Program Concentration: **Agriculture**
Career Pathway: **Agriscience**
Course Title: **Plant Science and Biotechnology**

Plant science is a basic component of the agriscience pathway. This course introduces students to the scientific theories, principles, and practices involved in the production and management of plants for food, feed, fiber, conservation and ornamental use. Classroom and laboratory activities are supplemented through supervised agricultural experiences and leadership programs and activities.

AG-PSB-1: The student defines, explains, and demonstrates the importance of plant science, agriscience and biotechnology in agriculture and society.

a. Describes the role of plants in the food chain.
b. Describes the role plants play in the environment.
c. Explains how plants are used in the food and fiber system and ornamental purposes.
d. Traces the origin of common crop and ornamental plants.
e. Discusses the economic importance of plant production.
f. Defines science and agriscience.
g. Demonstrates the scientific method.
h. Explains why agriculture is an applied science.
i. Describes at least three advances in agriculture resulting from agricultural research.
j. Describes the historical events related to agricultural research and development.
k. Distinguishes between basic and applied research.
l. Demonstrates proper use of the compound and dissecting microscopes.

Academic Standards:
SSEF1 (b) Define and give examples of productive resources as land (natural), labor (human), capital (capital goods), entrepreneurship.

SSEF6 (a) Define productivity as the relationship of inputs to outputs.

SSEMI2 (a) Define the Law of Supply and the Law of Demand.

SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3 Students will identify and investigate problems scientifically.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

SES6 Students will explain how life on Earth responds to and shapes Earth systems.

SB2 (e) Compare the advantages of sexual reproduction and asexual reproduction in different situations.

AG-PSB-2: The student differentiates between plants utilizing scientific plant classification.

a. Writes scientific names according to set guidelines.
b. Distinguishes the differences between the levels of the classification system.
c. Explains the importance of using a universal classification system.
d. Discusses the importance of the plant patent system.
e. Defines and explains the dichotomous key and uses it to identify unknown plants and other items.
f. Identifies terms used to describe the characteristics of plants.
g. Names and describes the major plant types.
h. Identifies plant species within the major plant types.
i. Discusses the differences between vascular and nonvascular plants.
j. Gives examples of each of the major plant types.

Academic Standards:
ELA10LSV1 (b) Asks relevant questions; (c) Responds to questions with appropriate information

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

S7L1 (b) Classify organisms based on a six-kingdom system and a dichotomous key.

AG-PSB-3: The student identifies the major structures of plants and describes their functions.

a. Describes the various structures and tissues of the root.
b. Distinguishes between taproots, lateral roots, adventitious roots, and fibrous roots.
c. Explains the function of plant roots, stems, flowers, and leaves.
d. Describes and explains the function of internal and external plant structures.
e. Defines and explains the process of photosynthesis.
f. Distinguishes between monocot and dicot stems.
g. Discusses and gives examples of adaptations plants have made.

Academic Standards:
SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB1 Students will analyze the nature of the relationships between structures and functions in living cells.

SB2 (e) Compare the advantages of sexual reproduction and asexual reproduction in different situations.

AG-PSB-4: The student identifies the parts of plant cells and demonstrates their growth and solute movements.

a. Identifies and describes the components of plant cells.
b. Lists the functions of plant cell components in relation to plant growth.
c. Distinguishes between plant cells and animal cells.
d. Summarizes the three kinds of plant cell activity (division, enlargement, and differentiation).
e. Describes the life cycle of a plant cell.
f. Lists phases of plant growth.
g. Identifies the zone of elongation and differentiation.
h. Identifies ways that osmosis affects plants.
i. Describes how water moves into and out of plant cells.
j. Defines important terms and functions related to plant cells including osmosis, diffusion, etc.

Academic Standards:
SB1 Students will analyze the nature of the relationships between structures and functions in living cells.

S7L2 Students will describe the structure and function of cells, tissues, organs, and organ systems.

AG-PSB-5: The student explains technological advancements in plant development, reproduction and protection.

a. Traces the development of modern species and varieties.
b. Outlines a procedure that early plant breeders might have used to domesticate a wild plant species.
c. Defines biotechnology terms including plant evolution, natural and artificial selection, genetic variation, etc.
d. Explains the role of biotechnology and bioengineering in modern plant production.
e. Compares traditional plant breeding and genetic engineering of plants.
f. Demonstrates plant tissue culture procedures and successfully propagates plant through plant tissue culture.
g. Describes the effects of growth hormones on tissue culture success.
h. Explains the importance of rhizobia bacteria to legumes.
i. Describes the importance of using legumes in agricultural operations.
j. Inoculates legumes with rhizobia bacteria.
k. Controls plant growth through the application of growth inhibitors, stimulants, and cultural practices.
l. Identifies the major plant hormones that are important to plant growth.
m. Forces plants through the use of cultural practices.
n. Explains why forcing of plants is important to the horticulture and related plant industries.
o. Discusses and gives examples of the important of genetic variation in the gene pool.
p. Discusses the uses, fears, and methods of genetically modified organisms.

Academic Standards:
ELA10RC3 (a) Demonstrates an understanding of contextual vocabulary in various subjects.

SSEF1 (b) define and give examples of productive resources as land (natural), labor (human), capital (capital goods), entrepreneurship.

SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB1 Students will analyze the nature of the relationships between structures and functions in living cells.

SB2 Students will analyze how biological traits are passed on to successive generations.

SB2 (e) Compare the advantages of sexual reproduction and asexual reproduction in different situations.

AG-PSB-6: The student identifies and describes plant nutritional needs, essential nutrients and prescribes nutritional programs for plants.

a. Describes the role of nutrients in plant growth and development.
b. Lists primary and secondary plant nutrients.
c. Defines plant needs for micro nutrients (trace elements).
d. Describes the role primary nutrients play in plant growth and development.
e. Explains the role of secondary and micro nutrients in plant growth and development.
f. Identifies natural, organic methods of supplying plants with nutrients.
g. Identifies and prescribes artificial sources of plant nutrients.
h. Describes common symptoms of plants with excess nutrients and prescribes remedies.
i. Describes common symptoms of nutrient deficient plants and prescribes remedies.
j. Tests for, identifies and describes soluble salt problems in soils.
k. Discusses the importance of soil tests and the application of prescribed remedies.
l. Samples soils, runs soil tests and interprets soil test reports.
m. Interprets plant tissue sample results.
n. Describes soil sampling procedures.
o. Identifies key plant parts involved in nutrient transport.
p. Describes the process of nutrient transport.

Academic Standards:
SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB1 Students will analyze the nature of the relationships between structures and functions in living cells.

AG-PSB-7: The student evaluates soil characteristics, factors and components that influence plant growth and evaluates land plots and soil types for production capability.

a. Identifies functions of soils on plant production.
b. Identifies acids and bases using the pH scale.
c. Describes the importance of soil pH on crops.
d. Selects and prescribes compounds that will change the soil pH.
e. Identifies the soil pH best suited for certain crops.
f. Describes the composition of an ideal soil.
g. Lists factors that contribute to soil composition.
h. Identifies problems with soils that are not in the proper physical condition for plant growth.
i. Estimates the amount of organic matter in a soil sample.
j. Identifies macro and micro animal and plant life in soils and describes their effects on the soil.
k. Classifies soil horizons by color, texture, or structural composition.
l. Discusses the major horizons of mineral soils and identifies their characteristics.
m. Identifies the soil structural classes.
n. Describes the effects of soil structure on crop production.
o. Lists the results of poor soil structure and the advantages of good soil structure.
p. Identifies the ways humans, animals and machinery can affect soil structure.
q. Sorts and identifies the three major constituents of mineral soil.
r. Describes each soil constituent relative to size and other characteristics.
s. Describes the effect of soil texture in agricultural operations.
t. Identifies commonly used artificial soils, listing their advantages and disadvantages.
u. Selects and artificial soil mixtures for specific uses.
v. Formulates and prescribes artificial soil mixes for specific plants.
w. Lists sources and characteristics of commonly used soil mix ingredients.

Academic Standards:
SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SC7 Students will characterize the properties that describe solutions and the nature of acids and bases.

S6E5 (g) Describe soil as consisting of weathered rocks and decomposed organic material.

S6E5 (h) Explain the effects of human activity on the erosion of the earth's surface.

S6E5 (I) Describe the methods for conserving natural resources such as water, soil and air.

AG-PSB-8: The student diagrams the life cycles of plants explains the functions of plant reproductive parts and demonstrates methods of seed dissemination and germination.

a. Describes sexual and asexual reproduction in plants and lists examples.
b. Identifies the advantages of each type of plant propagation.
c. Categorizes important agronomic and ornamental plants based on commercial propagation methods.
d. Defines annual, winter annual, perennial, and biennial.
e. Traces the life cycle of plants and phases of growth.
f. Identifies the male and female parts of flowering plants.
g. Describes the functions of each flower part.
h. Describes the processes of pollination and fertilization in plants.
i. Explains the process by which gametes are produced in both the male and female parts of the flower.
j. Distinguishes between monoecious and dioecious plants.
k. Distinguishes between complete and incomplete flowers.
l. Defines cross-pollination and self-pollination.
m. Defines fruit set and parthenocarpic fruit.
n. Classifies the types of fruits and flowers.
o. Describes the formation and role fruits play in reproduction.
p. Discusses how seeds are dispersed and the importance of seed dispersal.
q. Identifies methods of dispersal of common plants.
r. Identifies factors necessary for seed germination.
s. Describes the process of germination.
t. Explains the importance of seed dormancy in plant survival.
u. Scarifies and stratifies seeds.
v. Describes and applies hypogeal and epigeal germination.

Academic Standards:
ELA10RC2 (c) Relates messages and themes from one subject area to those in another area;

SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB2 Students will analyze how biological traits are passed on to successive generations.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

AG-PSB-9: The student explains the use and importance of genetics in plant breeding.

a. Describes Mendel's experiments in plant breeding.
b. Describes Law of Independent Assortment.
c. Discusses the difference between heterozygous and homozygous.
d. Lists the seven plant characteristics of the garden pea used extensively by Mendel.
e. Discusses the two factors that influenced Mendel to use garden peas as his plant variety for studying inheritance of plants.
f. Predicts genetic outcome using a Punnett Square.
g. Describes the structure of a DNA molecule.
h. Defines DNA and RNA.
i. Discusses and gives examples of major advances in agronomic production due to heterosis.
j. Determines the difference between F1 and F2 generations and describes the use of each in plant breeding.
k. Generate crossbred plants through plant breeding.

Academic Standards:
ELA10RC2 (c) Relates messages and themes from one subject area to those in another area

SCSh2 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh4 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

SB2 Students will analyze how biological traits are passed on to successive generations.

MM1D1 Students will determine the number of outcomes related to a given event.

AG-PSB-10: The student describes environmental effects on plants, demonstrates ways to manage the environment for production and ornamental use of plants, and match plants to given growing conditions.

a. Differentiates between climatic regions of Georgia and the US.
b. Describes the different types of climate and the potential and limitations for plant production.
c. Explains climatic effects on soils and the resulting effect on plant production.
d. Describes the effects of weather change and climatic effects on plants.
e. Locates and interprets weather information.
f. Explains the effect of light on plants and agricultural production practices.

g. Defines photoperiodism and demonstrates its use in plant production.
h. Distinguishes between light sources, intensity, and quality and prescribes light needs for plants.
i. Demonstrates the effects of light colors (chromatography) and intensity on plants.
j. Measures wind velocity and explains the effects of wind on plants, structures, etc.
k. Determines the best location for orchards, greenhouses, etc. based on climatic conditions.
l. Determines temperature and the effects on plant production.
m. Converts the measurements from Fahrenheit to Celsius and Celsius to Fahrenheit.
n. Distinguishes between cool season and warm season plants.
o. Explains the importance of temperature on germination, pollination and other plant functions.
p. Utilizes the plant hardiness zoning classifying system for plants.
q. Measures precipitation.
r. Determines the amount of annual precipitation in the various parts of Georgia, and the US and describes the limitations of plant production based on rainfall.
s. Matches plants adapted to regions based on rainfall.
t. Measures humidity and explains its importance in agriculture.
u. Explains the methods, materials and functions of evaporative cooling and their limitation.
v. Differentiates among the various tropisms including geotropism, phototropism, and chemotropism.
w. Explains the reasons plants respond to stimuli and grow in certain directions.

Academic Standards:
ELA10RL1 (a) Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational text.

SES5 Students will investigate the interaction of insulation and Earth systems to produce weather and climate.

SSEF1(b) define and give examples of productive resources as land (natural), labor (human), capital (capital goods), entrepreneurship.

SSWG1 (a) describe the concept of place by explaining how physical characteristics such as landforms, bodies of water, climate, soils, natural vegetation, and animal life are used to describe a place.

MM4P1 Students will solve problems (using appropriate technology).

S7L4 Students will examine the dependence of organisms on one another and their environments.

AG-PSB-11: The student explains the uses of plants in medicine, food crops, animal feeds, and ornamental applications.

a. Describes how and what plants can be used for medicinal purposes.
b. Identifies what plants and which parts of those plants are used for medicinal purposes.
c. Describes the importance of food crops and identifies food crops grown locally.

d. Explains the economic impact of food crops on the economy.
e. Lists major agronomic foods crops and identifies the region of Georgia or the U.S. where each is grown.
f. Defines the uses and economic importance of ornamental plants.

Academic Standards:
ELA10RC4 (a) Explores life experiences related to subject area content.

SSEF6 (a) define productivity as the relationship of inputs to outputs.

SSEMI2 (a) define the Law of Supply and the Law of Demand

SSWG8 (a) describe the location of major physical features and their impact on the Canada and the United States

SB2 Students will analyze how biological traits are passed on to successive generations.

SB2 (f) Examine the use of DNA technology in forensics, medicine and agriculture.

AG-PSB-12: The student propagates plants using methods of vegetative cloning and sexual reproduction.

a. Defines cloning and describes the materials and methods of cloning.
b. Explains the benefits of cloning plants.
c. Prescribes plant propagation procedures based on economics and reproduction success rate.
d. Differentiates between sexual and asexual reproduction.
e. Selects and utilizes plant hormones in plant propagation.
f. Explains the stimuli and response effect of plant hormones used in plant propagation.
g. Propagates plants though sexual and asexual reproduction.

Academic Standards:
ELA10RC3 (a) Demonstrates an understanding of contextual vocabulary in various subjects; (c) Explores understanding of new words found in subject area texts.

SB2 Students will analyze how biological traits are passed on to successive generations.

SB2 (e) Compare the advantages of sexual reproduction and asexual reproduction in different situations.

AG-PSB-13: The student identifies and classifies weeds, prescribes control methods, and describes the economic and environmental effects that weeds have on agricultural production.

a. Defines and classifies weeds according to plant characteristics.
b. Identifies the economic and aesthetic impact of weeds.
c. Explains how weeds compete with plants in fields, greenhouses, landscapes, etc.
d. Calculates crop losses to weeds.
e. Calculates the economic threshold for weed control measures to be implemented.

f. Describes actions, conditions, vectors and weed characteristics that help in distribution of weed seeds.
g. Identifies characteristics of weeds that affect treatment type and effectiveness of treatment.
h. Identifies common weed plants and the crops/locations they infest.
i. Prescribes methods of weed control and the appropriate use of weed control measures.
j. Explains the importance of Integrated Pest Management (IPM).
k. Interprets and implements pesticide label application instructions.
l. Infers potential and futuristic methods of weed control.
m. Interprets environmental concerns of the public related to weed control.
n. Prescribes alternative methods to chemical weed control.
o. Compares and contrasts advantages and disadvantages of specific weed control measures.
p. Discusses and explains methods of safe herbicide use.
q. Demonstrates the proper application method of herbicides.

Academic Standards:
SPS6. Students will investigate the properties of solutions.

MM4P1 Students will solve problems (using appropriate technology).

MM3A3 Students will solve a variety of equations and inequalities.

S7L1 (b) Classify organisms based on a six-kingdom system and a dichotomous key.

S7L3 Students will recognize the dependence of organisms on one another and their environments.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystem.

AG-PSB-14: The student identifies, determines control methods, and defines the environmental and economic impact that insects have on plant production.

a. Identifies common agricultural pests by sight and describes the damage done by insects.
b. Distinguishes between beneficial and harmful insects.
c. Explains why the study of entomology is important.
d. Describes beneficial insects and the ways in which beneficial insects control pests.
e. Identifies common beneficial insects and by sight and prescribes measures to encourage their continued presence.
f. Discusses the importance of insects in relation to pollination.
g. Classifies insects using a dichotomous key, and reference materials.
h. Describes and identifies body parts of insects.
i. Describes chemical and mechanical insect control measures available to producers to protect plants.
j. Discusses how natural pest control measures can be utilized by producers to protect plants.

k. Compares and contrasts the advantages and disadvantages of using insecticides with non-chemical, organic plant production.
l. Explains why environmentally safe insect controls are needed.
m. Discusses the use of Integrated Pest Management for controlling insects.
n. Demonstrates the safe use of pesticides.

Academic Standards:
ELA10RC2 (c) Relates messages and themes from one subject area to those in another area;

SPS6. Students will investigate the properties of solutions.

S7L1 (b) Classify organisms based on a six-kingdom system and a dichotomous key.

S7L3 Students will recognize the dependence of organisms on one another and their environments.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystem.

AG-PSB-15: The student identifies diseases, related organisms, and physiological disorders affecting plants, and prescribes methods of prevention and control.

a. Discusses the impact of diseases, nematodes, and physiological disorders on plant production.
b. Classifies the types of plant diseases and casual organism.
c. Prescribes methods of preventing and controlling plant disease, nematodes and physiological disorders.
d. Explain factors necessary for disease infection in plants.
e. Diagrams the life cycle of common diseases.
f. Explains how fungi, bacteria, and viruses are spread.
g. Identifies common plant diseases by symptoms and signs.
h. Defines key terms related to plant pathology.
i. Traces the history and importance of plant pathology.
j. Describes the types of nematodes and how they damage plants.
k. Explains how unfavorable environmental conditions can affect disease or disease-like infestations in plants.
l. Differentiates between pathogenic and non-pathogenic diseases.
m. Demonstrates the safe use of pesticides.

Academic Standard:
ELA10RC3 (a) Demonstrates an understanding of contextual vocabulary in various subjects; (c) Explores understanding of new words found in subject area texts.

S7L3 Students will recognize the dependence of organisms on one another and their environments.

AG-PSB-16: The student explains the water-plant relationship and describes how water and other materials move through the plant.

a. Describes the three categories of water that may be present in the soil.
b. Describes hydraulic conductivity, infiltration, and percolation.

c. Distinguishes between soil texture and bulk density and how they affect soil-water.
d. Defines absorption and describes how absorption takes place.
e. Explains how soil solution enters root hairs.
f. Describes and explains the movement of water in plant cells.
g. Distinguishes between xylem and phloem based on function.

Academic Standards:
S7L3 Students will recognize the dependence of organisms on one another and their environments.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystem.

AG-PSB-17: The student describes environmentally controlled plant growth systems and prescribes their use based on plant environmental needs and economic factors.

a. Discusses why environmentally controlled structures are used and describe their advantages.
b. Lists the types of structures used in horticulture and prescribes the uses of each of the structures based on the plants to be produced.
c. Diagrams the environmental control components of greenhouses, cold frames, and other plant growth structures.
d. Describes how hydroponic systems are used in horticulture and plant science.
e. Describes the essential elements of a hydroponic system.

Academic Standard:
ELA10RC4 (a) Explores life experiences related to subject area content.

S6E6 Students will describe various sources of energy, their uses, and the conservation of sources of energy.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystem.

AG-PSB-18: The student analyzes the affect of plant production on the environment and quality of life factors.

a. Explains the importance of plant processes to life on earth.
b. Explains the role of plants in the food chain.
c. Describes photosynthesis and respiration analyzing the role CO2 and O2 play.
d. Describes how conventional agricultural practices affect the environment.
e. Describes new agricultural practices that are environmentally friendly.
f. Compares and contrasts the advantages and disadvantages of conventional versus organic farming.
g. Describes how composting works and the procedures for creating a compost pile.
h. Describes uses for plant by-products and the environmental benefits to using them.
i. Explains the importance of compost in the production of plants.
j. Defines methods of erosion prevention and prescribes erosion control measures for a specific site in the community.

Academic Standards:
ELA10RC4 (a) Explores life experiences related to subject area content.

S7L3 Students will recognize the dependence of organisms on one another and their environments.

SB4 Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystem.

AG-PSB-19: The student becomes oriented to the comprehensive program of agricultural education, learns to work safely in the agriculture lab and work sites, demonstrates selected competencies in leadership through the FFA and agricultural industry organizations, and develops plans for a supervised agricultural experience program.

a. Explains the role of the Agriculture Education program and the FFA in personal development.
b. Demonstrates knowledge learned through a Supervised Agricultural Experience Program (SAEP).
c. Develops leadership and personal development skills through participation in the FFA.
d. Explores career opportunities in plant science.
e. Explores the professional agricultural organizations associated with the course content.

Academic Standard:
ELA10C1 The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats.

SCSh6 Students will communicate scientific investigations and information clearly.

SCSh9 Students will enhance reading in all curriculum areas.

ELA10LSV1 (d) Actively solicits another person's comments or opinion. (e) Offers own opinion forcefully without domineering.

ELA10LSV1 (i) Employs group decision-making techniques such as brainstorming or a problem-solving sequence (e.g., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution)

ELA10LSV1 (e) Offers own opinion forcefully without domineering; (f) Contributes voluntarily and responds directly when solicited by teacher or discussion leader; (g) Gives reasons in support of opinions expressed.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.