology, genetics, and reproduction;

(B) recognize characteristics of quality seeds such as mechanical damage, viability, and

grade;

(C) identify plant pests and diseases and their causes, prevention, and treatment;

(D) perform plant management practices such as germination tests, plant spacing trials, and

fertilizer tests; and

(E) measure trends in crop species and varieties grown locally in Texas and the United States

and how this affects agriculture and consumers.

(14) The student identifies how plants grow and how specialized cells, tissues, and organs develop. The

student is expected to:

(A) compare cells from different parts of the plant, including roots, stems, and leaves, to

show specialization of structures and functions; and

(B) sequence the levels of organization in multicellular organisms that relate the parts to each

other and the whole.

(15) The student diagrams the structure and function of nucleic acids in the mechanism of genetics. The

student is expected to:

(A) describe components of deoxyribonucleic acid and illustrate how information for

specifying the traits of an organism is carried in deoxyribonucleic acid;

(B) identify and illustrate how changes in deoxyribonucleic acid cause phenotypic or

genotypic changes;

(C) compare and contrast genetic variations observed in plants and animals; and

(D) compare the processes of mitosis and meiosis and their significance.

*Adopted to be effective August 23, 2010.*

(16) The student demonstrates skills related to the human, scientific, and technological dimensions of

crop production and the resources necessary for producing domesticated plants. The student is

expected to:

(A) describe the growth and development of major crops;

(B) apply principles of genetics and plant breeding;

(C) examine the development of crop varieties through the origin of agriculture; and

(D) design and conduct experiments to support known principles of genetics.

(17) The student explains the chemistry involved in plants at the cellular level. The student is expected

to:

(A) compare the structures and functions of different types of organic molecules such as

carbohydrates, lipids, proteins, and nucleic acids;

(B) compare the energy flow in photosynthesis to the energy flow in cellular respiration; and

(C) investigate and identify the effect of enzymes on plant cells.

(18) The student identifies the sources and flow of energy through environmental systems. The student

is expected to:

(A) summarize forms and sources of energy;

(B) explain the flow of energy in an environment;

(C) investigate and explain the effects of energy transformations in an ecosystem; and

(D) investigate and identify energy interaction in an ecosystem.