

Agricultural and Environmental Systems

Career Field Pathways and Course Structure

Courses in Agribusiness & Production Systems (A0)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Animal Science and Technology ²	010910
Plant and Horticultural Science ²	010155
Agonomic Systems	010620
Animal Nutrition, Health and Reproduction	010915
Business Management for Agricultural and Environmental Systems	010115
Greenhouse and Nursery Management	010610
Livestock Science	010920
Meat Science & Technology	011020
Small Animal Science	010925
Veterinary Science	010930
ELECTIVES	SUBJECT CODE
Agricultural and Environmental Systems Capstone ³	010190
Agricultural & Industrial Power ²	010210
Animal and Plant Biotechnology ²	012010
Communications and Leadership	010110
Energy Systems Management	010715
Environmental Science for Agriculture and Natural Resources	010720
Equine Science and Management	010935
Natural Resources ²	010710
Science & Technology of Food ²	011010
Structural Engineering	010120

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Animal Science and Technology

Subject Code: 010910

Learners will develop business leadership, problem-solving and communication skills in relation to the science and technology of animals. Students will learn responsible animal management principles and routine husbandry practices in relation to animal welfare and behavior. Learners will identify and describe the anatomy and physiology of monogastric and ruminant organisms as it applies to nutrition, reproduction, and animal health. Learners will investigate animal genetics and how it impacts principles of animal improvement, selection and marketing.

Plant and Horticultural Science

Subject Code: 010155

This first course in the pathway focuses on the broad knowledge and skills required to research, develop, produce and market agricultural, horticultural, and native plants and plant products. Students will apply principals and practices of plant physiology and anatomy, plant protection and health, reproductive biology in plants, influences in bioengineering, plant nutrition and disorders. Environmental aspects of irrigation, chemical application, soils, and pest management will be studied and applied. Projects and activities will enable students to develop communication, leadership, and business management skills.

Agronomic Systems

Subject Code: 010620

This course focuses on the knowledge and skills required to research, develop, produce and market major agricultural and horticultural crops. Cultural and sustainable production practices will be examined. Students will apply scientific knowledge of plant development, nutrition and growth regulation. The knowledge and skills needed to manage water, soils, and pests related to agronomic crops will be learned. Students will employ communication, business, and management strategies appropriate for the industry.

Animal Nutrition, Health and Reproduction

Subject Code: 010915

Learners will apply principles of nutritional management for various classes of animals. Learners will analyze nutritional content/quality of feeds; formulate rations; develop feeding recommendations; identify deficiency symptoms and implement corrective methods as needed. Care/management plans are developed that reflect the classification of animals and follows best practices and legal compliance. Learners will monitor/evaluate the quality of animal habitats and estimate carrying capacity as it relates to the impact of the environment and animal health.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Greenhouse and Nursery Management

Subject Code: 010610

The course will apply principles of science, engineering, and business to support the sustainable propagation and production of plants in a commercial nursery or greenhouse facility. Management of soil/media, water and nutrient distribution, lighting, ventilation and temperature, and pests will be learned and applied. Students will demonstrate knowledge of propagation methods, plant health, nutrition, and growth stimulation. Students will develop successful business, communication, marketing, and sales strategies for use in the greenhouse and nursery industries.

Livestock Science

Subject Code: 010920

Learners will apply principles of nutrition, health and reproduction to the management of animals, poultry and fish in production agriculture. Learners will demonstrate understanding of anatomy and physiology and apply genetic principles for improvement. Learners will apply knowledge of animal behavior, welfare, and husbandry principles. Learners will evaluate body/carcass composition and apply marketing principles to the sale and distribution of livestock products. Learners will employ communication, business, and management strategies appropriate for the industry.

Meat Science and Technology

Subject Code: 011020

Learners will apply food chemistry and microbiology to processing, preservation, packaging, storage and marketing of meat products. Learners will design and implement a quality assurance program that meets legal compliance. Learners will evaluate carcass composition, assign quality grades, and examine valued-added products. Learners will demonstrate knowledge of safety regulations and operate and maintain equipment and facilities. Learners will practice customer service and sales techniques while understanding the scope and importance of business regulations.

Small Animal Science

Subject Code: 010925

Learners apply principles of nutrition, health and reproduction to the management of animals intended for companionship or research. Through interpretation, problem-solving and diagnostic methods, the learners develop and implement management programs that reflect responsible animal behavior, welfare and husbandry practices. Learners implement principals and practices of nutritional management, responsible breeding and disease management. Safe handling, grooming and training skills are developed and applied. Learners identify business management procedures and understand the importance of business regulations.

Veterinary Science

Subject Code: 010930

Learners will develop knowledge of veterinary pharmacology, radiology and imaging techniques, principles of surgery, safe laboratory skills, and the concepts of ethics and professionalism in the work place. Learners will develop skills in inquiry and statistical methods. Learners will describe causes, symptoms, and treatment of common diseases with special emphasis on developing preventative health management plans and breeding programs. Learners will utilize principles of technology to manage information systems, and research issues affecting the industry.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Agricultural and Industrial Power

Subject Code: 010210

The A&I *Power* course will introduce students to the breadth of the Agricultural and Industrial Power Technology pathway. Students will learn the principles of agricultural and industrial power technology equipment systems including electronic, electrical, engines, fuel, hydraulics, and power trains. Additionally, students will learn to operate and maintain agricultural & industrial equipment.

Animal and Plant Biotechnology

Subject Code: 012010

Learners will apply principles of chemistry, microbiology and genetics to plant and animal research and product development. They will describe the importance of biotechnology in society, and analyze the issues that have affected agricultural biotechnology. Students will apply genetic principals to determine genotypes and phenotypes. Students will describe the parts and functions of animal and plant cells and their importance in biochemistry.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Energy Systems Management

Subject Code: 010715

Students will apply basic principles of energy accounting, thermodynamics and heat transfer, energy conversion and efficiency to heating, power generation and transportation. Students will apply the principles and practices needed for managing both renewable and non-renewable energy sources including, solar thermal, hydrogen generation, photovoltaic, hydroelectric, biomass use, geothermal heat transfer, and fossil fuel. Future energy systems and energy use scenarios are investigated, with a focus on promoting the use of renewable energy resources and technologies.

Environmental Science for Agriculture and Natural Resources

Subject Code: 010720

Learners will study relationships between organisms and their environment. Principles of biogeochemical cycles, air-water-land relationships, non-point pollution, and wetlands will be applied. Learners will examine economic fundamentals of resource development, agriculture sustainability, energy needs and pollution control. Learners will analyze and interpret data gathered from ecosystems, population studies, forest management practices, pesticide use, land use and waste management. Learners will develop responses to environmental problems and develop management strategies for responsible conservation and resource development.

Equine Science and Management

Subject Code: 010935

Learners are introduced to responsible equine management principals and routine husbandry practices in relation to equine behavior methodology and legal compliance. Learners will apply knowledge of health and nutrition when designing preventative health care plans, breeding plans, and feed management programs. Safe handling, grooming, training, equipment selection/maintenance/use and emergency care techniques are developed and applied. Learners will evaluate responsible stewardship practices and develop production management strategies that emphasize the industries goals through good reproductive decision-making.

Natural Resources

Subject Code: 010710

Learners will apply science principles and management practices to the protection of renewable and non-renewable natural resources. Students will learn fundamentals of land use as well as watershed, wildlife, fishery and forest management. Students will be introduced to management practices related to managing air and water quality along with requirements for managing solid and liquid waste. Communications, business principles and leadership skill development are essential to the program.

Science and Technology of Food

Subject Code: 011010

This first course in the pathway examines the research, marketing, processing and packaging techniques applied to the development of food products. Learners will examine principles of food preservation techniques and determine correlations to food sensory, shelf life and food stability. Learners will examine and develop food safety, sanitation, and quality assurance protocol. Government regulations and food legislation will be examined and the implications to food science and technology will be identified.

Structural Engineering

Subject Code: 010120

Students will apply principles of engineering and design along with an understanding of the properties and uses of construction materials to buildings and structures used in agriculture, horticulture and natural resources. The course will focus on the study and utilization of wood and lumber, metals, concrete and masonry, pipes and plumbing, and electrical systems. Students will design, plan, build and calculate costs-benefits analysis for construction projects while abiding by all building code and safety regulations.

Courses in Agricultural & Industrial Power Technology (A1)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Agricultural & Industrial Power ²	010210
Electronic & Electrical Systems	010215
Engines and Fuel Systems	010220
Hydraulics and Pneumatics	010225
Outdoor Power Technology	010235
Power Sports	010240
Power Trains	010230
ELECTIVES	SUBJECT CODE
Business Management for Agricultural and Environmental Systems	010115
Agricultural and Environmental Systems Capstone ³	010190
Communications and Leadership	010110

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Agricultural and Industrial Power

Subject Code: 010210

The A&I *Power* course will introduce students to the breadth of the Agricultural and Industrial Power Technology pathway. Students will learn the principles of agricultural and industrial power technology equipment systems including electronic, electrical, engines, fuel, hydraulics, and power trains. Additionally, students will learn to operate and maintain agricultural & industrial equipment.

Electronic and Electrical Systems

Subject Code: 010215

In the *Electronic and Electrical Systems* course, students will diagnose problems, test and repair electronic and electrical components. Students will learn physical principles of electricity and apply such to the proper maintenance, diagnosis and repair of electrical circuits. Students will learn the physical and mathematical principles of electronics, controllers and sensors and will learn the operation of onboard computers and programmable controllers.

Engines and Fuel Systems

Subject Code: 010220

In the *Engines & Fuel Systems* course, students will learn basic engine information and operations; different kinds of corollary systems; how to use test equipment and service tools; plus techniques for diagnosis and testing. Students will learn the different kinds of fuel systems, fuels and their characteristics, designations, and additives. Students will diagnose fuel system problems including the identification of parts failure and will be able to make necessary repairs.

Hydraulics and Pneumatics

Subject Code: 010225

In the *Hydraulics and Pneumatics* course, students will learn physical principles of hydraulics. They will diagnose problems, test system components, learn how to properly maintain hydraulic circuits and diagnose and test problem areas in hydraulics systems of agricultural and industrial power equipment.

Outdoor Power Technology

Subject Code: 010235

The *Outdoor Power Technology* course trains students in technical knowledge and skills necessary to maintain, troubleshoot and repair small power equipment used in agriculture, horticulture and natural resource management. Students will learn the theory of power and progress through aspects of 2- and 4-stroke engines, electrical systems, fuel systems, and drive train systems that make up modern small engine powered equipment.

Power Sports

Subject Code: 010240

In the *Power Sports* course, students will learn the theories of operating systems and the maintenance practices for power sport vehicles used off road or on the water. Students will learn principles of power sports vehicles including diagnosis, service, and repair. This course covers core information on power sport internal combustion engines, primary drive operation, transmission power flow, fuel system operation, and electrical and suspension systems.

Power Trains

Subject Code: 010230

In the *Power Trains* course, students will learn the physical principles of power trains, the different components that transfer and control power, and how power trains are designed to function. Students will also learn how to adjust and maintain a power train system as well as how to diagnose and test problem areas.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen pathway within the Agricultural and Environmental Systems career field. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner that requires the command, analysis and synthesis of knowledge and skills. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Courses in Animal Science & Management (A2)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Animal Nutrition, Health and Reproduction	010915
Animal Science and Technology ²	010910
Equine Science and Management	010935
Livestock Science	010920
Small Animal Science	010925
Veterinary Science	010930
Wildlife and Fisheries	010745
Zoo and Aquarium	010940
ELECTIVES	SUBJECT CODE
Animal and Plant Biotechnology ²	012010
Business Management for Agricultural and Environmental Systems	010115
Agricultural and Environmental Systems Capstone ³	010190
Communications and Leadership	010110
Structural Engineering	010120

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Animal Nutrition, Health and Reproduction

Subject Code: 010915

Learners will apply principles of nutritional management for various classes of animals. Learners will analyze nutritional content/quality of feeds; formulate rations; develop feeding recommendations; identify deficiency symptoms and implement corrective methods as needed. Care/management plans are developed that reflect the classification of animals and follows best practices and legal compliance. Learners will monitor/evaluate the quality of animal habitats and estimate carrying capacity as it relates to the impact of the environment and animal health.

Animal Science and Technology

Subject Code: 010910

Learners will develop business leadership, problem-solving and communication skills in relation to the science and technology of animals. Students will learn responsible animal management principles and routine husbandry practices in relation to animal welfare and behavior. Learners will identify and describe the anatomy and physiology of monogastric and ruminant organisms as it applies to nutrition, reproduction, and animal health. Learners will investigate animal genetics and how it impacts principles of animal improvement, selection and marketing.

Equine Science and Management

Subject Code: 010935

Learners are introduced to responsible equine management principals and routine husbandry practices in relation to equine behavior methodology and legal compliance. Learners will apply knowledge of health and nutrition when designing preventative health care plans, breeding plans, and feed management programs. Safe handling, grooming, training, equipment selection/maintenance/use and emergency care techniques are developed and applied. Learners will evaluate responsible stewardship practices and develop production management strategies that emphasize the industries goals through good reproductive decision-making.

Livestock Science

Subject Code: 010920

Learners will apply principles of nutrition, health and reproduction to the management of animals, poultry and fish in production agriculture. Learners will demonstrate understanding of anatomy and physiology and apply genetic principles for improvement. Learners will apply knowledge of animal behavior, welfare, and husbandry principles. Learners will evaluate body/carcass composition and apply marketing principles to the sale and distribution of livestock products. Learners will employ communication, business, and management strategies appropriate for the industry.

Small Animal Science

Subject Code: 010925

Learners apply principles of nutrition, health and reproduction to the management of animals intended for companionship or research. Through interpretation, problem-solving and diagnostic methods, the learners develop and implement management programs that reflect responsible animal behavior, welfare and husbandry practices. Learners implement principals and practices of nutritional management, responsible breeding and disease management. Safe handling, grooming and training skills are developed and applied. Learners identify business management procedures and understand the importance of business regulations.

Veterinary Science

Subject Code: 010930

Learners will develop knowledge of veterinary pharmacology, radiology and imaging techniques, principles of surgery, safe laboratory skills, and the concepts of ethics and professionalism in the work place. Learners will develop skills in inquiry and statistical methods. Learners will describe causes, symptoms, and treatment of common diseases with special emphasis on developing preventative health management plans and breeding programs. Learners will utilize principles of technology to manage information systems, and research issues affecting the industry.

Wildlife and Fisheries

Subject Code: 010745

Learners will apply the principles and practices of resource conservation and management to fish and wildlife populations. Students learn to properly handle wild animals, principles of wildlife nutrition, inventory practices, water quality parameters and testing, and natural and artificial propagation. Learners will apply principles of facility design and layout for managing fish populations. Learners will research and evaluate the impacts of various land practices, legislation, and human activities on habitats and populations.

Zoo and Aquarium

Subject Code: 010940

In this course, learners will identify and apply responsible animal science principals and routine husbandry practices to captive animal populations. Learners will apply knowledge of animal behavior, welfare, and husbandry principals to enhance exhibit design, animal enrichment and training plans, and educational and visitor engagement programs. Emphasis will be given to data collection and research techniques. Principles of responsible population control, disease risk and management, and problem-solving/action planning techniques will be examined.

Animal and Plant Biotechnology

Subject Code: 012010

Learners will apply principles of chemistry, microbiology and genetics to plant and animal research and product development. They will describe the importance of biotechnology in society, and analyze the issues that have affected agricultural biotechnology. Students will apply genetic principals to determine genotypes and phenotypes. Students will describe the parts and functions of animal and plant cells and their importance in biochemistry.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Structural Engineering

Subject Code: 010120

Students will apply principles of engineering and design along with an understanding of the properties and uses of construction materials to buildings and structures used in agriculture, horticulture and natural resources. The course will focus on the study and utilization of wood and lumber, metals, concrete and masonry, pipes and plumbing, and electrical systems. Students will design, plan, build and calculate costs-benefits analysis for construction projects while abiding by all building code and safety regulations.

Courses in Biotechnology for Food, Plant and Animal Science (A3)

PATHWAY COURSES		SUBJECT CODE
Agriculture, Food and Natural Resources ¹		010105
Animal and Plant Biotechnology ²		012010
Biotechnology and Bioinformatics		
Genetics and Laboratory Diagnostics		
ELECTIVES		SUBJECT CODE
Science & Technology of Food ²		011010
Business Management for Agricultural and Environmental Systems		010115
Agricultural and Environmental Systems Capstone ³		010190
Communications and Leadership		010110

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Animal and Plant Biotechnology

Subject Code: 012010

Learners will apply principles of chemistry, microbiology and genetics to plant and animal research and product development. They will describe the importance of biotechnology in society, and analyze the issues that have affected agricultural biotechnology. Students will apply genetic principals to determine genotypes and phenotypes. Students will describe the parts and functions of animal and plant cells and their importance in biochemistry.

Science and Technology of Food

Subject Code: 011010

This first course in the pathway examines the research, marketing, processing and packaging techniques applied to the development of food products. Learners will examine principles of food preservation techniques and determine correlations to food sensory, shelf life and food stability. Learners will examine and develop food safety, sanitation, and quality assurance protocol. Government regulations and food legislation will be examined and the implications to food science and technology will be identified.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Courses in Food Science & Technology (A4)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Science & Technology of Food ²	011010
Applications of Food Science and Technology	011030
Food Marketing and Research	011015
Meat Science & Technology	011020
Microbial Food Science and Safety	011025
ELECTIVES	SUBJECT CODE
Animal and Plant Biotechnology ²	012010
Business Management for Agricultural and Environmental Systems	010115
Agricultural and Environmental Systems Capstone ³	010190
Communications and Leadership	010110

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Science and Technology of Food

Subject Code: 011010

This first course in the pathway examines the research, marketing, processing and packaging techniques applied to the development of food products. Learners will examine principles of food preservation techniques and determine correlations to food sensory, shelf life and food stability. Learners will examine and develop food safety, sanitation, and quality assurance protocol. Government regulations and food legislation will be examined and the implications to food science and technology will be identified.

Applications of Food Science and Technology

Subject Code: 011030

Learners will use principles and practices of food processing and packaging to develop solutions for problems in food production, handling and storage. Learners will examine heat preservation, cold processing, food irradiation, fermentation, milling, and hydrogenation processing techniques. Learners will examine the process of food product development and techniques used to measure food sensory aspects, shelf life and food stability. Learners will examine government regulation impact on labeling, new packaging technologies, harvesting, transportation, and the environment.

Food Marketing and Research

Subject Code: 011015

Learners will focus on the stages of research process from research planning to gathering, analysis, and interpretation of data as it relates to food marketing management. Learners will apply knowledge of food additives, nutrition, mixes and solutions to enhance existing food products and to create new processed foods. Learners will identify and describe the impact that technological advances have on food production and availability. Cultural trends and preferences affecting product development will be examined.

Meat Science and Technology

Subject Code: 011020

Learners will apply food chemistry and microbiology to processing, preservation, packaging, storage and marketing of meat products. Learners will design and implement a quality assurance program that meets legal compliance. Learners will evaluate carcass composition, assign quality grades, and examine value-added products. Learners will demonstrate knowledge of safety regulations and operate and maintain equipment and facilities. Learners will practice customer service and sales techniques while understanding the scope and importance of business regulations.

Microbial Food Science and Safety

Subject Code: 011025

Learners are introduced to the chemistry, bioengineering and microbiology involved in producing food products. Processes contributing to the appearance, taste, texture, and smell of food products will be explored. Learners will examine functional foods, value-added foods, organic foods and food additives. Contamination points from biological hazards and food allergens will be identified and preventive measures developed. Food laws, regulations and regulatory and commercial grading standards will be examined.

Animal and Plant Biotechnology

Subject Code: 012010

Learners will apply principles of chemistry, microbiology and genetics to plant and animal research and product development. They will describe the importance of biotechnology in society, and analyze the issues that have affected agricultural biotechnology. Students will apply genetic principles to determine genotypes and phenotypes. Students will describe the parts and functions of animal and plant cells and their importance in biochemistry.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Courses in Horticulture (A5)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Plant and Horticultural Science ²	010155
Floral Design and Marketing	010625
Greenhouse and Nursery Management	010610
Landscape Design and Build	010630
Landscape Systems Management	010615
Turf Science & Management	010635
Urban Forestry	010740
ELECTIVES	SUBJECT CODE
Animal and Plant Biotechnology ²	012010
Business Management for Agricultural and Environmental Systems	010115
Agricultural and Environmental Systems Capstone ³	010190
Communications and Leadership	010110
Natural Resources ²	010710
Agricultural & Industrial Power ²	010210

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Plant and Horticultural Science

Subject Code: 010155

This first course in the pathway focuses on the broad knowledge and skills required to research, develop, produce and market agricultural, horticultural, and native plants and plant products. Students will apply principals and practices of plant physiology and anatomy, plant protection and health, reproductive biology in plants, influences in bioengineering, plant nutrition and disorders. Environmental aspects of irrigation, chemical application, soils, and pest management will be studied and applied. Projects and activities will enable students to develop communication, leadership, and business management skills.

Floral Design and Marketing

Subject Code: 010625

Students will use principles and elements of design to create various types and styles of floral arrangements with natural and artificial plants and plant products. Identification of ornamental plants and cut flowers, use of design materials, and storage and handling applications will be examined. Students will develop successful business, communication, marketing, and sales strategies for use in the floral industry.

Greenhouse and Nursery Management

Subject Code: 010610

The course will apply principles of science, engineering, and business to support the sustainable propagation and production of plants in a commercial nursery or greenhouse facility. Management of soil/media, water and nutrient distribution, lighting, ventilation and temperature, and pests will be learned and applied. Students will demonstrate knowledge of propagation methods, plant health, nutrition, and growth stimulation. Students will develop successful business, communication, marketing, and sales strategies for use in the greenhouse and nursery industries.

Landscape Design and Build

Subject Code: 010630

Students will develop skills in landscape planning, design, estimation and installation. Principles and elements of design and engineering will be emphasized. Students will design full-featured landscapes using computer-aided technology, construct hardscapes and install artificial lighting and water systems. Environmental effects of a landscape will be evaluated and eco-friendly techniques applied. Students will employ communication, business, and management strategies appropriate for the industry.

Landscape Systems Management

Subject Code: 010615

Students will learn methods for establishing and managing landscapes to promote growth and balance. The classification and care of woody and herbaceous landscape plants will be covered in-depth. Students will learn to optimize growing conditions, balance nutrients, and manage pests and disease. Horticultural skills including proper planting, fertilizing, and pruning techniques will be practiced while safely operating well maintained specialized equipment. The implications of landscape installation on the environment will be analyzed and eco-friendly practices applied. Students will employ communication, business, and management strategies appropriate for the industry.

Turf Science and Management

Subject Code: 010635

The course will apply principles of science, engineering, and business to support the establishment and maintenance of residential, athletic and recreational turf. Instruction in establishment, care, production, and marketing of turf grass along with safe operation and maintenance of specialized equipment will be provided. Environmental awareness and conservation practices will be applied. Students will employ communication, business, and management strategies appropriate for the industry.

Urban Forestry

Subject Code: 010740

The learner will promote the care and management of trees for residential and commercial purposes. Learners will apply principles of soil management, dendrology and pest management to the care and management of trees. Learners will analyze budgets; and develop short and long-range management plans that balance environmental and economic goals and that support sustainable land use patterns. Principles of rigging, advanced rope techniques, and chainsaw applications for tree pruning and removal will be learned.

Animal and Plant Biotechnology

Subject Code: 012010

Learners will apply principles of chemistry, microbiology and genetics to plant and animal research and product development. They will describe the importance of biotechnology in society, and analyze the issues that have affected agricultural biotechnology. Students will apply genetic principals to determine genotypes and phenotypes. Students will describe the parts and functions of animal and plant cells and their importance in biochemistry.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Natural Resources

Subject Code: 010710

Learners will apply science principles and management practices to the protection of renewable and non-renewable natural resources. Students will learn fundamentals of land use as well as watershed, wildlife, fishery and forest management. Students will be introduced to management practices related to managing air and water quality along with requirements for managing solid and liquid waste. Communications, business principles and leadership skill development are essential to the program.

Agricultural and Industrial Power

Subject Code: 010210

The *A&I Power Technology* course will introduce students to the breadth of the Agricultural and Industrial Power Technology pathway. Students will learn the principles of agricultural and industrial power technology equipment systems including electronic, electrical, engines, fuel, hydraulics, and power trains. Additionally, students will learn to operate and maintain agricultural & industrial equipment.

Courses in Natural Resource Management (A6)

PATHWAY COURSES	SUBJECT CODE
Agriculture, Food and Natural Resources ¹	010105
Natural Resources ²	010710
Energy Systems Management	010715
Environmental Science for Agriculture and Natural Resources	010720
Environmental Systems Management	010725
Forestry and Woodland Ecosystems	010730
Park & Recreational Management	010735
Urban Forestry	010740
Wildlife & Fisheries	010745
ELECTIVES	SUBJECT CODE
Business Management for Agricultural and Environmental Systems	010115
Agricultural and Environmental Systems Capstone ³	010190
Communications and Leadership	010110
Zoo and Aquarium	010940

¹First course in the Career Field; ²First course in the Pathway; ³Does not count as one of the required four courses

Agriculture, Food and Natural Resources

Subject Code: 010105

This is the first course in the Agricultural and Environmental Systems career field. It introduces students to the pathways that are offered in the Agricultural and Environmental Systems career field. As such, learners will obtain fundamental knowledge and skills in food science, natural resource management, animal science & management, plant & horticultural science, power technology and biotechnology. Students will be introduced to the FFA organization and begin development of their leadership ability.

Natural Resources

Subject Code: 010710

Learners will apply science principles and management practices to the protection of renewable and non-renewable natural resources. Students will learn fundamentals of land use as well as watershed, wildlife, fishery and forest management. Students will be introduced to management practices related to managing air and water quality along with requirements for managing solid and liquid waste. Communications, business principles and leadership skill development are essential to the program.

Energy Systems Management

Subject Code: 010715

Students will apply basic principles of energy accounting, thermodynamics and heat transfer, energy conversion and efficiency to heating, power generation and transportation. Students will apply the principles and practices needed for managing both renewable and non-renewable energy sources including, solar thermal, hydrogen generation, photovoltaic, hydroelectric, biomass use, geothermal heat transfer, and fossil fuel. Future energy systems and energy use scenarios are investigated, with a focus on promoting the use of renewable energy resources and technologies.

Environmental Science for Agriculture and Natural Resources

Subject Code: 010720

Learners will study relationships between organisms and their environment. Principles of biogeochemical cycles, air-water-land relationships, non-point pollution, and wetlands will be applied. Learners will examine economic fundamentals of resource development, agriculture sustainability, energy needs and pollution control. Learners will analyze and interpret data gathered from ecosystems, population studies, forest management practices, pesticide use, land use and waste management. Learners will develop responses to environmental problems and develop management strategies for responsible conservation and resource development.

Environmental Systems Management

Subject Code: 010725

Learners will analyze and interpret biological, chemical and physical properties of soil, water and air. They will determine the source and type of environmental contamination, evaluate pollution control measures and be prepared to respond accordingly. Learners will be able to monitor treatment processes for potable water, waste water and solid waste. Learners will develop and implement environmental plans using principles governing ecosystems in relation to resource development and industrial processes.

Forestry and Woodland Ecosystems

Subject Code: 010730

Learners will apply principles of botany, dendrology and silviculture to the management of forests and forest ecosystems. Learners will apply principles of timber cruising with surveying and mapping techniques to take forest measurements. Learners will develop the knowledge and skills necessary for forest reforestation, timber stand improvement, timber harvesting and forest product utilization. Learners will operate and maintain forestry equipment, apply fire management practices, and understand related regulations, laws, and policy issues.

Parks and Recreational Management

Subject Code: 010735

Students will design facilities, develop educational programs and manage resources for use in public recreation. Students will maintain and operate equipment for maintaining wildlife habitat and supporting a variety of public recreational activities. Students will develop marketing and programming skills for park development, apply management practices to park operations and learn the systems required to maintain public safety.

Urban Forestry

Subject Code: 010740

The learner will promote the care and management of trees for residential and commercial purposes. Learners will apply principles of soil management, dendrology and pest management to the care and management of trees. Learners will analyze budgets; and develop short and long-range management plans that balance environmental and economic goals and that support sustainable land use patterns. Principles of rigging, advanced rope techniques, and chainsaw applications for tree pruning and removal will be learned.

Wildlife and Fisheries

Subject Code: 010745

Learners will apply the principles and practices of resource conservation and management to fish and wildlife populations. Students learn to properly handle wild animals, principles of wildlife nutrition, inventory practices, water quality parameters and testing, and natural and artificial propagation. Learners will apply principles of facility design and layout for managing fish populations. Learners will research and evaluate the impacts of various land practices, legislation, and human activities on habitats and populations.

Business Management for Agricultural and Environmental Systems

Subject Code: 010115

Learners will examine elements of business, identify organizational structures and identify and apply management skills. Learners will develop business plans, financial reports and strategic goals for new ventures or existing businesses. Learners will use marketing concepts to evaluate the marketing environment and develop a marketing plan with marketing channels, product approaches, promotion and pricing strategies. Learners will practice customer sales techniques and apply concepts of ethics and professionalism while understanding related business regulations.

Agricultural and Environmental Systems Capstone

Subject Code: 010190

The capstone course is an opportunity for students to solve problems and demonstrate that they have achieved the requisite knowledge and skills in their chosen Agricultural and Environmental Systems career field pathway. The course is designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner. The capstone requires the application of learning to a project that serves as an instrument of evaluation.

Communications and Leadership

Subject Code: 010110

Students will analyze attributes and capabilities of those in leadership positions and develop their communication and leadership skills in authentic situations. The course prepares students to apply journalistic, communication and broadcasting principles to the development, production, and transmittal of agricultural and environmental systems information.

Zoo and Aquarium

Subject Code: 010940

In this course, learners will identify and apply responsible animal science principals and routine husbandry practices to captive animal populations. Learners will apply knowledge of animal behavior, welfare, and husbandry principals to enhance exhibit design, animal enrichment and training plans, and educational and visitor engagement programs. Emphasis will be given to data collection and research techniques. Principles of responsible population control, disease risk and management, and problem-solving/action planning techniques will be examined.