Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: **Horticulture Specialist**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101010102
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-1012 - First-Line Supervisors/Managers of Landscaping, Lawn Service, and Grounds keeping Workers

Purpose

This certificate program is part of the Agribusiness Management AS degree program (1101010100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the agribusiness management sector within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to apply the economic and business principles involved in the organization, operation and management of farms and agricultural business. Subject matter includes finance, laws, labor, machinery, facilities, and marketing, as well as leadership, communication, employability and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of plant physiology and growth.
02.0 Classify plants.
03.0 Manage a pest-control program.
04.0 Prepare growing media and seedbeds.
05.0 Grow plants.
06.0 Design, install, and maintain nursery irrigation systems.

Florida Department of Education
Student Performance Standards

Program Title: **Horticulture Specialist**
CIP Numbers: **0101010102**
Program Length: **15 credit hours**
SOC Code(s): **11-9011**

This certificate program is part of the Agribusiness Management AS degree program (1101010100). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of plant physiology and growth--The student will be able to:
	01.01 Describe the process of photosynthesis.
	01.02 Identify and describe the functions of all parts of the plant.
	01.03 Describe an asexual reproduction process.
	01.04 Explain the differences between angiosperms and gymnosperms.
	01.05 Identify the differences between woody and herbaceous plants.
02.0	Classify plants--The student will be able to:
	02.01 Identify and group shade and flowering trees.
	02.02 Identify and group fruit trees and plants.
	02.03 Identify and group annuals, vegetables, and herbs.
	02.04 Identify and group woody ornamentals, vines, and ground covers.
	02.05 Identify and group tropical foliage plants.
	02.06 Identify and group turf and ornamental grasses.
03.0	Manage a pest-control program--The student will be able to:
	03.01 Develop an integrated pest management program or schedule.
	03.02 Train employees in the safe use of pesticides.
	03.03 Obtain a pesticide license.

04.0	Prepare growing media and seedbeds--The student will be able to:
	04.01 Identify media materials.
	04.02 Mix rooting and growing media according to plant requirements.
	04.03 Sterilize rooting, potting, and growing media.
	04.04 Collect and test a soil sample from field and potting media.
	04.05 Adjust pH and nutritional levels of media.
	04.06 Prepare planting beds and sites.
	04.07 Fill and level benches and pots with media.
	04.08 Demonstrate sanitation practices when handling and storing plant media materials.
05.0	Grow plants--The student will be able to:
	05.01 Prepare media for containers.
	05.02 Prepare field site for transplants.
	05.03 Select plant containers.
	05.04 Determine plant spacing in the field and on container beds.
	05.05 Transplant propagated materials to various containers and to the field.
	05.06 Determine and provide light requirements of various plant types.
06.0	Design, install, and maintain nursery irrigation systems--The student will be able to:
	06.01 Determine irrigation requirements.
	06.02 Assess quality of irrigation water.
	06.03 Operate and service various types of irrigation systems.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Aquaculture Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101030302
Program Type	College Credit Certificate (CCC)
Program Length	26 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-1011 - First-Line Supervisors of Farming, Fishing, and Forestry Workers

Purpose

This certificate program is part of the Aquaculture Management AS degree program (1101030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the aquaculture industry within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction in ichthyology, fish breeding, fish nutrition, pond maintenance, diagnosis and treatment of diseases in fish, business management of a fish farm, and field experience necessary to operate an aquaculture operation.

See **additional information** relevant to Career and Technical Education (CTE) program implementation provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify important aquaculture plants and animals and describe their culture in various production units.
02.0 Perform general aquaculture production unit operations.
03.0 Determine methods of fish identification.
04.0 Demonstrate an understanding of water quality and aquaculture.
05.0 Maintain optimal nutrition for aquaculture organisms.
06.0 Diagnose and control common aquaculture maladies.
07.0 Operate and maintain aquaculture equipment.
08.0 Assist in the maturation, spawning, larval and juvenile rearing of aquaculture organisms.
09.0 Perform general aquaculture nursery systems operations.

Florida Department of Education
Student Performance Standards

Program Title: **Aquaculture Technology**
CIP Number: **0101030302**
Program Length: **26 credit hours**
SOC Code(s): **45-1011**

This certificate program is part of the Aquaculture Management AS degree program (1101030301). At the completion of this program, the student will be able to:	
01.0	Identify important aquaculture plants and animals and describe their culture in various production units – the student will be able to:
01.01	Define aquaculture and describe the historical important of aquaculture to local, state, national and international economies.
01.02	List occupations in aquaculture production, processing, distribution, marketing, and service.
01.03	Identify important aquatic species and products produced by aquatic farmers in Florida, U. S., and foreign countries.
01.04	List the types of production units and systems employed by aquaculturist in Florida, U. S. and foreign countries.
01.05	Outline basic techniques for constructing ponds, tanks, raceways, net pens and cages.
01.06	Describe basic production techniques for the culture of plants, mollusks, crustaceans, and finfish.
01.07	List and describe the major factors in growth of aquaculture species.
01.08	List important criteria in selecting a site for an aquaculture farm.
01.09	Describe natural fisheries and aquaculture production trends.
02.0	Perform general aquaculture production unit operations – the student will be able to:
02.01	Identify and describe the general anatomy, biology and life cycles for aquaculture species studied in this program.
02.02	Identify and describe the general morphology of aquatic macro and microalgae.
02.03	List methods to help determine aquatic animal health and behavior for various aquaculture production units.
02.04	List techniques for routine maintenance of aquaculture ponds, cage culture systems, and submerged lands.
02.05	Identify common aquaculture predators and list predator control techniques
02.06	Record production data such as water quality parameters, feed amounts, mortality and other routine information required for a

	specific operation on data sheets and enter into a computer.
03.0	Determine methods of fish identification – the student will be able to:
03.01	Identify the major families of fish.
03.02	Describe the complexities of fish anatomy for the following systems: • Skeletal systems • Musculature • Nervous system • Vascular system • Respiratory system • Urogenital system • Digestive system • Reproductive system
03.03	Identify the major anatomical fish structures.
03.04	Describe the physiological characteristics of fish for the following: • Color • Bioluminescence • Sound production • Sensory systems • Osmoregulation
03.05	Classify fish.
03.06	Describe the aquatic environment.
03.07	Discuss the basics of fish behavior.
03.08	Identify the muscles of a fish.
03.09	Measure the physical characteristics of fish.
03.10	Use a taxonomic key to identify fish.
03.11	Identify the major taxa of fish.
04.0	Demonstrate an understanding of water quality and aquaculture – the student will be able to:
04.01	Define environmental variables and list ranges important for survival and growth of important aquaculture species.
04.02	Demonstrate an understanding of aquifers, water quantity and management, and agricultural water use in Florida.

	04.03	Identify water quality measurements necessary for accurately culturing aquaculture organisms.
	04.04	Measure water quality parameters in aquaculture production units, record data in logs and computers, and interpret results.
	04.05	Describe the nitrogen cycle and identify system equipment and/or processes which reduce nitrogenous wastes.
	04.06	Discuss the importance of oxygen to the maintenance of production units and aquatic animal health and the effect of temperature on oxygen concentration.
	04.07	Describe processes in aquaculture production units that effect pH, alkalinity, carbon dioxide, oxygen, ammonia, and other environmental parameters.
	04.08	Measure primary productivity and discuss its importance in various aquaculture production units.
	04.09	Calculate water volumes for various sizes of aquaculture production units.
	04.10	List potential sources of aquaculture pollution and describe methods of preventing or abating these problems.
	04.11	Identify Best Management Practices for treating waste water from various aquaculture production units.
05.0	Maintain optimal nutrition for aquaculture organisms – the student will be able to:	
	05.01	Explain the digestive anatomy of fish.
	05.02	Explain fish metabolic rates.
	05.03	Identify fish food additives
	05.04	Outline the basic concepts of nutrition for plants, mollusks, crustaceans, and fish.
	05.05	Discuss the importance of nutrition to growth and survival of various aquaculture species.
	05.06	Identify feeding habits and practices of a variety of aquaculture species.
	05.07	List common ingredients and additives of aquatic feeds and identify practices in feeds formulation and manufacturing.
	05.08	Demonstrate an ability to culture live feeds including microalgae, rotifers and artemia and discuss their importance.
	05.09	Calculate feeding rates, growth and feed conversion ratios for various aquaculture species stocked at different densities and rates.
	05.10	List different feeding methods, measure feed and maintain feed records in logs and computers.
	05.11	Discuss and differentiate feeding practices for hatchery, nursery and grow out of mollusks.
	05.12	Discuss nutrition practices for culturing aquatic plants.
	05.13	Discuss the principles of bioenergetics to growth.

06.0	Diagnose and control common aquaculture maladies – the student will be able to:
06.01	Identify the common diseases that infect aquaculture organisms.
06.02	Understand the basic mechanisms for control of disease.
06.03	Identify common bacterial diseases and treatment options.
06.04	Identify common mycotic diseases and treatment options.
06.05	Identify common viral diseases and treatment options.
06.06	Identify common parasitic diseases and treatment options.
06.07	Discuss the relationship of nutrition, water quality and stress how they may cause disease in aquaculture organisms.
06.08	Prepare an aquatic organism for diagnostic examination or shipment.
06.09	Observe various diseases of aquatic organisms and demonstrate use of a microscope.
06.10	List approved drugs available for use in aquaculture.
06.11	Describe approved chemicals and their use in treating diseases.
06.12	Identify common aquatic parasites found in Florida waters.
06.13	Identify toxic environmental diseases in fish.
07.0	Operate and maintain aquaculture equipment – the student will be able to:
07.01	List equipment used in various production units necessary to raise plants, mollusks, crustaceans, and fish.
07.02	Set up and maintain standard aquaria.
07.03	Set up field aquaculture ponds.
07.04	Measure field parameters such as temperature, salinity, and hardness.
07.05	Set up a system to culture aquatic plants.
07.06	Demonstrate an ability to correctly use aquaculture equipment including, but not limited to, a thermometer, oxygen meter, refractometer, pH meter, pump, graduated cylinder, beaker, nets, siphon, scales, sieves, calipers, secchi disk, and a microscope.
07.07	Set up aquaculture filtration systems.
07.08	List equipment options of a recirculating system including solids removal, biofiltration, sterilization and aeration, and explain their basic functions.

	07.09	Operate and perform system maintenance on a recirculating system.
	07.10	Estimate pumping requirements and select an appropriately sized pump for a given system and water volume.
	07.11	Layout a PVC plumbing scheme for a given aquaculture system with a sufficient number of valves to allow for bypass and isolation and then measure, cut and assemble that water system.
	07.12	Layout and put together an aeration system operated on airlift technology.
	07.13	Replace and install a pump.
	07.14	Perform simple calculations related to water volume, water flow and system loading.
	07.15	Use and operate tools and equipment safely.
	07.16	Measure productivity in aquaculture systems.
08.0	Assist in the maturation, spawning, larval and juvenile rearing of aquaculture organisms – the student will be able to:	
	08.01	Describe the reproductive anatomy, function of reproductive organs, and reproductive cycles of selected aquaculture organisms.
	08.02	Differentiate between males and females of the same species.
	08.03	Relate environmental factors to successful reproduction of various aquaculture species.
	08.04	Explain the use of hormones, anesthetics, chemicals, antibiotics, and other techniques to manage broodstock and accelerate reproductive cycles and contrast the difference between environmental conditioning and induced spawning techniques.
	08.05	Maintain and care for broodstock and prepare spawning tanks and/or systems.
	08.06	Describe maturation, spawning, hatching, and larval rearing techniques for selected aquaculture species.
	08.07	Discuss the importance of nutrition at various stages of the larval rearing cycle for selected aquaculture species.
	08.08	Use a microscope to examine the stages and condition of eggs and larvae.
	08.09	Prepare, stock, feed and maintain larval rearing tanks.
	08.10	Culture live feeds and calculate feeding rates.
	08.11	Outline a maturation system design for selected aquatic species.
	08.12	List important practices and tasks in hatchery management.
	08.13	Estimate production numbers from a given spawn of a given species.
	08.14	Record hatching date in logs and computers and interpret results.

09.0	Perform general aquaculture nursery systems operations – the student will be able to:	
	09.01	Maintain, clean and operate a broodstock tank and list important practices in managing broodstock.
	09.02	Start, maintain, count and harvest live feeds.
	09.03	Maintain a nursery system by demonstrating an ability to clean tanks and filtration equipment, adjust water flow and volume, set aeration, and monitor water quality and feeding levels.
	09.04	Describe and differentiate between land-based and field-based nursery systems, equipment and operations.
	09.05	Monitor and record routine data such as feed amounts and times, temperature, oxygen, salinity, and ammonia and enter data into a computer or log book.
	09.06	List and describe nursery production systems and larval husbandry techniques for fish, crustaceans, and mollusks.
	09.07	Demonstrate practical hands-on experience in handling a variety of juvenile aquaculture organisms and operating nursery production units.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

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Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: **Equine Assistant Management**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101050701
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-1011 - First-Line Supervisors of Farming, Fishing, and Forestry Workers

Purpose

This certificate program is part of the Equine Studies AS degree program (1101050701).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the equine industry within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction to individuals in the areas of planning, organizing, and supervising equine operations with emphasis on the science and care of equine species and the knowledge and understanding necessary for managing equine operations.

The Equine Assistant Management College Credit Certificate should include the requirements specified in the statewide Articulation Manual.

See **additional information** relevant to Career and Technical Education (CTE) program implementation provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify veterinary terminology and illustrate equine health practices.
02.0 Analyze equine nutrient requirements and evaluate equine diets.
03.0 Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations.
04.0 Demonstrate employability skills including interpersonal skills, ethics, communication and responsibility through work based learning activities and a portfolio.
05.0 Demonstrate techniques in evaluation, selection and breeding of horses.
06.0 Demonstrate ability to plan, schedule and maintain records and contracts, using appropriate technical information systems.
07.0 Demonstrate leadership and effective communication in employee management.

Florida Department of Education
Student Performance Standards

Program Title: **Equine Assistant Management**
CIP Number: **0101050701**
Program Length: **24 credit hours**
SOC Code(s): **45-1011**

This certificate program is part of the Equine Studies AS degree program (1101050701). At the completion of this program, the student will be able to:	
01.0	Identify veterinary terminology and illustrate equine health practices – the student will be able to:
01.01	Understand equine diseases and establish appropriate wellness programs for equine populations.
01.02	Comprehend equine anatomy and form to function concepts
01.03	Anticipate typical problems of performance and reproductive horses to prevent injury or poor health; effectively follow veterinarian orders to restore health and productivity.
01.04	Identify and describe equine anatomy, with special emphasis on physiology and function.
01.05	Provide first aid for horses.
01.06	Identify equine medications and demonstrate ability to administer as per veterinarian instructions
02.0	Analyze equine nutrient requirements and evaluate equine diets – the student will be able to:
02.01	Evaluate equine diets according to nutrient requirements for different classes of horses (working, growing, lactating).
02.02	Determine economic impact of feedstuff purchasing decisions
02.03	Maintain safe feeding management programs for enhanced equine health
02.04	Prepare a typical diet for horses of different classes
02.05	Understand feed manufacturing techniques and feed analysis systems.
03.0	Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations – the student will be able to:
03.01	Describe housing designs for different equine management systems.
03.02	Identify appropriate levels of care and welfare for equines.

	03.03 Develop a health care program for an equine farm including vaccination protocols, deworming schedules/programs, biosecurity and first aid.
04.0	Demonstrate employability skills including interpersonal skills, ethics, communication and responsibility through work based learning activities and a portfolio – the student will be able to:
	04.01 Demonstrate punctuality, initiative, courtesy, dependability, flexibility and honesty.
	04.02 Demonstrate ability to work as part of a team.
	04.03 Conduct a job search, write a resume and practice interview techniques.
	04.04 Understand legal requirements for employees including hiring, firing, and documentation.
	04.05 Develop managerial skills such as mentoring, management by objectives, balanced feedback, critical appraisal and promotion.
05.0	Demonstrate techniques in evaluation, selection and breeding of horses – the student will be able to:
	05.01 Evaluate equine conformation according to use and purpose.
	05.02 Understand basic genetics and selection techniques for effective animal breeding.
	05.03 Show ability to manage reproductive health and efficiency.
	05.04 Develop appropriate management techniques for equine breeding farm, including stallion management, estrus detection, breeding, foaling and foal management.
06.0	Demonstrate ability to plan, schedule and maintain records and contracts, using appropriate technical information systems – the student will be able to:
	06.01 Maintain and analyze equine records and basic business records (health, breeding, inventory, equipment, purchases, and depreciation).
	06.02 Understand contract language and different types of contracts.
	06.03 Maintain machinery, equipment and facility inventory records.
	06.04 Understand legal requirements, rules and regulations concerning horses and agribusiness.
	06.05 Manage farm inventory (horses, feed, equipment) for optimum efficiency and profitability.
07.0	Demonstrate leadership and effective communication in employee management – the student will be able to:
	07.01 Demonstrate punctuality, initiative, courtesy, dependability, flexibility and honesty.
	07.02 Select and hire farm managers who will work with various levels of farm workers, work well in a team environment and care about equine.
	07.03 Develop effective oral and written communication skills.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Equine Technician**
Career Cluster: **Agriculture, Food and Natural Resources**

	CCC
CIP Number	0101050703
Program Type	College Credit Certificate (15 credits)
Program Length	15 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-1011 - First Line Supervisors of Farming, Fishing & Forestry Workers

Purpose

This certificate program is part of the Equine Studies AS degree program (1101050701).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the equine industry within the Agriculture, Food and Natural Resources career cluster.

The Equine Technician**,** a 15-credit hour college certificate program, introduces students to equine care and entry-level employment. The content includes but is not limited to instruction to individuals in the area of basic equine care. The program includes the requirements specified in the statewide Articulation Manual.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify veterinary terminology and illustrate equine health practices.
02.0 Analyze equine nutrient requirements and evaluate equine diets.
03.0 Identify, analyze and apply basic concepts related to normal and abnormal equine behaviors.
04.0 Perform safe horse handling techniques.
05.0 Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations.

Florida Department of Education
Student Performance Standards

Program Title: **Equine Technician**
CIP Numbers: **0101050703**
Program Length: **15 credit hours**
SOC Code(s): **45-1011**

This certificate program is part of the Equine Studies AS degree program (1101050700). At the completion of this program, the student will be able to:	
01.0	Identify veterinary terminology and illustrate equine health practices – the student will be able to:
01.01	Understand equine diseases and establish appropriate wellness programs for equine populations.
01.02	Comprehend equine anatomy and form to function concepts.
01.03	Anticipate typical problems of performance and reproductive horses to prevent injury or poor health; effectively follow veterinarian orders to restore health and productivity.
01.04	Identify and describe equine anatomy, with special emphasis on physiology and function.
01.05	Provide first aid for horses.
01.06	Identify equine medications and demonstrate ability to administer as per veterinarian instructions.
02.0	Analyze equine nutrient requirements and evaluate equine diets – the student will be able to:
02.01	Evaluate equine diets according to nutrient requirements for different classes of horses (working, growing, and lactating).
02.02	Determine economic impact of feedstuff purchasing decisions.
02.03	Maintain safe feeding management programs for enhanced equine health.
02.04	Prepare a typical diet for horses of different classes.
02.05	Understand feed manufacturing techniques and feed analysis systems.
03.0	Identify, analyze and apply basic concepts related to normal and abnormal equine behaviors – the student will be able to:
03.01	Understand and recognize natural horse behaviors.
03.02	Identify and resolve abnormal equine behaviors.

	03.03 Utilize horse learning behaviors to improve management and safe handling of horses.
04.0	Perform safe horse handling techniques – the student will be able to:
	04.01 Safely catch, lead, tie, groom, restrain and work around horses of various levels of training.
	04.02 Safely administer health and medical practices, such as leg wraps, vital signs, injections and restraint for such treatments.
	04.03 Evaluate safe transportation techniques and equipment for transportation.
	04.04 Evaluate training equipment and demonstrate application of training equipment.
05.0	Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations – the student will be able to:
	05.01 Describe housing designs for different equine management systems.
	05.02 Identify appropriate levels of care and welfare for equines.
	05.03 Develop a health care program for an equine farm including vaccination protocols, deworming schedules/programs, biosecurity and first aid.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Landscape and Horticulture Specialist**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101060503
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-3011 - Landscaping and Groundskeeping Workers 45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse

Purpose

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060502).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the landscape and horticulture sector within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction pertaining to an understanding of plant physiology and growth, plant classification and identification, maintenance of landscape plants and employability and human relations skills.

See **additional information** relevant to Career and Technical Education (CTE) program implementation provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of plant physiology and growth.
02.0 Classify plants.
03.0 Maintain landscape plants
04.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Landscape and Horticulture Specialist**
CIP Number: **0101060503**
Program Length: **12 credit hours**
SOC Code(s): **37-3011, 45-2092**

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060500). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of plant physiology and growth – the student will be able to:
	01.01 Describe the process of photosynthesis.
	01.02 Identify and describe the functions of all parts of the plant.
	01.03 Describe an asexual reproduction process.
	01.04 Explain the differences between angiosperms and gymnosperms.
	01.05 Identify the differences between woody and herbaceous plants.
02.0	Classify plants – the student will be able to:
	02.01 Identify and group shade and flowering trees.
	02.02 Identify and group fruit trees and plants.
	02.03 Identify and group annuals, vegetables, and herbs.
	02.04 Identify and group woody ornamentals, vines, and ground covers.
	02.05 Identify and group tropical foliage plants.
	02.06 Identify and group turf and ornamental grasses.
03.0	Maintain landscape plants – the student will be able to:
	03.01 Determine water requirements and apply at proper rates.
	03.02 Identify weeds and apply herbicides safely.
	03.03 Determine fertilization requirements and apply at proper rates.

	03.04 Identify plant pest problems and apply corrective measures.
	03.05 Regulate the growth of landscape plants through chemical or mechanical needs.
	03.06 Maintain turf viability (mow at proper height and frequency, aerate, edge, clip, and remove trash).
	03.07 Cultivate and mulch plants.
	03.08 Brace and repair trees.
04.0	Demonstrate employability skills – the student will be able to:
	04.01 Conduct a job search.
	04.02 Secure information about a job.
	04.03 Identify documents that may be required when applying for a job.
	04.04 Complete a job application form.
	04.05 Demonstrate competency in job interview techniques.
	04.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other person.
	04.07 Identify acceptable work habits.
	04.08 Demonstrate knowledge of how to make job changes.
	04.09 Demonstrate acceptable employee health habits.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Landscape and Horticulture Professional**
Career Cluster: **Agriculture, Food and Natural Resources**

	CCC
CIP Number	0101060504
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-1012- First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers

Purpose

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060502).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the landscape and horticulture sector within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to , instruction pertaining to an understanding of plant physiology and growth, plant nutrition and fertilization, plant classification and identification, pest control, pruning and shaping plants, maintenance of landscape plants and employability and human relations skills. This program also prepares for certification and licensure as horticulture professional.

See **Additional information** relevant to Career and Technical Education (CTE) program implementation provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of plant physiology and growth.
02.0 Classify plants.
03.0 Fertilize plants
04.0 Manage a pest-control program
05.0 Prune and shape plants
06.0 Demonstrate employability skills
07.0 Maintain landscape plants

Florida Department of Education
Student Performance Standards

Program Title: **Landscape and Horticulture Professional**
CIP Number: **0101060504**
Program Length: **18 credit hours**
SOC Code(s): **37-1012**

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060500). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of plant physiology and growth--The student will be able to:
	01.01 Describe the process of photosynthesis.
	01.02 Identify and describe the functions of all parts of the plant.
	01.03 Describe an asexual reproduction process.
	01.04 Explain the differences between angiosperms and gymnosperms.
	01.05 Identify the differences between woody and herbaceous plants.
02.0	Classify plants--The student will be able to:
	02.01 Identify and group shade and flowering trees.
	02.02 Identify and group fruit trees and plants.
	02.03 Identify and group annuals, vegetables, and herbs.
	02.04 Identify and group woody ornamentals, vines, and ground covers.
	02.05 Identify and group tropical foliage plants.
	02.06 Identify and group turf and ornamental grasses.
03.0	Fertilize plants--The student will be able to:
	03.01 Evaluate influences of nutrients on plant growth.
	03.02 Apply fertilizers, using appropriate methods (dry, liquid, slow-release, injection, etc.).
	03.03 Demonstrate proper handling and storage of fertilizers, observing safety precautions.

04.0	Manage a pest-control program--The student will be able to:
	04.01 Develop an integrated pest management program or schedule.
	04.02 Train employees in the safe use of pesticides.
05.0	Prune and shape plants--The student will be able to:
	05.01 Train employees in pruning techniques.
	05.02 Identify and use tools for pruning.
	05.03 Prune plants to achieve desired growth.
	05.04 Demonstrate sanitation and safety practices when pruning.
06.0	Demonstrate employability skills--The student will be able to:
	06.01 Conduct a job search.
	06.02 Secure information about a job.
	06.03 Identify documents that may be required when applying for a job.
	06.04 Complete a job application form.
	06.05 Demonstrate competency in job interview techniques.
	06.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other person.
	06.07 Identify acceptable work habits.
	06.08 Demonstrate knowledge of how to make job changes.
	06.09 Demonstrate acceptable employee health habits.
07.0	Maintain landscape plants--The student will be able to:
	07.01 Determine water requirements and apply at proper rates.
	07.02 Identify weeds and apply herbicides safely.
	07.03 Determine fertilization requirements and apply at proper rates.
	07.04 Identify plant pest problems and apply corrective measures.

07.05	Regulate the growth of landscape plants through chemical or mechanical needs.
07.06	Maintain turf viability (mow at proper height and frequency, aerate, edge, clip, and remove trash).
07.07	Cultivate and mulch plants.
07.08	Brace and repair trees.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Landscape and Horticulture Technician**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101060505
Program Type	College Credit Certificate (CCC)
Program Length	30 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-1012 - First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers

Purpose

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060502).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the landscape and horticulture sector within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction pertaining to an understanding of plant physiology and growth, plant nutrition and fertilization, plant classification and identification, pest control, pruning and shaping plants, maintenance of landscape plants, equipment maintenance, and employability and human relations skills. This program also prepares for certification and licensure as a horticulture professional and landscape technician.

See **additional information** relevant to Career and Technical Education (CTE) program implementation provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of plant physiology and growth.
02.0 Classify plants.
03.0 Select, operate, and maintain tools and equipment.
04.0 Fertilize plants.
05.0 Manage a pest-control program.
06.0 Prune and shape plants.
07.0 Maintain landscape plants.
08.0 Demonstrate employability skills.

Landscape Specialization:

09.0 Plan, install, and maintain landscape irrigation systems.
10.0 Analyze and organize the project.
11.0 Lay out and install landscape and interiorscape.

Horticulture Specialization:

12.0 Determine drainage system needs and design a drainage system.
13.0 Prune and shape plants.
14.0 Maintain and analyze records.
15.0 Prepare growing media and seedbeds.
16.0 Propagate plants.
17.0 Grow plants.
18.0 Harvest, process, and ship plants.
19.0 Market plants.
20.0 Design, install, and service nursery irrigation systems.

Florida Department of Education
Student Performance Standards

Program Title: **Landscape and Horticulture Technician**
CIP Number: **0101060505**
Program Length: **30 credit hours**
SOC Code(s): **37-1012**

This certificate program is part of the Landscape and Horticulture Technology AS degree program (1101060500). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of plant physiology and growth – the student will be able to:
	01.01 Describe the process of photosynthesis.
	01.02 Identify and describe the functions of all parts of the plant.
	01.03 Describe an asexual reproduction process.
	01.04 Explain the differences between angiosperms and gymnosperms.
	01.05 Identify the differences between woody and herbaceous plants.
02.0	Classify plants – the student will be able to:
	02.01 Identify and group shade and flowering trees.
	02.02 Identify and group fruit trees and plants.
	02.03 Identify and group annuals, vegetables, and herbs.
	02.04 Identify and group woody ornamentals, vines, and ground covers.
	02.05 Identify and group tropical foliage plants.
	02.06 Identify and group turf and ornamental grasses.
03.0	Select, operate, and maintain tools and equipment – the student will be able to:
	03.01 Select and operate equipment for the job.
	03.02 Maintain an inventory of parts and supplies.
04.0	Fertilize plants – the student will be able to:

	04.01 Evaluate influences of nutrients on plant growth.
	04.02 Apply fertilizers, using appropriate methods (dry, liquid, slow-release, injection, etc.).
	04.03 Demonstrate proper handling and storage of fertilizers, observing safety precautions.
05.0	Manage a pest-control program – the student will be able to:
	05.01 Develop an integrated pest management program or schedule.
	05.02 Train employees in the safe use of pesticides.
	05.03 Obtain a pesticide license.
06.0	Prune and shape plants – the student will be able to:
	06.01 Train employees in pruning techniques.
	06.02 Identify and use tools for pruning.
	06.03 Prune plants to achieve desired growth.
	06.04 Demonstrate sanitation and safety practices when pruning.
07.0	Maintain landscape plants – the student will be able to:
	07.01 Determine water requirements and apply at proper rates.
	07.02 Identify weeds and apply herbicides safely.
	07.03 Determine fertilization requirements and apply at proper rates.
	07.04 Regulate growth of landscape plants through chemical or mechanical needs.
	07.05 Maintain turf viability (mow at proper height and frequency, aerate, edge, clip, and remove trash).
	07.06 Identify plant pest problems and apply corrective measures.
	07.07 Cultivate and mulch plants.
	07.08 Brace and repair trees.
08.0	Demonstrate employability skills – the student will be able to:
	08.01 Conduct a job search.

	08.02 Secure information about a job.
	08.03 Identify documents that may be required when applying for a job.
	08.04 Complete a job application form.
	08.05 Demonstrate competency in job interview techniques.
	08.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other person.
	08.07 Identify acceptable work habits.
	08.08 Demonstrate knowledge of how to make job changes.
	08.09 Demonstrate acceptable employee health habits.
Landscape Specialization:	
09.0	Plan, install, and service landscape irrigation systems – the student will be able to:
	09.01 Determine irrigation requirements.
	09.02 Operate and service low-volume irrigation system.
	09.03 Operate and service overhead irrigation systems.
	09.04 Operate and maintain automatic system.
10.0	Analyze and organize the project – the student will be able to:
	10.01 Interpret plans and specifications.
	10.02 Identify safety requirements.
	10.03 Organize site preparation.
	10.04 Locate project materials.
11.0	Lay out and install landscape – the student will be able to:
	11.01 Rough grade site.
	11.02 Install large materials.
	11.03 Install irrigation system.

	11.04 Lay out and install plants.
	11.05 Prepare final grade.
	11.06 Install lawns.
	11.07 Install mulch.
	11.08 Perform final clean up.
Horticulture Specialization:	
12.0	Determine drainage system needs and design a drainage system – the student will be able to:
	12.01 Determine the texture and percolation characteristics of the soil.
13.0	Prune and shape plants – the student will be able to:
	13.01 Develop a pruning program and time schedule.
	13.02 Select and use chemical growth regulators.
	13.03 Root-prune plants and trees.
14.0	Maintain and analyze records – the student will be able to:
	14.01 Maintain fertilizer and pesticide application records.
	14.02 Use computers in the landscape and horticulture operations.
15.0	Prepare growing media and seedbeds – the student will be able to:
	15.01 Identify media materials.
	15.02 Mix rooting and growing media according to plant requirements.
	15.03 Sterilize rooting, potting, and growing media.
	15.04 Collect and test a soil sample from field and potting media.
	15.05 Adjust pH and nutritional levels of media.
	15.06 Prepare planting beds and sites.
	15.07 Fill and level benches and pots with media.

	15.08 Demonstrate sanitation practices when handling and storing plant media materials.
16.0	Propagate plants – the student will be able to:
	16.01 Collect propagation materials at proper time (seeds, cuttings, scions, bulbs, etc.).
	16.02 Demonstrate propagation by grafting, budding, layering, separating, dividing, cutting, and tissue culturing.
	16.03 Prepare flats and a seedbed and plant seeds.
	16.04 Prepare a rooting bed.
	16.05 Prepare propagation materials (seeds, cuttings, scions, etc.)
	16.06 Apply growth stimulants to propagation materials.
	16.07 Transplant rooted propagation materials including tissue culture transplants.
	16.08 Demonstrate sanitation and safety practices when propagating.
17.0	Grow plants – the student will be able to:
	17.01 Prepare media for containers.
	17.02 Prepare field site for transplants.
	17.03 Select plant containers.
	17.04 Determine plant spacing in the field and on container beds.
	17.05 Transplant propagated materials to various containers and to the field.
	17.06 Determine and provide light requirements of various plant types.
18.0	Harvest, process, and ship plants – the student will be able to:
	18.01 Grade and harvest field-grown plants (ball, burlap, bare-root, “grow-bags”).
	18.02 Select, grade, and assemble container-grown plants.
	18.03 Prepare for shipment, loading, and transporting harvested plant materials.
19.0	Market plants – the student will be able to:
	19.01 Identify, inventory, and label marketable plants.

20.0	Design, install, and maintain nursery irrigation systems – the student will be able to:
	20.01 Determine irrigation requirements.
	20.02 Assess quality of irrigation water.
	20.03 Operate and service various types of irrigation systems.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: **Biomass Cultivation Specialist**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0101110301
Program Type	College Credit Certificate (CCC)
Program Length	21 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-4011 - Agricultural and Food Science Technicians 45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse 19-4099 - Precision Agriculture Technicians 45-2091 - Agriculture Equipment Operators

Purpose

This certificate program is part of the Biomass Cultivation AS degree program (1101110302).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the agricultural production sector within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to manage land, water, machinery, crops and facilities as well as keep records, analyze records and technical reports, and demonstrate leadership, employability, communication and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Distinguish varieties of energy grasses.
02.0 Manage crops.
03.0 Manage machinery and equipment.
04.0 Demonstrate safe chemical handling and chemical waste removal.
05.0 Keep and analyze production records.
06.0 Demonstrate leadership, communication, employability and human relations skills.

Florida Department of Education
Student Performance Standards

Program Title: **Biomass Cultivation Specialist**
CIP Number: **0101110301**
Program Length: **21 credit hours**
SOC Code(s): **19-4011, 45-2092, 19-4099, 45-2091**

This certificate program is part of Biomass Cultivation AS degree program (1101110302). At the completion of this program, the student will be able to:	
01.0	Distinguish varieties of energy grasses – the student will be able to:
	01.01 List species used as bioenergy feedstock.
	01.02 Compare and contrast morphology and anatomy of energy grass species.
	01.03 Explain how biological features of energy grasses are important for cellulosic bioethanol production.
02.0	Manage crops – the student will be able to:
	02.01 Prepare soil for crops.
	02.02 Determine seeding/planting rate and spacing.
	02.03 Calibrate and adjust planting equipment.
	02.04 Plant crops.
	02.05 Select appropriate cultural practices including cultivation, fertilization and irrigation.
	02.06 Identify and control diseases, insects and pests.
	02.07 Determine maturity of crops.
	02.08 Harvest crops.
	02.09 Store crops.
03.0	Manage machinery and equipment – the student will be able to:
	03.01 Maintain oil, fuel and hydraulic levels in equipment.
	03.02 Maintain tires, batteries and coolant system on all equipment and vehicles.

	03.03 Operate and service small gasoline engines.
	03.04 Replace hoses, belts and lines.
	03.05 Cut and weld with oxy-acetylene and arc welding equipment.
	03.06 Observe safety procedures when operating farm equipment.
	03.07 Follow a general maintenance schedule.
04.0	Demonstrate safe chemical handling and chemical waste removal – the student will be able to:
	04.01 Maintain records per state and federal regulations.
	04.02 Know and practice chemical handling according to the guidelines established by Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA).
	04.03 Demonstrate safe waste disposal practices.
05.0	Keep and analyze production records – the student will be able to:
	05.01 Keep fertilization and pesticide use records.
	05.02 Keep equipment maintenance and service records.
	05.03 Record cultural and production information.
06.0	Demonstrate leadership, communication, employability and human relations skills – the student will be able to:
	06.01 Develop citizenship awareness and responsibility.
	06.02 Demonstrate effective communication skills.
	06.03 Complete an employment application.
	06.04 Conduct a job search.
	06.05 Demonstrate job interview skills.
	06.06 Recognize appropriate work habits.
	06.07 Identify associations and societies associated with occupation.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Marine Mammal Behavior and Training**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0103060101
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	N/A
SOC Codes (all applicable)	39-2011 - Animal Trainers

Purpose

This certificate program is part of the Marine Environmental Technology AS degree program (1103060100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The purpose of this program is to provide technically skilled employees for the marine mammal training, behavior, and research fields. Graduates of this program will obtain the fundamental academic skills necessary to be successful at entry level positions in the marine mammal training, behavior and research fields and demonstrate the an understanding of the fundamental concepts of marine mammal science.

Graduates will demonstrate the ability to understand and practice the fundamentals of: marine mammal husbandry; marine mammal medical care and pathology; behavior modification and training; anatomy; physiology; maternity; population management; habitat and maintenance; environmental enrichment; cognitive and behavioral research methodology, design and implementation; dolphin acoustics; and communication; marine mammal law; and conservation.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of the fundamental principles of marine mammal anatomy and evolution.
02.0 Demonstrate basic knowledge of marine mammal social structure and culture.
03.0 Demonstrate proficiency of basic marine mammal training and husbandry techniques.
04.0 Demonstrate knowledge of principle marine mammal laws and regulations.
05.0 Describe and discuss research focused on marine mammals.
06.0 Demonstrate knowledge of conservation issues involving marine mammals.
07.0 Demonstrate an understanding of the guiding principles and practices of marine mammals in human care.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Mammal Behavior and Training**
CIP Number: **0103060101**
Program length: **15 credit hours**
SOC Code (s): **39-2011**

This certificate program is part of the Marine Environmental Technology AS degree program (1103060100). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of the fundamental principles of marine mammal anatomy and evolution – the student will be able to:
01.01	Demonstrate an understanding of the external and internal aspects of dolphin anatomy and physiology, and their role in the successful survival of a mammal in the marine environment.
01.02	Demonstrate knowledge of the anatomy and evolution of various marine mammals including other cetaceans, pinnipeds and sirenians.
01.03	Demonstrate knowledge of the evolution of marine mammals.
02.0	Demonstrate basic knowledge of marine mammal social structure and culture – the student will be able to:
02.01	Demonstrate an understanding of basic dolphin ecology as related to communication, foraging, reproduction, calf rearing and social structure.
02.02	Explain and outline marine mammal maternal characteristics, behaviorism human care and the wild, as well as prenatal care, birthing situations and maternity care of mother and neonate human care facilities.
02.03	Explain how the natural social ecology of dolphins and the importance and impact of it on how they are managed at human care facility.
02.04	Demonstrate an understanding of the basic social structure of other representative marine mammal taxa.
02.05	Demonstrate how the term “culture” has been theorized to apply to certain aspects of cetacean societies and how that impacts our understanding of their cognition.
02.06	Understand the portrayal of marine mammals in the media and how and why it has changed over time.
02.07	Understand the application of animal assistance to humans throughout history and the more recent use of marine mammals in military service and how the latter has greatly contributed to our essential knowledge base of marine mammals overall.
03.0	Demonstrate proficiency of basic marine mammal training and husbandry techniques – the student will be able to:
03.01	Understand the philosophy and techniques of operant (behavioral) conditioning, with a focus on positive reinforcement in training behavior and its application to working with dolphins.
03.02	Demonstrate operant conditioning techniques through the use of learned hand signals in communicating requests for various trained behaviors from the dolphin.

	03.03	Apply skills learned in animal care, handling and reinforcement during a live animal presentation for the general public.
	03.04	Construct a plan for basic marine mammal care, dietary and medical needs, and animal handling.
	03.05	Understand the medical issues unique to marine mammals, methods of treatment of bacterial, viral, fungal and parasitic disease, established preventive care practices.
	03.06	Demonstrate the use of operant conditioning in training a new behavior through outlining, developing, implementing and modifying a behavior chain through practical application with the animals.
	03.07	To sumarize the importance of voluntary medical behavior training, concepts and techniques used to desensitize animals to non-invasive medical equipment and rocedures. Understand the importance of the of trainer/animal relationship with regard to properly maintaining the health and well being of the animals.
	03.08	To investigate and understand the purpose and necessity of animal enrichment including cognitive, development, and social aspects. Design and implement enrichment activities to enhance the habitat and activities of the animals.
	03.09	To sumarize safety precautions and the social issues surrounding enrichment devices, habitat design, safety & maintenance social groupings, training and dolphin & sea lion nutrition & energetics.
	03.10	To critique various career pathways and opportunities available in the field of marine mammal care and training, including necessary academics, field experience, trainer forums, further experiential education in the field, networking, etc.
04.0	Demonstrate knowledge of principle marine mammal laws and regulations – the student will be able to:	
	04.01	Understand and explain the laws and regulating agencies, and their evolution, designed to protect marine mammals in both the wild and human care as well as regulate facilities .
	04.02	Understand the separate roles of both NOAA and the Department of Agriculture and how they impact marine mammals and marine mammal facilities.
05.0	Describe and discuss research focused on marine mammals – the student will be able to:	
	05.01	Describe the historical and current research efforts relating to dolphin cognition, behavior, acoustics, communication, strandings, physiology, reproduction and conservation.
	05.02	Sumarize basic medical procedures and the importance and implications of husbandry techniques to marine mammal research.
	05.03	Explain how research with dolphins in human care have expanded our understanding of their wild cousins and contributed to their conservation.
	05.04	Sumarize trends in basic dolphin ethology, past and ongoing studies related to cognition, behavior and communication and its application in research, as well as an understanding of passive observational data collection and facilitation of active cognitive research.
	05.05	Evaluate theories and research on dolphin echolocation and whistle production; implication of anthropogenic noise in the marine environment and ongoing research in the area.
	05.06	Conduct independent behavioral observations.
	05.07	Review research design and logistics as it applies to marine mammals in human care through a project design exercise conducted collaborativelythroughout the course, including an understanding of results analyses and interpretation.
	05.08	Critique career pathways and requirements toward becoming a marine mammal research scientist in human care settings (ex situ) and in the field (in situ).

06.0	Demonstrate knowledge of conservation issues involving marine mammals – the student will be able to:	
	06.01	Understand the current conservation issues of international/domestic concern which affect marine mammals and their environment, cumulative impacts both natural and human induced, as well as ways in which individuals can affect the environment in a positive manner to conserve the species.
	06.02	Master the skills in synthesizing new information and experiences with prior conceptions of dolphins and the marine environment to clearly refine their opinions and knowledge base.
	06.03	Outline the organization of the Marine Mammal Stranding Network; procedures used in assisting and rehabilitating stranded marine mammals; international and domestic issues concerning threats to dolphins and the marine environment.
	06.04	List anthropogenic impacts affecting marine mammals and their environment, and demonstrate an understanding of research needed in this area, implications of impacts and associated research.
	06.05	Understand past and present state of whaling operations around the world and the processes and organizations that govern these activities
	06.06	Understand status of certain endangered marine mammal species and conservation measures to sustain their populations.
07.0	Demonstrate an understanding of the guiding principles and practices of marine mammals in human care – the student will be able to:	
	07.01	To diagram population management, including theories, tools and strategies for maintaining a population's genetic diversity and demographic stability in order to insure its long term persistence.
	07.02	Summarize specific concerns surrounding appropriate design, construction and maintenance of aquatic mammal habitats for marine mammals in human care.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Tropical Ornamental Mariculture Technician**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0103060102
Program Type	College Credit Certificate (CCC)
Program Length	30 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-2093 - Farmworkers, Farm, Ranch, and Aquacultural Animals

Purpose

This certificate program is part of the Marine Environmental Technology AS degree program (1103060100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction in tropical marine ornamental finfish and invertebrate husbandry, disease and parasite diagnostics and prevention, nutrition of marine aquaculture organisms, aquaculture best management practices, marine aquaculture systems and design, as well as an internship at a tropical marine aquaculture facility.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Compose scientific and/or technical reports.
02.0 Demonstrate an understanding of marine ecosystems, environmental management, and resource conservation.
03.0 Comprehension of fundamental principles governing business and entrepreneurship.
04.0 Demonstrate an understanding of the fundamental principles of marine aquaculture.
05.0 Demonstrate a thorough knowledge of aquaculture best management practices.
06.0 Identify and diagnose common diseases and parasites that infect marine aquaculture organisms.
07.0 Demonstrate a moderate understanding of marine aquaculture systems.
08.0 Recognize appropriate nutritional requirements for the most common marine aquaculture organisms.
09.0 Demonstrate a basic understanding of marine aquaculture husbandry principles and practices.

Florida Department of Education
Student Performance Standards

Program Title: **Tropical Ornamental Mariculture Technician**
CIP Number: **0103060102**
Program Length: **30 credit hours**
SOC Code(s): **45-2093**

This certificate program is part of the Marine Environmental Technology AS degree program (1103060100). At the completion of this program, the student will be able to:	
01.0	Compose scientific and/or technical reports – the student will be able to:
01.01	Explain the peer-review process of publishing a scientific article.
01.02	Explain the function of each section of a scientific paper or technical report.
01.03	Critically analyze a scientific paper describing its thesis, methods, results and conclusions.
01.04	Create at least two reports formatted according to a scientific publishing format.
02.0	Demonstrate an understanding of marine ecosystems, environmental management, and resource conservation – the student will be able to:
02.01	Explain the essential components of ecology, and how energy flows through an ecosystem.
02.02	Explain the functional role of primary producers in the marine environment, and identify common species of marine plants and algae.
02.03	Explain the essential components of intertidal ecology, and how energy flows through various types of intertidal ecosystems.
02.04	Describe the features and functional systems in the intertidal, neritic, epipelagic and deep ocean regions.
02.05	Explain the basic functional ecology and energy flow on a coral reef.
02.06	List the various resources humans derived from the sea and what problems this presents.
02.07	Explain how humankind has and continues to impact the marine environment.
02.08	Describe methods and best practices currently in use to conserve marine ecosystems including but not limited to as marine spatial planning, integrated coastal zone management and marine protected areas.
02.09	Explain the concepts of “Tragedy of the Commons” and “Precautionary Principle” as they relate to marine ecosystem and resource conservation.
03.0	Comprehension of fundamental principles governing business and entrepreneurship – the student will be able to:

	03.01 Demonstrate a familiarity of entrepreneurship by understanding the characteristics and mindset of entrepreneurs.
	03.02 Identify and evaluate opportunities within the marketplace, both for new venture creation and within existing organizations.
	03.03 Create the tools necessary to act on an entrepreneurial opportunity by writing a business plan, building a management team, financing the opportunity and creating an innovative marketing plan.
	03.04 Describe successful strategies and common mistakes made by successful entrepreneurs.
	03.05 Describe the legal requirements and obstacles in starting a business venture.
04.0	Demonstrate an understanding of the fundamental principles of marine aquaculture – the student will be able to:
	04.01 Demonstrate a basic understanding of marine aquaculture husbandry principles and practices.
	04.02 Demonstrate the skills required to culture phytoplankton and zooplankton required for larval rearing.
	04.03 Describe the basic types of marine aquaculture systems.
	04.04 Describe the various types of common organisms and techniques currently used
	04.05 Demonstrate a basic knowledge of common diseases and parasites during marine aquaculture and methods for their control.
05.0	Demonstrate a thorough knowledge of aquaculture best management practices – the students will be able to:
	05.01 Describe the concept of aquaculture Best Management Practices.
	05.02 Compile and analyze marine aquaculture industry management data.
	05.03 Identify and demonstrate proper use of key Quality Management tools.
	05.04 Develop and implement the key components and concepts of an aquaculture management plan.
06.0	Demonstrate a basic understanding of marine aquaculture husbandry principles and practices – the students will be able to:
	06.01 Identify the principles of water quality specific to marine aquaculture from a variety of marine taxa.
	06.02 Demonstrate a working knowledge of variety of husbandry techniques for most of the known marine species currently being cultured, including temperature and photoperiod control conducive to spawning and species specific life styles.
	06.03 Understand basic selective breeding techniques for enhanced phenotypic traits.
07.0	Identify and diagnose common diseases and parasites that infect marine aquaculture organisms – the students will be able to:
	07.01 Demonstrate an understanding of how the culture environment is associated with the occurrence and outbreak of disease and parasites in marine aquaculture systems.
	07.02 Identify the differences between environmental, viral, bacterial, parasitic and fungal diseases of marine species.

	07.03	Demonstrate a basic understanding of methodologies for treatment of diseases commonly encountered during marine aquaculture operations.
	07.04	Demonstrate an understanding of the basic principles of marine aquatic health management and biosecurity.
08.0	Demonstrate a moderate understanding of marine aquaculture systems – the students will be able to:	
	08.01	Describe the various types of marine aquaculture systems and demonstrate the ability to distinguish the primary components of specific marine aquaculture systems.
	08.02	Identify which systems are best for the culture and business model of the target species.
	08.03	Recognize the System requirements for Integrated Multi-Trophic Mariculture (IMTM) systems.
	08.04	Demonstrate an understanding of the impacts of specific marine aquaculture systems on the environment and especially marine ecosystems.
	08.05	Demonstrate basic skills for computer automated drafting.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: Turf Equipment Technology
Program Type: ATD (Applied Technology Diploma)
Career Cluster: Agriculture, Food and Natural Resources

	CC	PSAV
Program Number	N/A	A020608
CIP Number	0131030202	0131030203
Grade Level	Applied Technology Diploma (ATD)	Applied Technology Diploma (ATD)
Standard Length	38 credit hours	1140 clock hours
CTSO	N/A	N/A
SOC Codes (all applicable)	49-3053 - Outdoor Power Equipment and Other Small Engine Mechanics	49-3053 - Outdoor Power Equipment and Other Small Engine Mechanics
Basic Skills Level:	N/A	Mathematics: 10 Language: 10 Reading: 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to manage and maintain turf care equipment and to manage a shop facility. Instruction includes: hand tools, gasoline and diesel mechanics, paints and painting, sharpening and grinding, welding, hydraulics, electrical systems, training on specialized turf care equipment, record keeping, inventory control, safety, laws and regulations, public relations, human relations, shop management, professionalism, employability skills, communications skills, and management skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is an Applied Technology Diploma (ATD) program that is part of a technical degree program, is less than 60 credit hours, and leads to employment in a specific occupation. An ATD program may consist of either technical credit or college credit. A public school district may offer an ATD program only as technical credit, with college credit awarded to a student upon articulation to a community college.

PSAV Program

When offered at the district level, this program is a planned sequence of instruction consisting of one occupational completion points and the courses as shown below.

OCP	Course Number	Course Title	Length	SOC Code
A	SER0004	Outdoor Power Equipment and Other Small Engine Mechanics 1	435 hours	49-3053
	SER0005	Outdoor Power Equipment and Other Small Engine Mechanics 2	435 hours	
	SER0006	Outdoor Power Equipment and Other Small Engine Mechanics 3	270 hours	

College Credit

When offered at the community college level, this ATD program is part of the Turf Equipment Management AS program (1131030201) and has a program length of 38 credits.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Disassemble, reassemble, adjust, repair, and diagnose the problems related to two and four-cycle engines.
02.0 Service electrical systems, fuels and lubricating systems, cooling systems, power train/hydraulic drives, and controls on turf equipment.
03.0 Adjust, sharpen, grind, and rebuild reel and rotary mowing units.
04.0 Demonstrate understanding of governmental regulations and compliances pertaining to golf courses.
05.0 Use shop tools and equipment, and organize a shop following appropriate safety, management, and inventory techniques.
06.0 Order and stock parts and keep shop records.
07.0 Perform basic welding tasks using both gas and arc welding techniques.
08.0 Identify and safely operate turf care equipment.
09.0 Demonstrate employability skills.
10.0 Identify the various professional organizations and publications that pertain to the turf management industry.
11.0 Design a functional golf course maintenance facility and select appropriate maintenance equipment.
12.0 Develop a preventive maintenance program for turf care equipment.
13.0 Develop human relations skills.
14.0 Perform decision making activities.

Florida Department of Education
Student Performance Standards

Program Title: **Turf Equipment Technology**
PSAV Number: **A020608**

When this program is offered at the PSAV level, the following organization of courses, standards, and benchmarks apply.

PSAV Course Number: SER0004 **Occupational Completion Point: A** **Outdoor Power Equipment and Other Small Engine Mechanics 1 – 435 Hours – SOC Code 49-3053**	
01.0	Disassemble, reassemble, adjust, repair, and diagnose the problems related to two-cycle and four-cycle engines – the student will be able to:
01.01	Evaluate horsepower and torque.
01.02	Disassemble and reassemble a two-cycle and four-cycle engine.
01.03	Identify crankcase and cylinder assembly.
01.04	Identify and be able to assemble valves, piston assembly, crankshaft, cooling system, and air filters.
01.05	Identify and assemble parts of the carburetor assembly.
01.06	Identify and assemble the ignition system, governor, alternator, and starter system.
01.07	Identify types of batteries.
01.08	Follow safety rules and precautions when dealing with engines.
02.0	Service electrical systems, fuel and lubricating systems, power train/hydraulic drives, and controls on turf equipment – the student will be able to:
02.01	Identify turf equipment electrical systems.
02.02	Service hydraulic systems on a variety of turf equipment.
02.03	Service turf equipment power train systems.
02.04	Identify and service various lubricating systems and understand types of fuels and lubricants.
02.05	Operate and repair the various mechanical and hydraulic controls on turf equipment.
02.06	Repair the governor, ignition, alternator, and starter system on various pieces of turf equipment.

03.0	Adjust, sharpen, grind, and rebuild reel and rotary mowing units – the student will be able to:
	03.01 Sharpen and balance rotary mower blades.
	03.02 Remove and replace rotary mower blades.
04.0	Demonstrate understanding of governmental regulations and compliances pertaining to golf courses – the student will be able to:
	04.01 Control pollution
	04.02 Protect water quality
	04.03 Demonstrate fire prevention methods
	04.04 Identify and prevent health hazards and demonstrate proper first aid
05.0	Use shop tools and equipment and organize a shop following appropriate safety, management and inventory techniques – the student will be able to:
	05.01 Follow basic OSHA safety regulations and shop fire prevention techniques.
	05.02 Perform basic first aid procedures.
	05.03 Establish a file system for shop records.
	05.04 Identify and use shop hand tools and equipment that relate to turf equipment maintenance.
	05.05 Select the appropriate fasteners, bearings, seals, belts, chains, fuels, and lubricants for various turf equipment.
	05.06 Establish and maintain appropriate shop space for specific shop tasks.
	05.07 Establish an appropriate equipment inventory system.

PSAV Course Number: SER0005 Occupational Completion Point: A Outdoor Power Equipment and Other Small Engine Mechanics 2 – 435 Hours – SOC Code 49-3053	
06.0	Order and stock parts and keep shop records – the student will be able to:
	06.01 Use the various equipment manuals to identify parts and service procedures.
	06.02 Order parts properly.
	06.03 Establish a system for stocking appropriate turf equipment parts.
	06.04 Gather the appropriate forms for establishing a recordkeeping system.

	06.05 Maintain computer-based inventory and record-keeping system.
07.0	Perform basic welding tasks using both gas and arc welding techniques – the student will be able to:
	07.01 Follow welding symbols, and safety practices.
	07.02 Connect and operate oxy-acetylene welding equipment.
	07.03 Run beads and weld various types of joints.
	07.04 Braze and solder metal.
	07.05 Cut metal with and oxy-acetylene torch.
	07.06 Select appropriate welding rods.
	07.07 Set up an electrical arc welding machine.
	07.08 Arc weld various types of joints.
08.0	Identify and safely operate turf care equipment – the student will be able to:
	08.01 Identify the appropriate use for commonly used turf care equipment.
	08.02 Identify the operation safety procedures for commonly used turf equipment.
	08.03 Operate properly all commonly used turf care equipment.
09.0	Demonstrate employability skills – the student will be able to:
	09.01 Conduct a job search.
	09.02 Secure information about a job.
	09.03 Identify documents which may be required when applying for a job interview.
	09.04 Complete a job application correctly.
	09.05 Demonstrate competence in a job interview.
	09.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	09.07 Identify acceptable work habits.
	09.08 Demonstrate knowledge or how to make job changes appropriately.

	09.09 Demonstrate acceptable employee health habits.
	09.10 Identify appropriate attire and grooming to maintain a functional and professional atmosphere in the equipment maintenance facility.
10.0	Identify the various professional organizations and publications that pertain to the turf management industry – the student will be able to:
	10.01 Identify major points in the history of the golf course/turf industry.
	10.02 Identify and understand various professional turf publications.
	10.03 Identify and understand the basic role of professional turf organizations.
	10.04 Identify the basics of the seed production and sod production industries.
	10.05 Identify the various classes of golf courses and turf maintenance organizations.
11.0	Design a functional golf course maintenance facility and select appropriate maintenance equipment – the student will be able to:
	11.01 Evaluate the organization and management styles utilized by various golf courses.
	11.02 Classify, by use, the various equipment used on a typical 18-hole golf course.
	11.03 List the equipment needed to properly maintain an 18-hole golf course.
	11.04 Design and organize a golf course maintenance complex.
	11.05 Develop an equipment budget for an 18-hole golf course.
	11.06 Identify appropriate attire and grooming to maintain a functional and professional atmosphere in the equipment maintenance facility.

PSAV Course Number: SER0006 Occupational Completion Point: A Outdoor Power Equipment and Other Small Engine Mechanics 3 – 270 Hours – SOC Code 49-3053	
12.0	Develop preventive maintenance programs for turf care equipment – the student will be able to:
	12.01 Develop a recordkeeping system to record equipment use.
	12.02 Develop a recordkeeping system to record service work performed on equipment.
13.0	Develop human relations skills – the student will be able to:
	13.01 Demonstrate appropriate work habits.
	13.02 Identify traits that promote good human relations and increase job performance.

	13.03 Develop an understanding of the role of the golf course superintendent and turf equipment service manager in the overall successful operations of the golf course.
14.0	Perform decision-making activities – the student will be able to:
	14.01 Develop the ability to solve problems in a logical sequence.
	14.02 Demonstrate the ability to determine proper work priorities.
	14.03 Prepare a day's work schedule for the superintendent.
	14.04 Choose appropriate action in situations requiring following a chain of command.
	14.05 Choose appropriate action in situations requiring effective time management.
	14.06 Choose appropriate action in situations requiring application of business ethics.
	14.07 Identify ways to assign work to others.

Florida Department of Education
Student Performance Standards

Program Title: **Turf Equipment Technology**
ATD CIP Number: **0131030202**
SOC Code(s): **49-3053**

When this program is offered at the college level, the following standards and benchmarks apply:

01.0	Disassemble, reassemble, adjust, repair, and diagnose the problems related to two-cycle and four-cycle engines – the student will be able to:
	01.01 Evaluate horsepower and torque.
	01.02 Disassemble and reassemble a two-cycle and four-cycle engine.
	01.03 Identify crankcase and cylinder assembly.
	01.04 Identify and be able to assemble valves, piston assembly, crankshaft, cooling system, and air filters.
	01.05 Identify and assemble parts of the carburetor assembly.
	01.06 Identify and assemble the ignition system, governor, alternator, and starter system.
	01.07 Identify types of batteries.
	01.08 Follow safety rules and precautions when dealing with engines.
02.0	Service electrical systems, fuel and lubricating systems, power train/hydraulic drives, and controls on turf equipment – the student will be able to:
	02.01 Identify turf equipment electrical systems.
	02.02 Service hydraulic systems on a variety of turf equipment.
	02.03 Service turf equipment power train systems.
	02.04 Identify and service various lubricating systems and understand types of fuels and lubricants.
	02.05 Operate and repair the various mechanical and hydraulic controls on turf equipment.
	02.06 Repair the governor, ignition, alternator, and starter system on various pieces of turf equipment.
03.0	Adjust, sharpen, grind, and rebuild reel and rotary mowing units – the student will be able to:

	03.01 Repair and sharpen various types of reel mowers.
	03.02 Grind reel bedknives with various bedknife grinders.
	03.03 Lap reel mower blades.
	03.04 Follow safety procedures when using reel and bedknife grinders.
	03.05 Adjust reel mowers to produce proper cutting heights.
	03.06 Sharpen and balance rotary mower blades.
	03.07 Remove and replace rotary mower blades.
04.0	Demonstrate understanding of governmental regulations and compliances pertaining to golf courses – the student will be able to:
	04.01 Control pollution
	04.02 Protect water quality
	04.03 Demonstrate fire prevention methods
	04.04 Identify and prevent health hazards and demonstrate proper first aid
	04.05 Identify and manage hazardous waste on the golf course
	04.06 Manage fertilizer storage demonstrating proper handling techniques
	04.07 Demonstrate pesticide safety
05.0	Use shop tools and equipment and organize a shop following appropriate safety, management and inventory techniques – the student will be able to:
	05.01 Follow basic OSHA safety regulations and shop fire prevention techniques.
	05.02 Perform basic first aid procedures.
	05.03 Establish a file system for shop records.
	05.04 Identify and use shop hand tools and equipment that relate to turf equipment maintenance.
	05.05 Select the appropriate fasteners, bearings, seals, belts, chains, fuels, and lubricants for various turf equipment.
	05.06 Establish and maintain appropriate shop space for specific shop tasks.
	05.07 Establish an appropriate equipment inventory system.

06.0	Order and stock parts and keep shop records – the student will be able to:
	06.01 Use the various equipment manuals to identify parts and service procedures.
	06.02 Order parts properly.
	06.03 Establish a system for stocking appropriate turf equipment parts.
	06.04 Gather the appropriate forms for establishing a recordkeeping system.
	06.05 Maintain computer-based inventory and record-keeping system.
07.0	Perform basic welding tasks using both gas and arc welding techniques – the student will be able to:
	07.01 Follow welding symbols, and safety practices.
	07.02 Connect and operate oxy-acetylene welding equipment.
	07.03 Run beads and weld various types of joints.
	07.04 Braze and solder metal.
	07.05 Cut metal with and oxy-acetylene torch.
	07.06 Select appropriate welding rods.
	07.07 Set up an electrical arc welding machine.
	07.08 Arc weld various types of joints.
08.0	Identify and safely operate turf care equipment – the student will be able to:
	08.01 Identify the appropriate use for commonly used turf care equipment.
	08.02 Identify the operation safety procedures for commonly used turf equipment.
	08.03 Operate properly all commonly used turf care equipment.
09.0	Demonstrate employability skills – the student will be able to:
	09.01 Conduct a job search.
	09.02 Secure information about a job.
	09.03 Identify documents which may be required when applying for a job interview.

	09.04 Complete a job application correctly.
	09.05 Demonstrate competence in a job interview.
	09.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	09.07 Identify acceptable work habits.
	09.08 Demonstrate knowledge or how to make job changes appropriately.
	09.09 Demonstrate acceptable employee health habits.
	09.10 Identify appropriate attire and grooming to maintain a functional and professional atmosphere in the equipment maintenance facility.
10.0	Identify the various professional organizations and publications that pertain to the turf management industry – the student will be able to:
	10.01 Identify major points in the history of the golf course/turf industry.
	10.02 Identify and understand various professional turf publications.
	10.03 Identify and understand the basic role of professional turf organizations.
	10.04 Identify the basics of the seed production and sod production industries.
	10.05 Identify the various classes of golf courses and turf maintenance organizations.
11.0	Design a functional golf course maintenance facility and select appropriate maintenance equipment – the student will be able to:
	11.01 Evaluate the organization and management styles utilized by various golf courses.
	11.02 Classify, by use, the various equipment used on a typical 18-hole golf course.
	11.03 List the equipment needed to properly maintain an 18-hole golf course.
	11.04 Design and organize a golf course maintenance complex.
	11.05 Develop an equipment budget for an 18-hole golf course.
12.0	Develop preventive maintenance programs for turf care equipment – the student will be able to:
	12.01 Use equipment manufacturers' manuals to implement proper service procedures.
	12.02 Develop a recordkeeping system to record equipment use.
	12.03 Develop a recordkeeping system to record service work performed on equipment.

13.0	Develop human relations skills – the student will be able to:
13.01	Demonstrate appropriate work habits.
13.02	Identify traits that promote good human relations and increase job performance.
13.03	Develop an understanding of the role of the golf course superintendent and turf equipment service manager in the overall successful operations of the golf course.
14.0	Perform decision-making activities – the student will be able to:
14.01	Develop the ability to solve problems in a logical sequence.
14.02	Demonstrate the ability to determine proper work priorities.
14.03	Prepare a day's work schedule for the superintendent.
14.04	Choose appropriate action in situations requiring following a chain of command.
14.05	Choose appropriate action in situations requiring effective time management.
14.06	Choose appropriate action in situations requiring application of business ethics.
14.07	Identify ways to assign work to others.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Basic Skills

In PSAV programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C. the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10, Language 10, and Reading 10. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Program Length

In accordance with Rule 6A-10.024, F.A.C. an ATD program consists of a course of study that is part of an AS or AAS degree program, is less than 60 credit hours, is approximately 50% of the technical component (non-general education), and leads to employment in a specific occupation. An ATD program may consist of either technical credit or college credit.

Students must have a high school diploma, a GED, or a certificate of completion to be admitted to an ATD program. Within six weeks of entry, students in ATD programs of 450 or more hours must be tested pursuant to Rule 6A-10.040, F.A.C. and if below minimum standards for completion from the program, must receive remedial instruction. The minimum standards must be at least the equivalent of a score of ten (10) on all sections of basic skills test approved in Rule 6A-10.040, F.A.C. Students must successfully complete all remedial instruction before completing the ATD.

Community Colleges may offer either college or career credit toward the ATD. A Career Center in a public school district may offer an ATD program only as technical credit, with college credit awarded to a student upon articulation to a community college (Section 1004.02, F.S.)

When offered at a community college the standard length of this program is 38 credits. When offered at a technical center the standard length of this program is 1140 clock hours.

In accordance with Rule 6A-10.024, F.A.C. all faculty providing instruction must have at least a baccalaureate degree or an associate degree with demonstrated competencies in the specific instructional program as defined by the Southern Association of Colleges and Schools.

Florida Department of Education
Curriculum Framework

Program Title: **Hazardous Materials Specialist**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0703010403
Program Type	College Credit Certificate (CCC)
Program Length	14 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-4091 - Environmental Science and Protection Technicians, Including Health

Purpose

This certificate program is part of the Environmental Science Technology AS degree program (1703010401).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to analysis, handling, storage, and dispensing of hazardous materials in accordance with appropriate federal, state, and local laws and regulations governing proper chemical management. The certificate will cover industry standards such as those included in the Occupational Health and Safety Administration (OSHA) 29CFR1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard, the Oil Pollution Act of 1990, the Clean Air Act, the Clean Water Act, and the Department of Transportation (DOT) regulations. Graduates of this certificate program should be able to research applicable local, state, and federal regulations and implement methods and strategies to ensure compliance; to maintain records as required by OSHA, the Environmental Protection Agency (EPA), and the DOT; to develop and implement hazardous materials handling procedures; to plan for emergency response to hazardous materials incidents; and to protect employees/workers/communities from hazardous material exposures.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of the principles of managing water pollution through prevention and remediation
02.0 Demonstrate knowledge of the principles of managing air pollution through prevention and remediation
03.0 Demonstrate awareness of environmental noise sources and their monitoring.
04.0 Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants.
05.0 Sample, analyze and calculate data related to air, water and soil pollutants.
06.0 Demonstrate an awareness of radiation monitoring and radioactive contamination control.
07.0 Demonstrate and awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems.
08.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Hazardous Materials Specialist**
CIP Number: **0703010403**
Program Length: **14 credit hours**
SOC Code(s): **19-4091**

This certificate program is part of the Environmental Science Technology AS degree program (1703010401). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of the principles of managing water pollution through prevention and remediation --The student will be able to:
01.01	Determine chemical and physical properties of surface water and groundwater.
01.02	Describe microbial systems related to water pollution.
01.03	Describe surface water, groundwater systems, hydrologic cycle, ~~and~~ potable water and wastewater treatment processes.
01.04	Identify types and sources of surface water and groundwater contamination.
01.05	Collect water samples for field and laboratory analysis.
01.06	Identify the water quality standards for effluent from domestic and various industrial wastewater facilities.
01.07	Describe ambient water quality criteria.
01.08	Demonstrate the technology and methods applied to non-point source pollution control (stormwater and agriculture runoff).
02.0	Demonstrate knowledge of the principles of managing and remediation of air pollution--The student will be able to
02.01	Collect and analyze ambient and process air samples.
02.02	Measure air pollutants from a specific source.
02.03	Record, interpret, and report laboratory analyses.
03.0	Demonstrate awareness of environmental noise sources and their monitoring--The student will be able to:
03.01	Define and discuss the physical properties of sound.
03.02	Discuss the threshold of hearing, tolerance, and hearing loss.
03.03	Discuss environmental noise, its effect on humans, and solutions to noise pollution.

04.0	Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants--The student will be able to:
	04.01 Demonstrate knowledge of basic laboratory operation.
	04.02 Operate and calibrate selected laboratory instruments.
	04.03 Operate and calibrate selected field instruments and equipment.
05.0	Sample, analyze, and calculate data related to to air, water and soil pollutants --The student will be able to:
	05.01 Gather and analyze selected samples.
	05.02 Manipulate data and reach confident conclusions.
	05.03 Write formal technical reports.
	05.04 Identify and perform the correct analysis for selected air pollutants listed with state and federal regulations.
	05.05 Identify and perform the correct analysis for selected parameters listed with state and federal regulations for wastewater effluent, surface water and groundwater.
06.0	Demonstrate an awareness of radiation monitoring and radioactive contamination control--The student will be able to:
	06.01 Discuss nuclear power plant design, nuclear power hazards, and safety features.
	06.02 Discuss nuclear fuel reprocessing and storage and waste disposal.
07.0	Demonstrate an awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems--The student will be able to:
	07.01 Discuss the composition, sources, and quantity of solid waste.
	07.02 Discuss methods of solid waste disposal.
	07.03 Discuss various solutions to solid waste accumulations and disposal.
	07.04 Identify a sanitary landfill.
	07.05 Discuss the construction features of a safe landfill.
	07.06 Discuss the possibilities of contaminates (leachates) seeping into the groundwater.
	07.07 Discuss the purpose for installing monitoring wells located around a sanitary landfill.
	07.08 Discuss the kinds of wastes that are permitted by state and federal regulation to be disposed at a landfill site.
08.0	Demonstrate employability skills--The student will be able to:

08.01 Secure information about a job.
08.02 Identify documents that may be required when applying for a job.
08.03 Demonstrate competence in job interview techniques.
08.04 Demonstrate knowledge of how to make job changes appropriately.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Water Quality Technician**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0703010404
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-4091 - Environmental Science and Protection Technicians, Including Health

Purpose

This certificate program is part of the Environmental Science Technology AS degree program (1703010401).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to analysis and dispensing of water in accordance with appropriate federal, state, and local laws and regulations. The certificate will cover industry standards such as those included in the Clean Water Act. Graduates of this certificate program should be able to research applicable local, state, and federal regulations and implement methods and strategies to ensure compliance; to maintain records as required by OSHA, and the Environmental Protection Agency (EPA); and to control the process to transfer or treat water or liquid waste.

This program does not prepare individuals for the D, C, B or A level of Water or Wastewater Treatment Facility Operator Certification as those requirements are outlined in Department of Environmental Protection Rule 62-602.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of the principles of managing water pollution through prevention and remediation.
02.0 Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants.
03.0 Sample, analyze and calculate data related to air, water and soil pollutants.
04.0 Demonstrate an awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems.
05.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Water Quality Technician**
CIP Number: **0703010404**
Program Length: **12 credit hours**
SOC Code(s): **19-4091**

This certificate program is part of the Environmental Science Technology AS degree program (1703010401). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of the principles of managing water pollution through prevention and remediation – the student will be able to:
	01.01 Determine chemical and physical properties of surface water and groundwater.
	01.02 Describe microbial systems related to water pollution.
	01.03 Describe surface water, groundwater systems, hydrologic cycle, potable water and wastewater treatment processes.
	01.04 Identify types and sources of surface water and groundwater contamination.
	01.05 Describe legal aspects, laws, rules and consequences related to surface and groundwater pollution.
	01.06 Collect water samples for field and laboratory analysis.
	01.07 Identify the water quality standards for effluent from domestic and various industrial wastewater facilities.
	01.08 Describe ambient water quality criteria.
	01.09 Demonstrate the technology and methods applied to non-point source pollution control (stormwater and agriculture runoff).
02.0	Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants – the student will be able to:
	02.01 Demonstrate knowledge of basic laboratory operation.
	02.02 Operate and calibrate selected laboratory instruments.
	02.03 Operate and calibrate selected field instruments and equipment.
03.0	Sample, analyze and calculate data related to air, water and soil pollutants – the student will be able to:
	03.01 Gather and analyze selected samples.

	03.02 Manipulate data and reach confident conclusions.
	03.03 Write formal technical reports.
	03.04 Identify and perform the correct analysis for selected parameters listed with state and federal regulations for wastewater effluent, surface water and groundwater.
04.0	Demonstrate an awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems – the student will be able to:
	04.01 Discuss the possibilities of contaminates (leachates) seeping into the groundwater.
	04.02 Discuss the purpose for installing monitoring wells located around a sanitary landfill.
05.0	Demonstrate employability skills – the student will be able to:
	05.01 Conduct a job search.
	05.02 Secure information about a job.
	05.03 Identify documents that may be required when applying for a job.
	05.04 Complete a job application.
	05.05 Demonstrate competence in job interview techniques.
	05.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	05.07 Identify acceptable work habits.
	05.08 Demonstrate knowledge of how to make job changes appropriately.
	05.09 Demonstrate acceptable employee health habits and safety skills.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method is offered, the following is required for each student: (1) a training plan signed by the student, the instructor and the employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; and (2) a work station which reflects equipment, skills, and tasks relevant to the student's career goal. Students must receive compensation for work performed.

In accordance with State Board of Education Rule 6A-10.0315, minimum basic skill levels have been established for admittance into a college associate degree program.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Environmental Science Technician**
Career Cluster: **Agriculture, Food and Natural Resources**

CCC	
CIP Number	0703010407
Program Type	College Credit Certificate (CCC)
Program Length	30 credit hours
CTSO	N/A
SOC Codes (all applicable)	29-9012 - Occupational Health and Safety Technicians 13-1041 - Compliance Officers

Purpose

This certificate program is part of the Environmental Science Technology AS degree program (1703010401).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction in worker health and safety, transportation of hazardous materials, and a focus on federal regulations for environmental protection. Instruction includes the analysis, handling, storage, transportation, and dispensing of hazardous materials in accordance with appropriate regulations and the planning for the protection of employees/workers/communities from hazardous material exposures.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of the principles of managing water pollution through prevention and remediation
02.0 Demonstrate knowledge of the principles of managing air pollution through prevention and remediation
03.0 Demonstrate awareness of environmental noise sources and their monitoring.
04.0 Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants.
05.0 Sample, analyze and calculate data related to air, water and soil pollutants.
06.0 Demonstrate an awareness of radiation monitoring and radioactive contamination control.
07.0 Demonstrate and awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems.
08.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Environmental Science Technician**
CIP Numbers: **0703010407**
Program Length: **30 credit hours**
SOC Code(s): **29-9012, 13-1041**

This certificate program is part of Environmental Science Technology AS degree program (1703010401). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of the principles of managing water pollution through prevention and remediation – the student will be able to:
	01.01 Determine chemical and physical properties of surface water and groundwater.
	01.02 Describe legal aspects, laws, rules and consequences of related to surface and groundwater pollution.
02.0	Demonstrate knowledge of the principles of managing air pollution through prevention and remediation – the student will be able to:
	02.01 Identify natural and manmade pollutants; their sources, effects, and control techniques.
	02.02 Collect and analyze air samples.
	02.03 List the regulated parameters of emission for selected industrial sources.
	02.04 Record, interpret and report laboratory analyses.
03.0	Demonstrate awareness of environmental noise sources and their monitoring – the student will be able to:
	03.01 Define and discuss the physical properties of sound.
	03.02 Discuss the threshold of hearing, tolerance, and hearing loss.
	03.03 Discuss environmental noise, its effect on humans, and solutions to noise pollution.
	03.04 Identify the regulatory agencies that monitor and control~~s~~ noise sources.
04.0	Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants – the student will be able to:
	04.01 Demonstrate knowledge of basic laboratory operation.
	04.02 Operate and calibrate selected laboratory instruments.

	04.03 Operate and calibrate selected field instruments and equipment.
05.0	Sample, analyze and calculate data related to air, water and soil pollutants – the student will be able to:
	05.01 Manipulate data and reach confident conclusions.
	05.01 Write formal technical reports.
	05.02 Identify and perform the correct analysis for selected parameters listed with state and federal regulations for wastewater effluent, surface water and groundwater.
06.0	Demonstrate an awareness of radiation monitoring and radioactive contamination control – the student will be able to:
	06.01 Discuss types and sources of radiation.
	06.02 Discuss the immediate and long range effects of radiation on animals and plants.
	06.03 Discuss nuclear power plant design, nuclear power hazards, and safety features.
07.0	Demonstrate an awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems – the student will be able to:
	07.01 Discuss the composition, sources and quantity of solid waste.
	07.02 Discuss methods of solid waste disposal.
	07.03 Identify the solid wastes from domestic households, municipalities and industry.
	07.04 Discuss those wastes that are permitted by state and federal regulation to be disposed at a landfill site.
08.0	Demonstrate employability skills – the student will be able to:
	08.01 Secure information about a job.
	08.02 Identify documents that may be required when applying for a job.
	08.03 Complete a job application.
	08.04 Demonstrate competence in job interview techniques.
	08.05 Identify acceptable work habits.
	08.06 Demonstrate knowledge of how to make job changes appropriately.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Agricultural Production Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101000000
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	11-9013 - Farmers, Ranchers, and Other Agricultural Managers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to manage land, water, machinery, financing, crops and/or livestock, labor and facilities as well as make contracts, manage taxes, keep records, analyze records and technical reports, and demonstrate leadership, employability, communication and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Obtain and dispose of an agricultural enterprise.
02.0 Manage and supervise labor.
03.0 Manage crops.
04.0 Manage livestock.
05.0 Manage machinery and equipment.
06.0 Manage facilities.
07.0 Select sources and methods of financing the operation.
08.0 Keep and analyze financial, production and personnel records.
09.0 Market crops/livestock.
10.0 Interpret technical information and incorporate it into managerial practices.
11.0 Integrate state and federal regulations into the operation.
12.0 Demonstrate leadership, communication, employability and human relations skills.

Florida Department of Education
Student Performance Standards

Program Title: **Agricultural Production Technology**
CIP Number: **1101000000**
Program Length: **60 credit hours**
SOC Code(s): **11-9013**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Obtain and dispose of agricultural enterprise – the student will be able to:
01.01	Determine land capability classes of farm or ranch.
01.02	List steps in obtaining title to real estate.
01.03	Determine advantage of using services of Soil Conservation Service (SCS).
01.04	Develop a farm or ranch rental/lease agreement.
01.05	Determine value of property.
01.06	Develop a will for transfer or disposal of property.
02.0	Manage and supervise labor – the student will be able to:
02.01	Train and supervise workers.
02.02	Obtain information from workers necessary for employment.
02.03	List responsibilities and liability of employer regarding workers rights, safety and welfare.
02.04	List local, state and federal regulations regarding employment of workers.
02.05	Develop an employee work schedule.
03.0	Manage crops – the student will be able to:
03.01	Prepare a land use plan.
03.02	Determine long-range conservation practices.
03.03	Prepare soil for crops.

	03.04 Select crop varieties best suited for land, market and type of farm operation.
	03.05 Determine seeding/planting rate and spacing.
	03.06 Calibrate and adjust planting equipment.
	03.07 Plant crops.
	03.08 Select appropriate cultural practices including cultivation, fertilization and irrigation.
	03.09 Identify and control diseases, insects and pests.
	03.10 Determine maturity of crops.
	03.11 Harvest crops.
	03.12 Store crops.
	03.13 Determine the most advantageous method of marketing crops.
04.0	Manage livestock – the student will be able to:
	04.01 Select and/or breed livestock.
	04.02 Determine nutritional requirements and balance livestock rations.
	04.03 Prepare a feeding schedule.
	04.04 Determine quality of pasture range or forage.
	04.05 Provide for winter rations and supplements.
	04.06 Maintain pasture fertility and quality.
	04.07 Develop a breeding/marketing plan for operation.
	04.08 Cull unproductive animals.
	04.09 Provide aid for animals with parturition problems.
	04.10 Care for newborn livestock.
	04.11 List causes of livestock infertility.
	04.12 Provide mineral supplement for animals.

	04.13 Determine most advantageous method of marketing livestock.
	04.14 Transport livestock.
	04.15 Identify and treat disorders, diseases and pests of livestock.
05.0	Manage machinery and equipment – the student will be able to:
	05.01 Assess needs for the purchases of new or replacement equipment.
	05.02 Maintain oil, fuel and hydraulic levels in equipment.
	05.03 Maintain tires, batteries and coolant system on all equipment and vehicles.
	05.04 Operate and service small gasoline engines.
	05.05 Replace hoses, belts and lines.
	05.06 Cut and weld with oxy-acetylene and arc welding equipment.
	05.07 Observe safety procedures when operating farm equipment.
	05.08 Develop a general maintenance schedule.
06.0	Manage facilities – the student will be able to:
	06.01 Safely operate and maintain general farm shop tools and equipment.
	06.02 Install and maintain electrical wiring and equipment.
	06.03 Square and build a farm structure.
	06.04 Determine a bill of materials for a farm construction project.
	06.05 Form and pour concrete.
	06.06 Build and repair fences, gates and pens.
	06.07 Develop a general maintenance schedule for facilities and equipment.
07.0	Select sources and methods of financing the operation – the student will be able to:
	07.01 List major sources of production credit.
	07.02 List sources of credit for capital items and real estate.

	07.03 Prepare a case using accepted forms for obtaining credit from farm lending institutions.
08.0	Keep and analyze financial, production and personnel records – the student will be able to:
	08.01 Keep fertilization and pesticide use records.
	08.02 Keep equipment maintenance and service records.
	08.03 Record cultural and production information.
	08.04 Determine cost efficiency of operations.
	08.05 Maintain labor and personnel records.
	08.06 Prepare a farm tax return.
	08.07 Prepare an annual budget
	08.08 Determine credit, cash flow and investment returns.
	08.09 Review sources and kinds of farm insurance.
09.0	Market crops/livestock – the student will be able to:
	09.01 Secure and interpret market information.
	09.02 Select marketing channels for greatest profit.
	09.03 Interpret elements of marketing agreements.
	09.04 Market crops/livestock.
	09.05 Provide for transportation of product to market.
10.0	Interpret technical information and incorporate it into managerial practices – the student will be able to:
	10.01 Keep and maintain a file of current technical information from universities, governmental and commercial agencies.
	10.02 Maintain a reference file for periodicals and other publications.
	10.03 Attend seminars and workshops to update skills and knowledge.
	10.04 Determine sources and advantages of using computer networking.
11.0	Integrate state and federal regulations into operation – the student will be able to:

	11.01 List agencies responsible for inspecting and regulating operation of product.
	11.02 Secure necessary inspection certificates and registrations.
	11.03 List reasons for the necessity of inspections, certifications and registrations.
12.0	Demonstrate leadership, communication, employability and human relations skills – the student will be able to:
	12.01 Develop citizenship awareness and responsibility.
	12.02 Demonstrate knowledge in organizing and conducting meetings.
	12.03 Demonstrate effective communication skills.
	12.04 Complete an employment application
	12.05 Conduct a job search.
	12.06 Demonstrate job interview skills.
	12.07 Recognize appropriate work habits.
	12.08 Identify associations and societies associated with occupation or profession.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Agribusiness Management**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101010100
Program Type	College Credit
Standard Length	60 credit hours (primary) / 63 credit hours (secondary)
CTSO	N/A
SOC Codes (all applicable)	11-9013 - Farmers, Ranchers, and Other Agricultural Managers 45-4011 - Forest and Conservation Workers 37-3011 - Landscaping and Groundskeeping Workers 37-1012 - First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to apply the economic and business principles involved in the organization, operation and management of farms and agricultural business. Subject matter includes finance, laws, labor, machinery, facilities, and marketing, as well as leadership, communication, employability and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60-63 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Obtain and dispose of an agricultural enterprise.
02.0 Prepare and administer an agricultural oriented plan (manage the crop/livestock plan).
03.0 Supervise and manage the operation, maintenance and repair of equipment.
04.0 Manage facilities and structures.
05.0 Select sources and methods of financing operation.
06.0 Interpret and apply state and federal rules and regulations.
07.0 Perform accounting activities.
08.0 Perform communication activities.
09.0 Develop human relations skills.
10.0 Demonstrate employability skills.
11.0 Develop leadership skills.
12.0 Identify, classify, and demonstrate management activities.
13.0 Demonstrate a basic understanding of legal and ethical issues in a business environment.
14.0 Demonstrate basic computer skills.

In addition, students will complete the objectives in one of the following specializations:
Forest Operations

- Forest Operations – SOC Code: 45-4011 – Forest and Conservation Workers

15.0 Prepare and administer forest management plans.
16.0 Plan and administer forest inventories.
17.0 Assist registered land surveyor in location of property corners and boundary lines, road construction and drainage projects.
18.0 Prepare and administer forest fire and smoke management plans and assist in forest fire suppression and control.
19.0 Identify major southeastern forest tree species.
20.0 Identify and control major southeastern forest insects and diseases.
21.0 Evaluate forest ecosystems.
22.0 Evaluate forest soils with respect to chemical and fertilizer applications and hydrology.
23.0 Collect, maintain and/or analyze data and records.
24.0 Prepare, analyze and enforce contracts and other legal documents.
25.0 Administer the purchase, sale and/or marketing of forest products.

Irrigation Technology

- Irrigation Technology -- SOC Code: 37-3011 – Landscaping and Groundskeeping Workers

26.0 Demonstrate an understanding of the use of communications in an irrigation business environment.

27.0 Demonstrate an understanding of the types of pipe installation common to irrigation systems.
28.0 Demonstrate an understanding of irrigation system components.
29.0 Demonstrate an understanding of basic design principles used in irrigation systems.
30.0 Demonstrate an understanding of basic irrigation system maintenance and operation.
31.0 Demonstrate an understanding of distribution systems used in the irrigation industry.
32.0 Demonstrate an understanding of control systems used in irrigation installation and repair.
33.0 Demonstrate an understanding of water supply.
34.0 Demonstrate an understanding of sprinkler performance.
35.0 Demonstrate an understanding of site analysis in residential and commercial irrigation systems.
36.0 Demonstrate an understanding of and practice in design principles used in residential and commercial irrigation systems.
37.0 Demonstrate an understanding of job preparation necessary in residential and commercial irrigation systems.
38.0 Demonstrate an understanding of installation techniques used in residential and commercial irrigation systems.
39.0 Demonstrate an understanding of how to obtain site information necessary in the residential irrigation system design process.
40.0 Demonstrate an understanding of selection and safe use of equipment for residential irrigation system installation.
41.0 Demonstrate an understanding of how to select pipe sizes and valves appropriate for specific residential irrigation system installations.
42.0 Demonstrate an understanding of microcomputer applications used to design residential irrigation systems.
43.0 Demonstrate an understanding of the role of “the green industry.”
44.0 Demonstrate an understanding of the basic principles of plant growth.
45.0 Demonstrate an understanding of the role of plant nutrients and fertilizers.
46.0 Demonstrate an understanding of pest management practices.
47.0 Demonstrate an understanding of the role of irrigation.
48.0 Demonstrate an understanding of the role of soil science.
49.0 Demonstrate an understanding of plants used in urban and suburban landscapes.
50.0 Demonstrate an understanding of the basic safety issues involved in the “green industry.”
51.0 Demonstrate an understanding of the water cycle.
52.0 Demonstrate an understanding of the uses of water resources.
53.0 Demonstrate an understanding of water resource policies in Florida.
54.0 Demonstrate an understanding of surface water supplies.
55.0 Demonstrate an understanding of groundwater supplies.
56.0 Demonstrate an understanding of drip system components.
57.0 Demonstrate an understanding of the characteristics of water emission devices.
58.0 Demonstrate an understanding of basic design principles for low volume irrigation systems.
59.0 Demonstrate an understanding of procedures involved in installation of low volume irrigation systems.
60.0 Demonstrate an understanding of irrigation system computer software currently used in industry.
61.0 Demonstrate an understanding of materials selection and costing needed for sales presentations.
62.0 Develop an understanding of the breadth of the irrigation industry.
63.0 Demonstrate an understanding of irrigation water requirements.
64.0 Demonstrate an understanding of economic analysis as applied to irrigation investment decisions.
65.0 Demonstrate an understanding of methods of develop overall operating and maintenance procedures.
66.0 Demonstrate an understanding of analysis of irrigation systems.
67.0 Demonstrate an understanding of how to obtain site information necessary in the commercial irrigation system design process.

68.0 Demonstrate an understanding of selection and safe use of equipment for a commercial irrigation system installation.
69.0 Demonstrate an understanding of how to select pipe sizes and valves appropriate for specific commercial irrigation system installations.
70.0 Demonstrate an understanding of writing irrigation specifications.
71.0 Demonstrate an understanding of advanced hydraulic and head lay out concepts.

Horticulture Technician

- Horticulture Technician – SOC Code: 37-1012 -- First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers

72.0 Demonstrate an understanding of plant physiology and growth.
73.0 Classify plants.
74.0 Select, operate, and maintain tools and equipment.
75.0 Fertilize plants.
76.0 Manage a pest-control program.
77.0 Prune and shape plants.
78.0 Maintain landscape plants.
79.0 Demonstrate employability skills.
80.0 Determine drainage system needs and design a drainage system.
81.0 Maintain and analyze records.
82.0 Prepare growing media and seedbeds.
83.0 Propagate plants.
84.0 Grow plants.
85.0 Harvest, process, and ship plants.
86.0 Market plants.
87.0 Design, install, and maintain nursery irrigation systems.

Golf Course Technician

- Golf Course Technician – SOC Code: 37-1012.00 -- First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers

88.0 Supervise and manage the operation, maintenance and repair of golf course equipment.
89.0 Schedule irrigation and manage the design, installation and maintenance of golf course irrigation systems.
90.0 Prescribe, supervise and manage the application of agricultural chemicals for the prevention and control of pests.
91.0 Prescribe, supervise and manage the fertilization of the turf and landscape.
92.0 Train and supervise employees in grooming and maintaining greens, tees, fairways, roughs and other areas.
93.0 Provide a safe environment for workers and patrons.
94.0 Keep and analyze maintenance, employee, equipment and inventory records.
95.0 Observe local, state and federal laws and regulations.
96.0 Demonstrate leadership, communication, public relations, employability and human relations skills.

97.0 Demonstrate an understanding of the types of pipe installation common to irrigation system.
98.0 Demonstrate an understanding of irrigation system components.
99.0 Demonstrate an understanding of basic design principles used in irrigation systems.
100.0 Demonstrate an understanding of basic irrigation system maintenance and operation.
101.0 Demonstrate an understanding of sprinkler performance.
102.0 Demonstrate an understanding of the basic principles of plant growth.
103.0 Demonstrate an understanding of the role of plant nutrients and fertilizers.
104.0 Demonstrate an understanding of pest management practice.
105.0 Demonstrate an understanding of the role of irrigation.
106.0 Demonstrate an understanding of the basic safety issues involved in the “green industry”.
107.0 Demonstrate an understanding of the drip system components.
108.0 Demonstrate an understanding of basic design principles for low volume irrigation systems.
109.0 Demonstrate an understanding of procedures involved in installation of low volume irrigation systems.
110.0 Demonstrate an understanding of plant physiology and growth.
111.0 Classify plants.
112.0 Select, operate and maintain tools and equipment.
113.0 Fertilize plants.
114.0 Manage a pest-control program.

Florida Department of Education
Student Performance Standards

Program Title: **Agribusiness Management**
CIP Number: **1101010100**
Program Length: **60 credit hours (primary) / 63 credit hours (secondary)**
SOC Code(s): **11-9011**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Obtain and dispose of an agricultural enterprise – the student will be able to:
	01.01 Develop plan for type and size of agricultural enterprise.
	01.02 Obtain title to real estate.
	01.03 Complete farm rental/lease Agreement.
	01.04 Purchase building insurance.
	01.05 Purchase liability insurance.
	01.06 Transfer agribusiness ownership.
02.0	Prepare and administer an agricultural oriented plan – the student will be able to:
	02.01 Prepare land development plan.
	02.02 Prepare agricultural plan in one of the following: crop or product program, irrigation, fertilization, pesticide, plant.
	02.03 Enroll in Agricultural Stabilization Conservation Service Program if applicable.
	02.04 Enroll in and review Soil Conservation Service Practices if applicable.
	02.05 Contract for custom services.
	02.06 Develop plan for purchase and operation of irrigation system.
	02.07 Develop fertilization plan.
	02.08 Develop pesticide plan.
	02.09 Develop plan to meet seed/plant needs.

	02.10 Develop marketing plan.
	02.11 Market livestock/livestock products.
	02.12 Purchase insurance.
03.0	Supervise and manage the operation, maintenance and repair of equipment – the student will be able to:
	03.01 Develop budgets for changing the machinery and equipment program.
	03.02 Prepare inventory of farm machinery and equipment; harvest, fuel, and lubricants.
	03.03 Obtain machinery and equipment by purchase, rent, lease or trade.
	03.04 Develop plan for machinery and equipment maintenance program.
04.0	Manage facilities and structures – the student will be able to:
	04.01 Plan for the expansion of existing facilities or construction of new facilities.
	04.02 Develop plan for repairing, remodeling, improving facilities.
	04.03 Acquire buildings by purchase, rental or lease.
	04.04 Purchase building supplies.
05.0	Select sources and methods of financing operation – the student will be able to:
	05.01 Analyze major sources of agricultural production credit.
	05.02 Analyze and select sources of credit for capital items and real estate.
	05.03 Prepare a case using accepted forms for obtaining credit from an agricultural lending institution.
	05.04 Analyze contracts, leases and other legal documents.
	05.05 Analyze and interpret land use maps.
	05.06 Interpret a real estate legal description.
	05.07 Identify major elements in lease agreements.
	05.08 Identify major elements in contracts.
	05.09 Secure legal services.

06.0	Interpret and apply state and federal rules and regulations to enterprise – the student will be able to:
	06.01 List agencies responsible for inspecting and regulating operation or product.
	06.02 Secure necessary inspections, certifications and registrations.
	06.03 Maintain a file of current rules and regulations relative to operation.
	06.04 List reasons for the necessity of inspections, certification and regulations.
07.0	Perform accounting activities – the student will be able to:
	07.01 Record and post transactions in a general journal.
	07.02 Prepare an income statement and payroll records.
	07.03 Prepare a balance sheet.
	07.04 Prepare a cash flow statement.
	07.05 Journalize and post-closing entries.
	07.06 Demonstrate knowledge of petty case records.
	07.07 Demonstrate knowledge of checking account records and bank reconciliation.
	07.08 Interpret financial statements.
	07.09 Demonstrate knowledge of the accounting cycle.
	07.10 Demonstrate knowledge of budget principles and interpret budgets.
	07.11 Demonstrate accounting operations on a computer.
	07.12 Calculate and record depreciation, net worth, and income.
	07.13 Complete a comparative trend analysis table.
	07.14 Complete a profit and loss statement.
	07.15 Calculate and record capital gains and losses, monthly/yearly receipts, operating expenses.
	07.16 Balance bank statement.
	07.17 Develop plan for bestowing the estate.

	07.18 Complete IRS income or loss schedule, Capital gains and losses schedule, Investment credit schedule, 1040 schedule.
08.0	Perform communication activities – the student will be able to:
	08.01 Demonstrate effective telephone usage and courtesy.
	08.02 Demonstrate effective listening skills.
	08.03 Give, follow, and Interpret oral and written communication.
	08.04 Demonstrate knowledge of e-mail etiquette and ethics.
	08.05 Compose business correspondence and related documents and demonstrate correct spelling, grammar, punctuation, and work choice.
	08.06 Prepare, outline, and deliver an effective short oral presentation.
	08.07 Participate in a group discussion as a member and as a leader.
	08.08 Obtain appropriate information from graphics and other visual media.
	08.09 Research and interpret information retrieved from print and electronic resources.
	08.10 Annotate letters, reports, and news articles.
	08.11 Proofread and edit documents.
	08.12 Research and compose a document containing statistical information.
	08.13 Prepare visual material, including electronic media, to support an oral presentation.
	08.14 Demonstrate ability to communicate effectively with diverse populations.
09.0	Develop human relation skills – the student will be able to:
	09.01 Analyze and develop written solutions to behavior problems affecting job performance.
	09.02 Demonstrate ability to work effectively as part of a team.
	09.03 Demonstrate conflict resolution skills.
	09.04 Demonstrate punctuality, initiative, courtesy, dependability, flexibility, and honesty.
	09.05 Develop and demonstrate the unique human relations skills needed for success in the business sector.
	09.06 Recognize different personality styles and how to interact effectively with them in the workplace.

09.07	Differentiate between an acceptable and unacceptable code of ethical conduct in business.
09.08	Discuss how values and attitudes influence behavior.
09.09	Explain how understanding of self-concept and self-esteem impacts human relations skills.
09.10	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
10.0	Demonstrate employability skills – the student will be able to:
10.01	Demonstrate understanding of acceptable hygiene and grooming habits.
10.02	Identify sources of employment opportunities.
10.03	Identify appropriate attire and grooming for a business office.
10.04	Identify documents that may be required when applying for a job.
10.05	Complete a resume and cover letter.
10.06	Complete a job application form correctly.
10.07	Prepare a plain-text resume for electronic distribution.
10.08	Demonstrate effective job interview techniques.
10.09	Demonstrate understanding of different types of interviews.
10.10	Prepare a thank you letter for an interview.
10.11	Identify and demonstrate appropriate responses to feedback from supervisors.
10.12	Identify and demonstrate acceptable work habits.
10.13	Demonstrate knowledge of how to make job and career changes appropriately.
10.14	Demonstrate basic knowledge of employment law.
10.15	Demonstrate ability to adapt to change.
10.16	Demonstrate effective time management skills.
10.17	Prepare a letter of resignation.
10.18	Identify methods for securing an employment reference.

	10.19 Conduct a job search.
	10.20 Secure information about a job.
	10.21 Demonstrate competence in job interview techniques.
11.0	Develop leadership skills – the student will be able to:
	11.01 Demonstrate an understanding of how to plan and lead an effective meeting.
	11.02 Define effective leadership.
	11.03 Identify and explain key leadership behaviors.
	11.04 Compare different styles of leadership.
	11.05 Relate leadership to other management and communication skills.
	11.06 Examine ways effective leaders develop, coach, and motivate.
	11.07 Define organization vision and mission.
	11.08 Identify characteristics of effective goals.
	11.09 Describe personal leadership style.
	11.10 Explain how effective leaders identify problems and make decisions.
	11.11 Compare different styles of managing conflict.
	11.12 Identify acceptable work habits.
	11.13 Demonstrate knowledge of how to make job changes appropriately.
12.0	Identify, classify and demonstrate management activities – the student will be able to:
	12.01 Compare management styles.
	12.02 Identify the major functions of management.
	12.03 Demonstrate understanding of basic management concepts such as authority, responsibility, delegation, empowerment, and hiring and firing.
	12.04 Demonstrate knowledge of the relationship between authority and responsibility to task accomplishment.
	12.05 Select the most effective communication systems.

	12.06 Identify problems and make appropriate decisions.
	12.07 Demonstrate understanding of organizational culture and its impact on communication.
	12.08 Identify and discuss current management issues in business and other organizations.
	12.09 Describe activities associated with the management functions of planning, organizing, staffing, leading and controlling.
	12.10 Manage and supervise labor
	12.11 Develop labor supply plan.
	12.12 Hire and dismiss employees.
	12.13 Establish and record pay scale and benefits.
	12.14 Train workers using demonstration performance method.
	12.15 Develop employee work schedules
	12.16 Prepare payroll records.
13.0	Demonstrate a basic understanding of legal and ethical issues in a business environment – the student will be able to:
	13.01 Demonstrate basic understanding of contracts.
	13.02 Demonstrate basic understanding of human resource issues.
	13.03 Demonstrate basic understanding of negotiable instruments.
	13.04 Demonstrate basic understanding of intellectual property rights.
	13.05 Demonstrate basic understanding of appropriate use of employer property.
	13.06 Demonstrate basic understanding of confidentiality.
	13.07 Demonstrate basic understanding of role of ethical decision making in dealing with stakeholders.
	13.08 Demonstrate knowledge of social responsibilities.
	13.09 Demonstrate knowledge of legal and privacy issues regarding e-mail, voice mail, internet, telephone, and other communication methods.
14.0	Demonstrate basic computer skills – the student will be able to:
	14.01 Demonstrate Keyboarding Techniques.

14.02	Demonstrate basic proficiency in spreadsheet, word processing, database, and presentation software and e-mail communication.
14.03	Perform research using the internet and intranet.
Forest Operations	
15.0	Prepare and administer forest management plans – the student will be able to:
15.01	Prepare and conduct a statistically based forest inventory.
15.02	Calculate, analyze and evaluate forest inventory data.
15.03	Write an approximate management plan for tract based on landowner objectives including timber volumes, harvesting schedules, regeneration schedules, stand maps, stand and stock tables and recommendations for multiple-use and for future management.
15.04	Select and execute appropriate silvicultural system for tract.
15.05	Conduct a prescribed burn including pre-planning, permitting, firing systems, smoke management and suppression techniques.
15.06	Plan and execute timber stand improvement when needed.
15.07	Plan and execute appropriate site preparation, tree planting and harvesting.
15.08	Demonstrate knowledge of ordinances related to harvesting and regeneration activities.
16.0	Plan and administer forest inventories – the student will be able to:
16.01	Prepare and conduct a statistically based forest inventory using area samples, i.e. fixed-radius plot inventory.
16.02	Prepare and conduct a statistically based forest inventory using point sample, i.e. prism inventory.
16.03	Operate dendrometers such as tree calipers and diameter tape.
16.04	Operate hypsometers such as altimeter, clinometers and relaskop.
16.05	Operate hand-held magnetic compass and demonstrate proper pacing procedure in forested situations.
16.06	Locate forest tracts using legal description, maps, aerial photos and atlases.
16.07	Select and use appropriate volume tables.
16.08	Calculate timber volumes by forest products.
16.09	Calculate and prepare valuation of forest tract based on product and current market prices.
16.10	Prepare "lump sum" timber bid.

	16.11 Prepare "per unit" timber bid.
	16.12 Calculate and prepare stand and stock tables.
	16.13 Calculate and prepare growth projections and regeneration stocking.
	16.14 Calculate tract averages using maps, aerial photos and/or pacing.
17.0	Assist registered land surveyor in location of property corners and boundary lines, road construction and drainage projects – the student will be able to:
	17.01 Identify forest tracts based on legal description and write proper legal description for given forest tract.
	17.02 Locate and mark forest tract corners and boundary lines.
	17.03 Determine forest road location and identify on the ground.
	17.04 Determine drainage patterns for watershed and locate proper stream crossing points.
	17.05 Obtain proper permits for stream crossings, i.e. culverts, bridges.
18.0	Prepare and administer forest fire and smoke management plans and assist in forest fire suppression and control – the student will be able to:
	18.01 Demonstrate knowledge of various firing techniques.
	18.02 Demonstrate knowledge of weather conditions as related to forest fire-prescribed and wildfire - and smoke management.
	18.03 Select proper firing techniques based on landowner objectives and weather conditions.
	18.04 Demonstrate knowledge of fire suppression tools and equipment, both hand tools and mechanical.
	18.05 Demonstrate knowledge of pre-suppression forest fire activities.
	18.06 Evaluate acreage and damages of wildfire and recommend future forest management activities to renew resource.
	18.07 Plan and administer a fire and smoke management plan including proper burning authorizations.
	18.08 Complete U.S. Forest Service S-190, Introduction to Fire Behavior, and S-130, Basic Fire Fighter course with passing scores and, when possible, receive Incident Qualification Card ("Red Card").
19.0	Identify major southeastern forest tree species – the student will be able to:
	19.01 Identify major commercial forest species of the southeast United States by scientific name, common name, habitat and commercial products derived from species.
	19.02 Identify major commercial forest species of Florida, with or without foliage, by personal observation using the five senses.
	19.03 Use dichotomous key to identify unfamiliar species.

20.0	Identify and control major southeastern forest insects and diseases – the student will be able to:
20.01	Identify major forest insects and diseases of the southeastern United States by scientific name, common name and damage inflicted.
20.02	Identify major forest insects and diseases of the southeastern United States by scientific name, common name, symptoms, and damage inflicted and recommendations for control.
20.03	Identify major forest insects and diseases of Florida in the forest by personal observation and recommend appropriate controls.
20.04	Demonstrate knowledge of chemical and biological control of forest pests.
20.05	Evaluate damages by forest insects and diseases and make recommendations for future forest management.
21.0	Evaluate forest ecosystems – the student will be able to:
21.01	Demonstrate knowledge of the major forest ecosystems of the United States.
21.02	Identify the major forest ecosystems of Florida.
21.03	Identify the relationship between human activities and forest flora and fauna.
21.04	Identify endangered species of Florida and associated regulations and/or recommended forest practices.
21.05	Demonstrate knowledge of threatened species of Florida and associated regulations and/or recommended forest practices.
21.06	Demonstrate knowledge of forest ecosystem practices on both private and public lands.
22.0	Evaluate forest soils with respect to chemical and fertilizer applications and hydrology – the student will be able to:
22.01	Demonstrate knowledge of the major forest soil types in the southeastern United States.
22.02	Identify and classify the major forest soil types of Florida.
22.03	Identify types, uses and application rates of approved forest herbicides.
22.04	Prepare and execute a herbicide plan.
22.05	Identify fertilizer formulations applicable to Florida forest soils.
22.06	Identify proper fertilizer formulations rates with proper soil type on Florida forest soils.
22.07	Define major watersheds and hydrology of a given forest area.
22.08	Demonstrate knowledge of Best Management Practices (BMP), especially special management zones (SMZ).
22.09	Identify and locate SMZ on the ground.

	22.10 Obtain proper permits relating to stream crossings, ditching, cut and fill and wetland harvesting.
23.0	Collect, maintain and/or analyze data and records – the student will be able to:
	23.01 Collect field data from forest inventory
	23.02 Setup and maintain files of technical forestry information.
	23.03 Demonstrate knowledge of federal, state and local regulations related to forestry practices.
24.0	Prepare, analyze and enforce contracts and other legal document – the student will be able to:
	24.01 Demonstrate knowledge of types of contracts and legal documents related to forestry practices.
	24.02 Select proper timber sale contract for given situation and prepare and execute same under supervision of forester and/or legal counsel.
	24.03 Obtain and maintain proper licensure, certifications and registrations.
25.0	Administer the purchase, sale and/or marketing of forest products – the student will be able to:
	25.01 Demonstrate knowledge of various forest products and markets.
	25.02 Identify Florida forest products and current market valuations.
	25.03 Identify timber harvesting systems used in southeastern United States.
	25.04 Prepare and execute a timber sale, either lump sum or per unit.
	25.05 Supervise timber harvesting activities.
	25.06 Scale forest products.
Irrigation Technology	
26.0	Demonstrate an understanding of the use of communications in an irrigation business environment – the student will be able to:
	26.01 Explain the communications patterns used in the irrigation industry, including connected network and chain of command.
	26.02 Define common irrigation vocabulary terms.
	26.03 Locate specific engineering information from print and on-line sources.
27.0	Demonstrate an understanding of the types of pipe installation common to irrigation systems – the student will be able to:
	27.01 List the different types and schedules of available Polyvinyl Chloride (PVC) pipes.

	27.02 Describe the different types of available fittings including solvent weld, o-rings, and mechanical joint (MJ) joints.
	27.03 Describe the basic chemical reactions that occur in the manufacture of PVC pipe.
	27.04 Explain the process of connecting PVC pipe by using solvent weld chemicals.
	27.05 Explain the process of connecting o-ring pipe by using push-on fittings.
28.0	Demonstrate an understanding of irrigation system components – the student will be able to:
	28.01 Identify various irrigation system types such as rotors, sprays, and drip.
	28.02 Explain the process of time clock selection.
	28.03 Explain the process of valve selection.
	28.04 Explain the process of sprinkler head selection.
	28.05 Explain the process of low-voltage wire selection.
29.0	Demonstrate an understanding of basic design principles used in irrigation systems – the student will be able to:
	29.01 Calculate the static or working water pressure at a given point in the system.
	29.02 Determine the velocity for certain type and size pipe at a given flow.
	29.03 Select appropriate sprinkler heads for specific applications.
	29.04 Group irrigation heads to form irrigation zones complying with proper design criteria.
	29.05 Calculate specific friction loss through piping.
	29.06 Compute the precipitation rate for various sprinkler types and spacing patterns.
30.0	Demonstrate an understanding of basic irrigation system maintenance and operation – the student will be able to:
	30.01 Determine the watering time needed per week per station.
	30.02 Develop a water schedule based on proper design principles.
	30.03 Read and explain an as-built drawing.
	30.04 Explain the process of remove and install sprinkler heads.
	30.05 Describe introductory the process of automatic control valve repair.

	30.06 Describe the process of automatic controller repair.
	30.07 Diagnose and correcting wiring problems.
31.0	Demonstrate an understanding of distribution systems used in the irrigation industry – the student will be able to:
	31.01 Diagnose low and high pressure conditions that result from damaged piping, faulty installation, and clogged piping.
	31.02 Repair zone lines using solvent weld fittings.
	31.03 Repair main lines using mechanical joint (MJ) couplings.
32.0	Demonstrate an understanding of control systems used in irrigation installation and repair – the student will be able to:
	32.01 Develop watering schedules and setting control timers.
	32.02 Diagnose control system using test meters and wire tracking equipment.
	32.03 Isolate problems into one of three areas for repair: control timer, field wiring, and control valve.
	32.04 Repair or replacing an automatic control timer.
	32.05 Repair/splicing field wiring.
	32.06 Repair/replacing faulty parts on the irrigation control valve.
33.0	Demonstrate an understanding of water supply – the student will be able to:
	33.01 Diagnose problems of water supply interruption.
	33.02 Diagnose problems with water quality.
	33.03 Repair or adjusting pump control systems.
	33.04 Repair adjusting backflow prevention devices.
	33.05 Clean filter media or screens.
34.0	Demonstrate an understanding of sprinkler performance – the student will be able to:
	34.01 Diagnose sprinkler distribution problems.
	34.02 Measure and analyze precipitation rates.
	34.03 Remove, clean, and reinstall heads.

	34.04 Repair and adjust heads.
	34.05 Adjust sprinkler head spacing if required.
35.0	Demonstrate an understanding of site analysis in residential and commercial irrigation systems – the student will be able to:
	35.01 Complete an accurate site drawing.
	35.02 Determine the watering requirements in view of the site plan.
	35.03 Identify unique site conditions that might affect installation.
	35.04 Identify the appropriate water source.
36.0	Demonstrate an understanding of and practice in design principles used in residential and commercial irrigation systems – the student will be able to:
	36.01 Lay out heads on a print utilizing graphic symbol.
	36.02 Select/sizing control valve.
	36.03 Select/sizing zone lines.
	36.04 Select/sizing main line.
37.0	Demonstrate an understanding of job preparation necessary in residential and commercial irrigation systems – the student will be able to:
	37.01 List the different types of underground utilities and how to locate them.
	37.02 Prepare a list of materials necessary to install the class designed irrigation system.
	37.03 Identify the tools and equipment needed to install the class designed irrigation system.
38.0	Demonstrate an understanding of installation techniques used in residential and commercial irrigation systems – the student will be able to:
	38.01 Use a walk behind trencher to excavate trenches.
	38.02 Hand digs a trench.
	38.03 Backfill and compact a trench.
	38.04 Measure, cut, clean, prime, and glue solvent weld PVC pipe.
	38.05 Cut and install o-ring pipe and fittings.
	38.06 Install spray heads and/or rotor heads.

	38.07 Install control valves.
	38.08 Install nozzles, adjusting flow rates, and setting pattern.
	38.09 Identify and Install low voltage direct burial wire.
	38.10 Produce an “as-built” drawing.
39.0	Demonstrate an understanding of how to obtain site information necessary in the residential irrigation system design process – the student will be able to:
	39.01 Develop an accurate plot plan or site drawing.
	39.02 Determine the type of landscaping and water requirement for a specific site.
	39.03 Identify environmental traits such as soil type and weather for a specific site.
	39.04 Identify unique site conditions that might affect design or installation.
	39.05 Identify possible water sources and select appropriate source.
40.0	Demonstrate an understanding of selection and safe use of equipment for residential irrigation system installation – the student will be able to:
	40.01 Select appropriate sprinkler heads for each area.
	40.02 Lay out heads on print utilizing graphic symbols in an irrigation design.
	40.03 Group irrigation heads to form irrigation zones.
41.0	Demonstrate an understanding of how to select pipe sizes and valves appropriate for specific residential irrigation system installations – the student will be able to:
	41.01 Determine the water volume and pressure available from the water supply.
	41.02 Select and sizing a control valve for each zone.
	41.03 Select and sizing pipe main line.
	41.04 Select and sizing pipe for zone lines.
42.0	Demonstrate an understanding of microcomputer applications used to design residential irrigation systems – the student will be able to:
	42.01 Enter the elements of a site plan into the computer.
	42.02 Use a scanner to enter a site plan into a microcomputer application.
	42.03 Lay out heads using a microcomputer application.

	42.04 Use a microcomputer application to group heads together to form irrigation zones.
	42.05 Use a microcomputer application to select pipe size.
43.0	Demonstrate an understanding of the role of “the green industry” – the student will be able to:
	43.01 Describe the importance of the “green industry” to local, state, and national economies.
	43.02 Explain the importance and impact of local, state and federal regulations.
	43.03 Describe the relationship of the “green industry” to the environment.
44.0	Demonstrate an understanding of the principles of plant growth – the student will be able to:
	44.01 Describe the functions of plant parts including roots, stems, leaves, flowers and fruits.
	44.02 Describe the processes of plant growth including photosynthesis, respiration, nutrient uptake and respiration.
	44.03 Describe the growth characteristics, and use of subtropical and tropical landscape plants.
	44.04 Identify various landscape designs, natural systems and the plants associated with them.
	44.05 Describe the process of effective establishment of plants in the landscape.
	44.06 Describe the influences of the environment on the landscape including pollutants.
45.0	The student will demonstrate an understanding of the role of plant nutrients and fertilizers – the student will be able to:
	45.01 Identify the nutrients required for plant growth and the role of each.
	45.02 Identify the types and kinds of fertilizers.
	45.03 Read and interpreting fertilizer labels.
	45.04 Describe the application of various fertilizer formulations.
	45.05 Identify symptoms of nutritional deficiencies and toxicities of plants.
46.0	The student will demonstrate an understanding of pest management practices – the student will be able to:
	46.01 Describe the principles and benefits of integrated pest management.
	46.02 Explain the nature of physical and chemical damage to plants.
	46.03 Describe the selection process involved in the use of horticultural chemicals for arthropod pest control and subsequent implications of their usage.

	46.04 Explain the role of efficient irrigation in pest control.
	46.05 Explain the role of plant health in pest control.
47.0	Demonstrate an understanding of the role of irrigation – the student will be able to:
	47.01 List the components of Florida's fresh water systems.
	47.02 Explain evaporation transpiration rate.
	47.03 Explain hydro zoning/precipitation rate.
	47.04 Identify the water needs of plants.
	47.05 Explain the role of mulches in the landscape.
	47.06 Describe soil moisture retention and movement for various soil types.
48.0	Demonstrate an understanding of the role of soil science – the student will be able to:
	48.01 Identify soil types and textures.
	48.02 Explain the role of soil pH and soluble salts on plant growth.
	48.03 Explain the physical properties of fill soil.
	48.04 Explain the role of soil type as it affects water retention.
	48.05 Interpret soil test information.
	48.06 Read and understanding soil survey maps.
49.0	Demonstrate an understanding of plants used in urban and suburban landscapes – the student will be able to:
	49.01 Describe the process of binomial nomenclature.
	49.02 Describe the use of bedding plants and other herbaceous perennials.
	49.03 Describe the use of ground covers, shrubs, trees, and vines including angiosperms and gymnosperms.
	49.04 Describe the use of palms, grasses, and other monocots.
50.0	Demonstrate an understanding of the basic safety issues involved in the "green industry" – the student will be able to:
	50.01 List the most common causes of accidents in the "green industry."

	50.02 Discuss the importance of following proper safety precautions.
	50.03 Describe the symptoms of pesticide poisoning.
	50.04 Extract pertinent information from material safety data sheets.
51.0	Demonstrate an understanding of the water cycle – the student will be able to:
	51.01 Describe the role of precipitation.
	51.02 Explain the effects of evaporation and transpiration.
	51.03 Describe the effects of runoff on water supply and quality.
	51.04 Explain the process of ground water infiltration.
	51.05 Describe how different ecosystems affect the water supply.
52.0	Demonstrate an understanding of the uses of water resources – the student will be able to:
	52.01 List the uses and quantity of water used on a global scale.
	52.02 List the uses and quantity of water used in the United States.
	52.03 List the uses and quantity of water used in Florida.
53.0	Demonstrate an understanding of water resource policies in Florida – the student will be able to:
	53.01 Explain the role that planning agencies have on water supply and quality.
	53.02 Explain the effect the current legislation has on water supply and quality.
	53.03 List the pending legislation that may affect the water supply and quality.
54.0	Demonstrate an understanding of surface water supplies – the student will be able to:
	54.01 Explain the role of rivers, lakes and reservoirs.
	54.02 Explain the importance of flood damage reduction planning.
	54.03 Explain the issues involved in ensuring that surface water supplies are properly managed.
55.0	Demonstrate an understanding of groundwater supplies – the student will be able to:
	55.01 Describe groundwater’s role as a water source.

	55.02 Describe the effect of pollutants on groundwater.
	55.03 Describe the role of the aquifer and the regional aquifer characteristics.
	55.04 Describe the effect that water pumped from the ground has on the water table.
56.0	Demonstrate an understanding of drip system components – the student will be able to:
	56.01 Identify the various types of water emitters.
	56.02 Identify and explain the use of drip lateral materials.
	56.03 Identify and explain the use of pressure regulators.
	56.04 Identify and explain the use of valves including flush valves, control valves and air vents.
57.0	Demonstrate an understanding of the characteristics of water emission devices – the student will be able to:
	57.01 Identify and explain the operation of orifice emitters.
	57.02 Identify and explain the operation of laminar flow emitters.
	57.03 Identify and explain the operation of turbulent flow emitters.
	57.04 Identify and explain the operation of vortex emitters.
	57.05 Identify and explain the operation of pressure compensating emitters.
	57.06 Explain emission uniformity and quality.
58.0	Demonstrate an understanding of basic design principles for low volume irrigation systems – the student will be able to:
	58.01 Analyze the irrigation site and gathering appropriate site data.
	58.02 Identify point or line source area.
	58.03 Determine the appropriate irrigation method for each area.
	58.04 Determine the number of water emitters required per plant per area.
	58.05 Adapt irrigation requirements to available water supply.
59.0	Demonstrate an understanding of procedures involved in installation of low volume irrigation systems – the student will be able to:
	59.01 Connect the main water line to a point of connection.

	59.02 Run lateral lines.
	59.03 Run distribution tubing.
	59.04 Install emitters.
	59.05 Develop an irrigation schedule.
60.0	Demonstrate an understanding of irrigation system computer software currently used in industry – the student will be able to:
	60.01 Participate in seminars presented by industry professionals.
	60.02 Identify the basic concepts of computerized control systems.
61.0	Demonstrate an understanding of materials selection and costing needed for sales presentations – the student will be able to:
	61.01 Research materials costs for an irrigation project.
	61.02 Visit wholesale supply houses.
62.0	Develop an understanding of the breadth of the irrigation industry – the student will be able to:
	62.01 Describe an irrigation company.
	62.02 Describe an irrigation supply wholesale business.
	62.03 Describe the use of irrigation in a greenhouse.
	62.04 Describe the use of irrigation in a golf course.
	62.05 Describe the use of irrigation in a park.
	62.06 Describe the use of irrigation in a commercial irrigation installation.
	62.07 Describe the use of irrigation in a residential irrigation installation.
63.0	Demonstrate an understanding of irrigation water requirements – the student will be able to:
	63.01 Explain common system components and their effective water use.
	63.02 Explain basic concepts such as application rates, sprinkler spacing, and distribution uniformity.
	63.03 Explain matched precipitation rates.
	63.04 List the different types of soils and their infiltration rates.

64.0	Demonstrate an understanding of economic analysis as applied to irrigation investment decisions – the student will be able to:
	64.01 Describe the procedure for determining equipment and installation cost.
	64.02 Explain the process of computing ownership costs.
	64.03 Explain the process of determining total system cost.
65.0	Demonstrate an understanding of methods of develop overall operating and maintenance procedures – the student will be able to:
	65.01 Develop an efficient site watering schedule.
	65.02 Obtain product maintenance information.
	65.03 Explain how to develop an “as-built” drawing.
66.0	Demonstrate an understanding of analysis of irrigation systems – the student will be able to:
	66.01 List the different levels of evaluation.
	66.02 Describe and performing a visual inspection of an irrigation system.
	66.03 Describe and performing a flow inspection.
	66.04 Describe and performing a catch can test.
67.0	Demonstrate an understanding of how to obtain site information necessary in the commercial irrigation system design process – the student will be able to:
	67.01 Develop an accurate site drawing.
	67.02 Determine the type of landscaping and water requirement for a specific site.
	67.03 Identify environmental traits such as soil type and weather for a specific site.
	67.04 Identify unique site conditions that might affect design or installation.
	67.05 Identify possible water sources and select appropriate source.
68.0	Demonstrate an understanding of selection and safe use of equipment for a commercial irrigation system installation – the student will be able to:
	68.01 Select appropriate sprinkler heads for each area.
	68.02 Lay out heads on print utilizing graphic symbols in an irrigation design.
	68.03 Group irrigation heads to form irrigation zones.

69.0	Demonstrate an understanding of how to select pipe sizes and valves appropriate for specific commercial irrigation system installations – the student will be able to:
	69.01 Determine the water volume and pressure available from the water supply.
	69.02 Select and sizing a control valve for each zone.
	69.03 Select and sizing pipe main line.
	69.04 Select and sizing pipe for zone lines.
70.0	Demonstrate an understanding of writing irrigation specifications – the student will be able to:
	70.01 Review manufacturing and engineering data sheets and downloading from websites detailed drawings in preparation for an irrigation project.
	70.02 Conform to the Florida Irrigation Society Guidelines for landscape irrigation systems.
	70.03 Write specifications for a commercial irrigation project.
71.0	Demonstrate an understanding of advanced hydraulic and head layout concepts – the student will be able to:
	71.01 Describe the factors that determine system flow requirements.
	71.02 Explain the concepts of uniformity and efficiency.
	71.03 Explain the concepts of uniformity indicators.
	71.04 Demonstrate the ability to read sprinkler profiles.
	71.05 Demonstrate the ability to read sprinkler dens grams.
Horticulture Technician	
72.0	Demonstrate an understanding of plant physiology and growth – the student will be able to:
	72.01 Describe the process of photosynthesis.
	72.02 Identify and describe the functions of all parts of the plant.
	72.03 Describe an asexual reproduction process.
	72.04 Explain the differences between angiosperms and gymnosperms.
	72.05 Identify the differences between woody and herbaceous plants.
73.0	Classify plants – the student will be able to:

	73.01 Identify and group shade and flowering trees.
	73.02 Identify and group fruit trees and plants.
	73.03 Identify and group annuals, vegetables, and herbs.
	73.04 Identify and group woody ornamentals, vines, and ground covers.
	73.05 Identify and group tropical foliage plants.
	73.06 Identify and group turf and ornamental grasses.
74.0	Select, operate, and maintain tools and equipment – the student will be able to:
	74.01 Select and operate equipment for the job.
	74.02 Maintain an inventory of parts and supplies.
75.0	Fertilize plants – the student will be able to:
	75.01 Evaluate influences of nutrients on plant growth.
	75.02 Apply fertilizers, using appropriate methods (dry, liquid, slow-release, injection, etc.).
	75.03 Demonstrate proper handling and storage of fertilizers, observing safety precautions.
76.0	Manage a pest-control program – the student will be able to:
	76.01 Develop an integrated pest management program or schedule.
	76.02 Train employees in the safe use of pesticides.
	76.03 Obtain a pesticide license.
77.0	Prune and shape plants – the student will be able to:
	77.01 Train employees in pruning techniques.
	77.02 Identify and use tools for pruning.
	77.03 Prune plants to achieve desired growth.
	77.04 Demonstrate sanitation and safety practices when pruning.
	77.05 Develop a pruning program and time schedule.

	77.06 Select and use chemical growth regulators.
	77.07 Root and prune ornamental plants and trees.
78.0	Maintain landscape plants – the student will be able to:
	78.01 Determine water requirements and apply at proper rates.
	78.02 Identify weeds and apply herbicides safely.
	78.03 Determine fertilization requirements and apply at proper rates.
	78.04 Regulate growth of landscape plants through chemical or mechanical needs.
	78.05 Maintain turf viability (mow at proper height and frequency, aerate, edge, clip, and remove trash).
	78.06 Identify plant pest problems and apply corrective measures.
	78.07 Cultivate and mulch plants.
	78.08 Brace and repair trees.
79.0	Demonstrate employability skills – the student will be able to:
	79.01 Conduct a job search.
	79.02 Secure information about a job.
	79.03 Identify documents that may be required when applying for a job.
	79.04 Complete a job application form.
	79.05 Demonstrate competency in job interview techniques.
	79.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other person.
	79.07 Identify acceptable work habits.
	79.08 Demonstrate knowledge of how to make job changes.
	79.09 Demonstrate acceptable employee health habits.
80.0	Determine drainage system needs and design a drainage system – the student will be able to:
	80.01 Determine the texture and percolation characteristics of the soil.

81.0	Maintain and analyze records – the student will be able to:
	81.01 Maintain fertilizer and pesticide application records.
	81.02 Use computers in the landscape and horticulture operations.
82.0	Prepare growing media and seedbeds – the student will be able to:
	82.01 Identify media materials.
	82.02 Mix rooting and growing media according to plant requirements.
	82.03 Sterilize rooting, potting, and growing media.
	82.04 Collect and test a soil sample from field and potting media.
	82.05 Adjust pH and nutritional levels of media.
	82.06 Prepare planting beds and sites.
	82.07 Fill and level benches and pots with media.
	82.08 Demonstrate sanitation practices when handling and storing plant media materials.
83.0	Propagate plants – the student will be able to:
	83.01 Collect propagation materials at proper time (seeds, cuttings, scions, bulbs, etc.).
	83.02 Demonstrate propagation by grafting, budding, layering, separating, dividing, cutting, and tissue culturing.
	83.03 Prepare flats and a seedbed and plant seeds.
	83.04 Prepare a rooting bed.
	83.05 Prepare propagation materials (seeds, cuttings, scions, etc.)
	83.06 Apply growth stimulants to propagation materials.
	83.07 Transplant rooted propagation materials including tissue culture transplants.
	83.08 Demonstrate sanitation and safety practices when propagating.
84.0	Grow plants – the student will be able to:
	84.01 Prepare media for containers.

	84.02 Prepare field site for transplants.
	84.03 Select plant containers.
	84.04 Determine plant spacing in the field and on container beds.
	84.05 Transplant propagated materials to various containers and to the field.
	84.06 Determine and provide light requirements of various plant types.
85.0	Harvest, process, and ship plants – the student will be able to:
	85.01 Grade and harvest field-grown plants (ball, burlap, bare-root, “grow-bags”).
	85.02 Select, grade, and assemble container-grown plants.
	85.03 Prepare for shipment, loading, and transporting harvested plant materials.
86.0	Market plants – the student will be able to:
	86.01 Identify, inventory, and label marketable plants.
87.0	Design, install, and maintain nursery irrigation systems – the student will be able to:
	87.01 Determine irrigation requirements.
	87.02 Assess quality of irrigation water.
	87.03 Operate and service various types of irrigation systems.
Golf Course Technician	
88.0	Supervise and manage the operation, maintenance and repair of golf course equipment – the student will be able to:
	88.01 Define the role of the golf course equipment mechanic in relation to the organization.
	88.02 Determine the essential power, shop and hand tools required in a golf course mechanics shop.
	88.03 Design a shop layout.
	88.04 Compile a list of equipment required in the operation of an 18-hole golf course.
	88.05 Demonstrate knowledge and use of golf course equipment.
	88.06 Develop and supervise a system of preventive maintenance.

	88.07 Sharpen and grind blades and cutting surfaces on all mowing equipment.
	88.08 Monitor and record the use of fuel, lubricants and consumable shop supplies.
	88.09 Maintain a safe clean shop.
	88.10 Maintain current catalogs for supplies and equipment.
	88.11 Maintain tires and tire pressure on golf course equipment.
	88.12 Train and supervise employees in the safe use of tools and equipment.
89.0	Schedule irrigation and manage the design, installation and maintenance of golf course irrigation systems – the student will be able to:
	89.01 Determine water requirements for a particular turf.
	89.02 Illustrate the design, computations, pumping capacity and pipe sizing needed to irrigate a given operation.
	89.03 Schedule irrigation as required.
	89.04 Store and handle chemicals safely.
	89.05 Recognize symptoms of agricultural chemical poisoning and apply first aid.
	89.06 Dispose of chemical containers.
	89.07 Read and interpret safety precautions provided on equipment and pesticide containers.
90.0	Prescribe, supervise and manage the application of agricultural chemicals for the prevention and control of pests – the student will be able to:
	90.01 Instruct employees in the safe use of agricultural chemicals.
	90.02 Prepare proper proportions of chemicals and carrying agents.
	90.03 Compute amounts of active ingredients of chemicals to be used.
	90.04 Calibrate volume, pressure and output of equipment.
	90.05 Weigh and measure chemicals.
	90.06 Adjust height and width of equipment to achieve desired spray pattern.
	90.07 Recognize symptoms of pesticide damage.
	90.08 Identify fungi and bacteria.

	90.09 Recognize symptoms of insects and nematodes.
	90.10 Identify common insects, weeds, diseases and other pests common to golf courses.
	90.11 Clean and store sprayers.
91.0	Prescribe, supervise and manage the fertilization of the turf and landscape – the student will be able to:
	91.01 Take soil and leaf samples for chemical analysis.
	91.02 Adjust pH level of soil.
	91.03 Interpret soil and tissue chemical analysis results.
	91.04 Apply fertilizer in liquid form.
	91.05 Interpret labels on fertilizer containers.
	91.06 Apply dry fertilizers.
	91.07 Identify nutrient deficiency symptoms in turf and landscape plants.
	91.08 Determine kind and type of fertilizer to apply to a given area.
	91.09 Determine the nutrient requirements of various plants.
	91.10 Determine amount of fertilizer to apply to a given area.
	91.11 Analyze cost of various formulations and methods of application.
	91.12 Recognize fertilizer injury to plant materials.
92.0	Train and supervise employees in grooming and maintaining greens, tees, fairways, roughs and other areas – the student will be able to:
	92.01 Supervise the mowing of greens, collars, roughs, aprons, and fairways.
	92.02 Determine the placement and location of cups and tees.
	92.03 Supervise the repair of divots.
	92.04 Determine conditions necessary for verticuting and aerifying turf.
	92.05 Supervise the care and maintenance of sand traps.
	92.06 Prune trees and shrubs.

	92.07 Develop maintenance schedule for grooming golf courses.
	92.08 Train and supervise employees in the care of golf courses.
	92.09 Follow written and verbal instructions.
93.0	Provide a safe environment for workers and patrons – the student will be able to:
	93.01 Provide instruction for the safe use of chemicals, tools and equipment.
	93.02 Inspect tools and equipment for safe operation.
	93.03 Apply emergency first aid.
	93.04 Monitor employees work habits.
	93.05 Maintain safety awareness.
94.0	Keep and analyze maintenance, employee, equipment and inventory records – the student will be able to:
	94.01 Maintain equipment use and maintenance records.
	94.02 Maintain pesticide use information.
	94.03 Keep inventory records.
	94.04 Prepare a written report or summary based on records.
	94.05 Observe and make recommendations based on records.
	94.06 Evaluate employees, equipment and practices based on records.
95.0	Observe local, state and federal laws and regulations – the student will be able to:
	95.01 Observe OSHA rules and regulations.
	95.02 Observe EPA rules and regulations.
	95.03 Maintain a list of agencies responsible for regulating the industry.
96.0	Demonstrate leadership, communication, public relations, employability and human relations skills – the student will be able to:
	96.01 Conduct a job search.
	96.02 Secure information about a job.

	96.03 Identify documents that may be required when applying for a job.
	96.04 Complete a job application form correctly.
	96.05 Demonstrate competence in job interview techniques.
	96.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	96.07 Demonstrate acceptable employee health habits.
97.0	Demonstrate an understanding of the types of pipe installation common to irrigation systems – the student will be able to:
	97.01 List the different types and schedules of available Polyvinyl Chloride (PVC) pipes.
	97.02 Describe the different types of available fittings including solvent weld, o-rings, and mechanical joint (MJ) joints.
	97.03 Describe the basic chemical reactions that occur in the manufacture of PVC pipe.
	97.04 Explain the process of connecting PVC pipe by using solvent weld chemicals.
	97.05 Explain the process of connecting o-ring pipe by using push-on fittings.
98.0	Demonstrate an understanding of irrigation system components – the student will be able to:
	98.01 Identify various irrigation system types such as rotors, sprays, and drip.
	98.02 Explain the process of time clock selection.
	98.03 Explain the process of valve selection.
	98.04 Explain the process of sprinkler head selection.
	98.05 Explain the process of low-voltage wire selection.
99.0	Demonstrate an understanding of basic design principles used in irrigation systems – the student will be able to:
	99.01 Calculate the static or working water pressure at a given point in the system.
	99.02 Determine the velocity for certain type and size pipe at a given flow.
	99.03 Select appropriate sprinkler heads for specific applications.
	99.04 Group irrigation heads to form irrigation zones complying with proper design criteria.
	99.05 Calculate specific friction loss through piping.

	99.06 Compute the precipitation rate for various sprinkler types and spacing patterns.
100.0	Demonstrate an understanding of basic irrigation system maintenance and operation – the student will be able to:
	100.01 Determine the watering time needed per week per station.
	100.02 Develop a water schedule based on proper design principles.
	100.03 Read and explain an as-built drawing.
	100.04 Explain the process of remove and install sprinkler heads.
	100.05 Describe introductory the process of automatic control valve repair.
	100.06 Describe the process of automatic controller repair.
	100.07 Diagnose and correcting wiring problems.
101.0	Demonstrate an understanding of sprinkler performance – the student will be able to:
	101.01 Diagnose sprinkler distribution problems.
	101.02 Measure and analyze precipitation rates.
	101.03 Remove, clean, and reinstall heads.
	101.04 Repair and adjust heads.
	101.05 Adjust sprinkler head spacing if require
102.0	Demonstrate an understanding of the principles of plant growth – the student will be able to:
	102.01 Describe the functions of plant parts including roots, stems, leaves, flowers and fruits.
	102.02 Describe the processes of plant growth including photosynthesis, respiration, nutrient uptake and respiration.
	102.03 Describe the growth characteristics, and use of subtropical and tropical landscape plants.
	102.04 Identify various landscape designs, natural systems and the plants associated with them.
	102.05 Describe the process of effective establishment of plants in the landscape.
	102.06 Describe the influences of the environment on the landscape including pollutants.
103.0	The student will demonstrate an understanding of the role of plant nutrients and fertilizers – the student will be able to:

	103.01 Identify the nutrients required for plant growth and the role of each.
	103.02 Identify the types and kinds of fertilizers.
	103.03 Read and interpreting fertilizer labels.
	103.04 Describe the application of various fertilizer formulations.
	103.05 Identify symptoms of nutritional deficiencies and toxicities of plants.
104.0	The student will demonstrate an understanding of pest management practices – the student will be able to:
	104.01 Describe the principles and benefits of integrated pest management.
	104.02 Explain the nature of physical and chemical damage to plants.
	104.03 Describe the selection process involved in the use of horticultural chemicals for arthropod pest control and subsequent implications of their usage.
	104.04 Explain the role of efficient irrigation in pest control.
	104.05 Explain the role of plant health in pest control.
105.0	Demonstrate an understanding of the role of irrigation – the student will be able to:
	105.01 List the components of Florida's fresh water systems.
	105.02 Explain evaporation transpiration rate.
	105.03 Explain hydro zoning/precipitation rate.
	105.04 Identify the water needs of plants.
	105.05 Explain the role of mulches in the landscape.
	105.06 Describe soil moisture retention and movement for various soil types.
106.0	Demonstrate an understanding of the basic safety issues involved in the "green industry" – the student will be able to:
	106.01 List the most common causes of accidents in the "green industry."
	106.02 Discuss the importance of following proper safety precautions.
	106.03 Describe the symptoms of pesticide poisoning.
	106.04 Extract pertinent information from material safety data sheets.

107.0	Demonstrate an understanding of drip system components – the student will be able to:
	107.01 Identify the various types of water emitters.
	107.02 Identify and explain the use of drip lateral materials.
	107.03 Identify and explain the use of pressure regulators.
	107.04 Identify and explain the use of valves including flush valves, control valves and air vents.
108.0	Demonstrate an understanding of basic design principles for low volume irrigation systems – the student will be able to:
	108.01 Analyze the irrigation site and gathering appropriate site data.
	108.02 Identify point or line source area.
	108.03 Determine the appropriate irrigation method for each area.
	108.04 Determine the number of water emitters required per plant per area.
	108.05 Adapt irrigation requirements to available water supply.
109.0	Demonstrate an understanding of procedures involved in installation of low volume irrigation systems – the student will be able to:
	109.01 Connect the main water line to a point of connection.
	109.02 Run lateral lines.
	109.03 Run distribution tubing.
	109.04 Install emitters.
	109.05 Develop an irrigation schedule.
110.0	Demonstrate an understanding of plant physiology and growth – the student will be able to:
	110.01 Describe the process of photosynthesis.
	110.02 Identify and describe the functions of all parts of the plant.
	110.03 Describe an asexual reproduction process.
	110.04 Explain the differences between angiosperms and gymnosperms.
	110.05 Identify the differences between woody and herbaceous plants.

111.0	Classify plants – the student will be able to:
	111.01 Identify and group shade and flowering trees.
	111.02 Identify and group fruit trees and plants.
	111.03 Identify and group annuals, vegetables, and herbs.
	111.04 Identify and group woody ornamentals, vines, and ground covers.
	111.05 Identify and group tropical foliage plants.
	111.06 Identify and group turf and ornamental grasses.
112.0	Select, operate, and maintain tools and equipment – the student will be able to:
	112.01 Select and operate equipment for the job.
	112.02 Maintain an inventory of parts and supplies.
113.0	Fertilize plants – the student will be able to:
	113.01 Evaluate influences of nutrients on plant growth.
	113.02 Apply fertilizers, using appropriate methods (dry, liquid, slow-release, injection, etc.).
	113.03 Demonstrate proper handling and storage of fertilizers, observing safety precautions.
114.0	Manage a pest-control program – the student will be able to:
	114.01 Develop an integrated pest management program or schedule.
	114.02 Train employees in the safe use of pesticides.
	114.03 Obtain a pesticide license.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The AS degree in Agribusiness Management is a degree into which various agricultural certificates or ATDs can articulate. Up to 30 credits of an approved college credit certificate can be articulated into the 60 credit AS giving the student a "specialty" in various agricultural areas such as: irrigation, forestry, horticulture or golf course operations.

It is also recommended that students be members of professional organizations associated with the selected agricultural specialty (example: Florida Nursery Growers and Landscape Association, Florida Forestry Association, Florida Irrigation Society, Florida Turfgrass Association)

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Horticulture Specialist (0101010102) – 15 hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Aquaculture Management**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101030301
Program Type	College Credit
Standard Length	63 credit hours
CTSO	N/A
SOC Codes (all applicable)	11-9013 - Farmers, Ranchers, and Other Agricultural Managers 45-1011 - First-Line Supervisors of Farming, Fishing, and Forestry Workers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to apply the economic and business principles involved in the organization, operation and management of aquaculture farms and businesses. Content includes, but is not limited to, instruction in ichthyology, fish breeding, fish nutrition, pond maintenance, diagnosis and treatment of diseases in fish, economic and marketing principles for the production of an aquatic crop, business management of a fish farm, and field experience necessary to operate an aquaculture operation.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 63 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

After successfully completing this program, the student will be able to perform the following:

01.0 Identify important aquaculture plants and animals and describe their culture in various production units.
02.0 Perform general aquaculture production unit operations.
03.0 Determine methods of fish identification.
04.0 Demonstrate an understanding of water quality and aquaculture.
05.0 Maintain optimal nutrition for aquaculture organisms.
06.0 Diagnose and control common aquaculture maladies.
07.0 Operate and maintain aquaculture equipment.
08.0 Assist in the maturation, spawning, larval and juvenile rearing of aquaculture organisms.
09.0 Perform general aquaculture nursery systems operations.
10.0 Demonstrate an ability to manage aquatic species in multiple production units over time.
11.0 Apply business, economic and marketing principles to the production of an aquatic crop.
12.0 Demonstrate management skills required to operate an aquaculture farm.
13.0 Manage a pond operation.

Florida Department of Education
Student Performance Standards

Program Title: **Aquaculture Management**
CIP Number: **1101030301**
Program Length: **63 credit hours**
SOC Code(s): **11-9013, 45-1011**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Identify important aquaculture plants and animals and describe their culture in various production units – the student will be able to:
01.01	Define aquaculture and describe the historical important of aquaculture to local, state, national and international economies.
01.02	List occupations in aquaculture production, processing, distribution, marketing, and service.
01.03	Identify important aquatic species and products produced by aquatic farmers in Florida, U. S., and foreign countries.
01.04	List the types of production units and systems employed by aquaculturist in Florida, U. S. and foreign countries.
01.05	Outline basic techniques for constructing ponds, tanks, raceways, net pens and cages.
01.06	Describe basic production techniques for the culture of plants, mollusks, crustaceans, and finfish.
01.07	List and describe the major factors in growth of aquaculture species.
01.08	List important criteria in selecting a site for an aquaculture farm.
01.09	Describe natural fisheries and aquaculture production trends.
02.0	Perform general aquaculture production unit operations – the student will be able to:
02.01	Identify and describe the general anatomy, biology and life cycles for aquaculture species studied in this program.
02.02	Identify and describe the general morphology of aquatic macro and microalgae.
02.03	List methods to help determine aquatic animal health and behavior for various aquaculture production units.
02.04	List techniques for routine maintenance of aquaculture ponds, cage culture systems, and submerged lands.
02.05	Identify common aquaculture predators and list predator control techniques
02.06	Record production data such as water quality parameters, feed amounts, mortality and other routine information required for a

	specific operation on data sheets and enter into a computer.
03.0	Determine methods of fish identification – the student will be able to:
03.01	Identify the major families of fish.
03.02	Describe the complexities of fish anatomy for the following systems: • Skeletal systems • Musculature • Nervous system • Vascular system • Respiratory system • Urogenital system • Digestive system • Reproductive system
03.03	Identify the major anatomical fish structures.
03.04	Describe the physiological characteristics of fish for the following: • Color • Bioluminescence • Sound production • Sensory systems • Osmoregulation
03.05	Classify fish.
03.06	Describe the aquatic environment.
03.07	Discuss the basics of fish behavior.
03.08	Identify the muscles of a fish.
03.09	Measure the physical characteristics of fish.
03.10	Use a taxonomic key to identify fish.
03.11	Identify the major taxa of fish.
04.0	Demonstrate an understanding of water quality and aquaculture – the student will be able to:
04.01	Define environmental variables and list ranges important for survival and growth of important aquaculture species.
04.02	Demonstrate an understanding of aquifers, water quantity and management, and agricultural water use in Florida.

	04.03	Identify water quality measurements necessary for accurately culturing aquaculture organisms.
	04.04	Measure water quality parameters in aquaculture production units, record data in logs and computers, and interpret results.
	04.05	Describe the nitrogen cycle and identify system equipment and/or processes which reduce nitrogenous wastes.
	04.06	Discuss the importance of oxygen to the maintenance of production units and aquatic animal health and the effect of temperature on oxygen concentration.
	04.07	Describe processes in aquaculture production units that effect pH, alkalinity, carbon dioxide, oxygen, ammonia, and other environmental parameters.
	04.08	Measure primary productivity and discuss its importance in various aquaculture production units.
	04.09	Calculate water volumes for various sizes of aquaculture production units.
	04.10	List potential sources of aquaculture pollution and describe methods of preventing or abating these problems.
	04.11	Identify Best Management Practices for treating waste water from various aquaculture production units.
05.0	Maintain optimal nutrition for aquaculture organisms – the student will be able to:	
	05.01	Explain the digestive anatomy of fish.
	05.02	Explain fish metabolic rates.
	05.03	Identify fish food additives
	05.04	Outline the basic concepts of nutrition for plants, mollusks, crustaceans, and fish.
	05.05	Discuss the importance of nutrition to growth and survival of various aquaculture species.
	05.06	Identify feeding habits and practices of a variety of aquaculture species.
	05.07	List common ingredients and additives of aquatic feeds and identify practices in feeds formulation and manufacturing.
	05.08	Demonstrate an ability to culture live feeds including microalgae, rotifers and artemia and discuss their importance.
	05.09	Calculate feeding rates, growth and feed conversion ratios for various aquaculture species stocked at different densities and rates.
	05.10	List different feeding methods, measure feed and maintain feed records in logs and computers.
	05.11	Discuss and differentiate feeding practices for hatchery, nursery and grow out of mollusks.
	05.12	Discuss nutrition practices for culturing aquatic plants.
	05.13	Discuss the principles of bioenergetics to growth.

06.0	Diagnose and control common aquaculture maladies – the student will be able to:
06.01	Identify the common diseases that infect aquaculture organisms.
06.02	Understand the basic mechanisms for control of disease.
06.03	Identify common bacterial diseases and treatment options.
06.04	Identify common mycotic diseases and treatment options.
06.05	Identify common viral diseases and treatment options.
06.06	Identify common parasitic diseases and treatment options.
06.07	Discuss the relationship of nutrition, water quality and stress how they may cause disease in aquaculture organisms.
06.08	Prepare an aquatic organism for diagnostic examination or shipment.
06.09	Observe various diseases of aquatic organisms and demonstrate use of a microscope.
06.10	List approved drugs available for use in aquaculture.
06.11	Describe approved chemicals and their use in treating diseases.
06.12	Identify common aquatic parasites found in Florida waters.
06.13	Identify toxic environmental diseases in fish.
07.0	Operate and maintain aquaculture equipment – the student will be able to:
07.01	List equipment used in various production units necessary to raise plants, mollusks, crustaceans, and fish.
07.02	Set up and maintain standard aquaria.
07.03	Set up field aquaculture ponds.
07.04	Measure field parameters such as temperature, salinity, and hardness.
07.05	Set up a system to culture aquatic plants.
07.06	Demonstrate an ability to correctly use aquaculture equipment including, but not limited to, a thermometer, oxygen meter, refractometer, pH meter, pump, graduated cylinder, beaker, nets, siphon, scales, sieves, calipers, secchi disk, and a microscope.
07.07	Set up aquaculture filtration systems.
07.08	List equipment options of a recirculating system including solids removal, biofiltration, sterilization and aeration, and explain their basic functions.

	07.09	Operate and perform system maintenance on a recirculating system.
	07.10	Estimate pumping requirements and select an appropriately sized pump for a given system and water volume.
	07.11	Layout a PVC plumbing scheme for a given aquaculture system with a sufficient number of valves to allow for bypass and isolation and then measure, cut and assemble that water system.
	07.12	Layout and put together an aeration system operated on airlift technology.
	07.13	Replace and install a pump.
	07.14	Perform simple calculations related to water volume, water flow and system loading.
	07.15	Use and operate tools and equipment safely.
	07.16	Measure productivity in aquaculture systems.
08.0	Assist in the maturation, spawning, larval and juvenile rearing of aquaculture organisms – the student will be able to:	
	08.01	Describe the reproductive anatomy, function of reproductive organs, and reproductive cycles of selected aquaculture organisms.
	08.02	Differentiate between males and females of the same species.
	08.03	Relate environmental factors to successful reproduction of various aquaculture species.
	08.04	Explain the use of hormones, anesthetics, chemicals, antibiotics, and other techniques to manage broodstock and accelerate reproductive cycles and contrast the difference between environmental conditioning and induced spawning techniques.
	08.05	Maintain and care for broodstock and prepare spawning tanks and/or systems.
	08.06	Describe maturation, spawning, hatching, and larval rearing techniques for selected aquaculture species.
	08.07	Discuss the importance of nutrition at various stages of the larval rearing cycle for selected aquaculture species.
	08.08	Use a microscope to examine the stages and condition of eggs and larvae.
	08.09	Prepare, stock, feed and maintain larval rearing tanks.
	08.10	Culture live feeds and calculate feeding rates.
	08.11	Outline a maturation system design for selected aquatic species.
	08.12	List important practices and tasks in hatchery management.
	08.13	Estimate production numbers from a given spawn of a given species.
	08.14	Record hatching date in logs and computers and interpret results.

09.0	Perform general aquaculture nursery systems operations – the student will be able to:
09.01	Maintain, clean and operate a broodstock tank and list important practices in managing broodstock.
09.02	Start, maintain, count and harvest live feeds.
09.03	Maintain a nursery system by demonstrating an ability to clean tanks and filtration equipment, adjust water flow and volume, set aeration, and monitor water quality and feeding levels.
09.04	Describe and differentiate between land-based and field-based nursery systems, equipment and operations.
09.05	Monitor and record routine data such as feed amounts and times, temperature, oxygen, salinity, and ammonia and enter data into a computer or log book.
09.06	List and describe nursery production systems and larval husbandry techniques for fish, crustaceans, and mollusks.
09.07	Demonstrate practical hands-on experience in handling a variety of juvenile aquaculture organisms and operating nursery production units.
10.0	Demonstrate an ability to manage aquatic species in multiple production units over time – the student will be able to:
10.01	Identify routine management techniques involved in aquaculture.
10.02	Calculate system volume and stocking strategies for given aquaculture production units.
10.03	Develop a written protocol and design data sheets for daily feeding, water quality measuring, system maintenance, and other factors for various aquaculture production units culturing a given species.
10.04	Periodically sample or otherwise determine growth and production unit biomass/density and adjust feeding rates accordingly.
10.05	List methods of harvesting aquatic crops from various aquaculture production units and preparing them for shipment to market.
10.06	Acclimate and transfer aquatic animals from one water source to another.
10.07	Design, layout, build, and plumb a simple aquaculture recirculating or other aquaculture production unit system.
10.08	Calculate production area or volume, stocking rates, densities, feeding rates, conversion and growth of a given species for a given aquaculture production unit system being supervised.
10.09	Demonstrate an understanding of management principles and use of management decision-making tools, including a computer.
10.10	List communication skills and identify work habits necessary for supervising employees.
11.0	Apply business, economic and marketing principles to the production of an aquatic crop – the student will be able to:
11.01	Describe aquaculture production and value of selected species in Florida, domestically, and internationally.
11.02	List and access sources of market information and statistics for selected aquaculture species.
11.03	Identify sources of competition both locally and globally.

11.04	Identify critical risk factors which may limit success of a farm.
11.05	Itemize fixed and variable costs of an aquaculture venture.
11.06	Explain the principles of production economics to include costs, taxes, interest, depreciation, record keeping, cash flow and financial statements.
11.07	Write a hypothetical business plan and a production plan for an aquaculture venture.
11.08	Describe factors and variables in selecting a site for an aquaculture facility, including land, water, proximity of markets, labor and community acceptance.
11.09	Link culture system options to a given site and water resources.
11.10	Predict hypothetical production numbers for a given facility with given variables.
11.11	Outline a simple operating budget for an aquaculture facility including cash flow and financial statement.
11.12	Describe characteristics of a well-planned aquaculture facility.
11.13	Demonstrate use of a computer for record keeping, production and decision-making.
11.14	Evaluate techniques for aquaculture marketing.
12.0	Demonstrate management skills required to operate an aquaculture farm – the student will be able to:
12.01	List rules, state statutes and federal regulations important to aquaculture.
12.02	Explain the regulations that govern aquaculture on the local, state and national levels.
12.03	Describe permitting procedures for various species, sites and aquaculture production units.
12.04	List Best Management Practices necessary to operate and permit selected aquaculture facilities.
12.05	Develop a production plan and budget for a given aquaculture facility, design a record keeping system, establish operating procedures, harvest schedules and determine potential profitability.
12.06	Demonstrate an ability to maintain farm records including property, insurance, personnel, payroll, permits and licenses, equipment and tangible property, aquatic animal inventory, accounts receivable, accounts payable, and others.
12.07	Define HACCP and discuss its importance to both processing and aquaculture.
12.08	List management skills necessary for effective supervision of employees.
13.0	Manage a pond operation – the student will be able to:
13.01	Explain the basic techniques for building aquaculture ponds.
13.02	Explain the aquifer water quality in Florida.

13.03 Perform water chemistry quality measurements and explain their importance.
13.04 Produce aquatic plants in an aquaculture environment.
13.05 Identify filtration systems for aquaculture.
13.06 Manage water quality.
13.07 Explain water treatments.
13.08 Perform plankton analysis.
13.09 Describe the value of aeration systems.
13.10 Set up a closed system.
13.11 Set up cage systems.
13.12 Measure primary productivity.
13.13 Explain the importance of pond fertilization.
13.14 Explain the feeding techniques for large pond operations.
13.15 Measure density of organisms per acre.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Aquaculture Technology (0101030302) – 26 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Equine Studies**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101050701
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-1011 - First-Line Supervisors of Farming, Fishing, and Forestry Workers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to prepare students for employment in equine industry occupations under one of two different specializations. **Equine Farm Management** includes careers such as entry level equine farm supervisory and management positions, assistant farm manager, broodmare/foal manager, yearling manager in a variety of equine enterprises, or First-Line Supervisors/Managers of Animal Husbandry and Animal Care Workers (45-1011.08). Additional positions include entry level managerial positions in equine retail sales, managerial positions in service based sectors of the equine industry or entrepreneurial opportunities in the equine industry. **Equine Exercise Physiology** trains students in the emerging field of equine athletic management, providing students with expertise in conditioning techniques, management of the equine athlete and rehabilitation techniques. Graduates will be employed as assistant trainers, rehabilitation technicians, grooms for high performance horses or independent contractors in horse care.

The content for both specializations includes instruction to individuals in the areas of planning, organizing, directing and controlling of an equine operation with dual emphasis on:

- The science and care of equine species and the knowledge and understanding necessary for managing equine operations and husbandry and disease.
- Business skills such as financial management, marketing, employee relations, computer applications and business plan development.

The Equine Studies Associate in Science degree program should include the requirements specified in the statewide Articulation Manual.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

A. Equine Science Core Learning Outcomes:

01.0 Identify veterinary terminology and illustrate equine health practices.
02.0 Analyze equine nutrient requirements and evaluate equine diets.
03.0 Identify, analyze and apply basic concepts related to normal and abnormal equine behaviors.
04.0 Perform safe horse handling techniques.
05.0 Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations.
06.0 Demonstrate employability skills including interpersonal skills, ethics, communication and responsibility through work based learning activities and a portfolio.

B. Business Management Specialization Learning Outcomes:

07.0 Identify equine industry sectors and business opportunities in a business plan.
08.0 Demonstrate techniques in evaluation, selection and breeding of horses.
09.0 Demonstrate ability to plan, schedule and maintain records and contracts, using appropriate technical information systems.
10.0 Perform equine marketing and sales management functions.
11.0 Demonstrate leadership and effective communication in employee management.

C. Exercise Physiology Learning Outcomes:

12.0 Design and manage physiological conditioning programs for the equine athlete.
13.0 Apply manual therapies for maintenance and therapeutic applications.
14.0 Identify and apply rehabilitation techniques using state-of-the-art equipment.
15.0 Evaluate hoof care, tack and equipment for different equine athletic endeavors.

Florida Department of Education
Student Performance Standards

Program Title: **Equine Studies**
CIP Number: **1101050701**
Program Length: **60 credit hours**
SOC Code(s): **45-1011**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
Equine Science Core Learning Outcomes:	
01.0	Identify veterinary terminology and illustrate equine health practices – the student will be able to:
01.01	Understand equine diseases and establish appropriate wellness programs for equine populations.
01.02	Comprehend equine anatomy and form to function concepts.
01.03	Anticipate typical problems of performance and reproductive horses to prevent injury or poor health; effectively follow veterinarian orders to restore health and productivity.
01.04	Identify and describe equine anatomy, with special emphasis on physiology and function.
01.05	Provide first aid for horses.
01.06	Identify equine medications and demonstrate ability to administer as per veterinarian instructions.
02.0	Analyze equine nutrient requirements and evaluate equine diets – the student will be able to:
02.01	Evaluate equine diets according to nutrient requirements for different classes of horses (working, growing, lactating).
02.02	Determine economic impact of feedstuff purchasing decisions.
02.03	Maintain safe feeding management programs for enhanced equine health.
02.04	Prepare a typical diet for horses of different classes.
02.05	Understand feed manufacturing techniques and feed analysis systems.
03.0	Identify, analyze and apply basic concepts related to normal and abnormal equine behaviors – the student will be able to:
03.01	Understand and recognize natural horse behaviors.

	03.02 Identify and resolve abnormal equine behaviors.
	03.03 Utilize horse learning behaviors to improve management and safe handling of horses.
04.0	Perform safe horse handling techniques – the student will be able to:
	04.01 Safely catch, lead, tie, groom, restrain and work around horses of various levels of training.
	04.02 Safely administer health and medical practices, such as leg wraps, vital signs, injections and restraint for such treatments.
	04.03 Evaluate safe transportation techniques and equipment for transportation.
	04.04 Evaluate training equipment and demonstrate application of training equipment.
05.0	Evaluate equine management systems for appropriate animal welfare, including housing, care and regulations – the student will be able to:
	05.01 Describe housing designs for different equine management systems.
	05.02 Identify appropriate levels of care and welfare for equines.
	05.03 Develop a health care program for an equine farm including vaccination protocols, deworming schedules/programs, biosecurity and first aid.
06.0	Demonstrate employability skills including interpersonal skills, ethics, communication and responsibility through work based learning activities and a portfolio – the student will be able to:
	06.01 Demonstrate punctuality, initiative, courtesy, dependability, flexibility and honesty.
	06.02 Demonstrate ability to work as part of a team.
	06.03 Conduct a job search, write a resume and practice interview techniques.
	06.04 Understand legal requirements for employees including hiring, firing, and documentation.
	06.05 Develop managerial skills such as mentoring, management by objectives, balanced feedback, critical appraisal and promotion.
Business Management Specialization Learning Outcomes:	
07.0	Identify equine industry sectors and business opportunities in a business plan – the student will be able to:
	07.01 Identify breeds of horses and describe typical uses.
	07.02 Understand evolution and the role horses have played in history and cultural development.
	07.03 Develop awareness of critical issues to the horse industry such as legislative, regulatory, ethical and environmental responsiveness.
	07.04 Identify business opportunities in various equine sectors by evaluating market opportunity and profit potential.

	07.05 Develop a business plan for a typical equine business specifically aimed at a financial institution for funding.
08.0	Demonstrate techniques in evaluation, selection and breeding of horses – the student will be able to:
	08.01 Evaluate equine conformation according to use and purpose.
	08.02 Understand basic genetics and selection techniques for effective animal breeding.
	08.03 Show ability to manage reproductive health and efficiency.
	08.04 Develop appropriate management techniques for equine breeding farm, including stallion management, estrus detection, breeding, foaling and foal management.
09.0	Demonstrate ability to plan, schedule and maintain records and contracts, using appropriate technical information systems – the student will be able to:
	09.01 Maintain and analyze equine records and basic business records (health, breeding, inventory, equipment, purchases, and depreciation).
	09.02 Understand contract language and different types of contracts.
	09.03 Maintain machinery, equipment and facility inventory records.
	09.04 Understand legal requirements, rules and regulations concerning horses and agribusiness.
	09.05 Manage farm inventory (horses, feed, equipment) for optimum efficiency and profitability.
10.0	Perform equine marketing and sales management functions – the student will be able to:
	10.01 Perform market analysis and collect market information.
	10.02 Develop a marketing plan, including advertising, communications, promotional goals and budget.
	10.03 Actively participate in marketing activities, such as public speaking, demonstrations, clinics, shows, group activities and community service.
11.0	Demonstrate leadership and effective communication in employee management – the student will be able to:
	11.01 Demonstrate punctuality, initiative, courtesy, dependability, flexibility and honesty.
	11.02 Select and hire farm managers who will work with various levels of farm workers, work well in a team environment and care about equine.
	11.03 Develop effective oral and written communication skills.
Exercise Physiology Learning Outcomes:	
12.0	Design and manage physiological conditioning programs for the equine athlete – the student will be able to:
	12.01 Understand and apply different training/conditioning techniques for various equine athletics.

	12.02 Understand equine biomechanics and how they influence equine performance.
	12.03 Develop optimum conditioning programs to minimize risk of injury to the horse.
13.0	Apply manual therapies for maintenance and therapeutic applications – the student will be able to:
	13.01 Understand different manual therapies that can be applied by non-veterinarians for the health and well-being of the horse.
	13.02 Develop expertise in the application of different manual therapies for the horse.
14.0	Identify and apply rehabilitation techniques using state-of-the-art equipment – the student will be able to:
	14.01 Understand concepts of rehabilitation for horses, including different therapeutic modalities and equipment.
	14.02 Work in a rehabilitation center to gain familiarity with different equipment and rehabilitation strategies.
15.0	Evaluate hoof care, tack and equipment for different equine athletic endeavors – the student will be able to:
	15.01 Understand different farrier techniques for various equine athletic endeavors.
	15.02 Understand action of bits and hackamores in the control and training of horses.
	15.03 Evaluate saddle fit.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Equine Assistant Management (0101050701) – 24 credit hours
Equine Technician (0101050703) – 15 credit hours
Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Landscape and Horticulture Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101060502
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-1012 - First-Line Supervisors of Landscaping, Lawn Service, and Grounds keeping Workers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction pertaining to an understanding of plant physiology and growth, plant nutrition and fertilization, plant classification and identification, propagation, pest control, pruning and shaping plants, maintenance of landscape plants, drainage and irrigation systems, equipment management, marketing, cultural and environmental management, business management, design, and employability and human relations skills. This program also prepares for certification and licensure as a horticulture professional, landscape technician, or landscape contractor and designer.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of plant physiology and growth.
02.0 Classify plants.
03.0 Determine drainage system needs and design a drainage system.
04.0 Select, operate, and maintain tools and equipment.
05.0 Fertilize plants.
06.0 Manage a pest-control program.
07.0 Prune and shape plants.
08.0 Plan and install a drainage system.
09.0 Protect plants and equipment from adverse weather.
10.0 Maintain and analyze records.
11.0 Demonstrate employability skills.
12.0 Demonstrate managerial and supervisory skills.

A. Horticulture Specialization:

13.0 Prepare growing media and seedbeds.
14.0 Propagate plants.
15.0 Grow plants.
16.0 Protect plants and equipment from adverse weather.
17.0 Harvest, process, and ship plants.
18.0 Market plants.
19.0 Design horticulture facilities.
20.0 Design, install, and service nursery irrigation systems.

B. Landscape Specialization:

21.0 Analyze and design the project (landscape and interiorscape).
22.0 Prepare, estimate, and establish contracts.
23.0 Analyze and organize the project.
24.0 Lay out and install landscape.
25.0 Plan and install a drainage system.
26.0 Maintain customer relations and observe follow-up procedures.
27.0 Maintain landscape plants.
28.0 Select, operate, and maintain landscape tools and equipment.
29.0 Plan, install, and service landscape irrigation systems.

Florida Department of Education
Student Performance Standards

Program Title: **Landscape and Horticulture Technology**
CIP Number: **1101060502**
Program Length: **60 credit hours**
SOC Code(s): **37-1012**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of plant physiology and growth – the student will be able to:
01.01	Describe the process of photosynthesis.
01.02	Identify and describe the functions of all parts of the plant.
01.03	Describe an asexual reproduction process.
01.04	Explain the differences between angiosperms and gymnosperms.
01.05	Identify the differences between woody and herbaceous plants.
02.0	Classify plants – the student will be able to:
02.01	Identify and group shade and flowering trees.
02.02	Identify and group fruit trees and plants.
02.03	Identify and group annuals, vegetables, and herbs.
02.04	Identify and group woody ornamentals, vines, and ground covers.
02.05	Identify and group tropical foliage plants.
02.06	Identify and group turf and ornamental grasses.
03.0	Determine drainage system needs and design a drainage system – the student will be able to:
03.01	Determine the natural slope/grade of an area.
03.02	Determine the texture and percolation characteristics of the soil.
03.03	Identify techniques for constructing ditches and culverts.

	03.04 Direct the movement of water away from structures and installations.
	03.05 Design and underground drainage system.
04.0	Select, operate, and maintain tools and equipment – the student will be able to:
	04.01 Determine equipment needs for the company.
	04.02 Select and operate equipment for the job.
	04.03 Supervise the service and maintenance of power equipment.
	04.04 Supervise the repair and maintenance of facilities.
	04.05 Instruct and supervise employees in the safe use of tools and equipment.
	04.06 Maintain an inventory of parts and supplies.
05.0	Fertilize plants – the student will be able to:
	05.01 Evaluate influences of nutrients on plant growth.
	05.02 Collect soil and leaf tissue samples for analysis.
	05.03 Interpret and evaluate the results of soil and leaf tissue analysis.
	05.04 Apply fertilizers, using appropriate methods (dry, liquid, slow-release, injection, etc.).
	05.05 Demonstrate proper handling and storage of fertilizers, observing safety precautions.
06.0	Manage a pest-control program – the student will be able to:
	06.01 Develop an integrated pest management program or schedule.
	06.02 Train employees in the safe use of pesticides.
	06.03 Obtain a restricted-use pesticide license.
07.0	Prune and shape plants – the student will be able to:
	07.01 Train employees in pruning techniques.
	07.02 Develop a pruning program and time schedule.
	07.03 Identify and use tools for pruning.

	07.04 Prune plants to achieve desired growth.
	07.05 Prune plans with unique cultural requirements (roses, fruit trees, etc.).
	07.06 Prune specialty items (topiary, espalier, bonsai, etc.).
	07.07 Select and use chemical growth regulators.
	07.08 Root-prune plants and trees.
	07.09 Demonstrate sanitation and safety practices when pruning.
08.0	Plan and install a drainage system – the student will be able to:
	08.01 Determine the natural slope/grade of an area.
	08.02 Determine the texture and percolation characteristics of the soil.
	08.03 Identify techniques for constructing ditches and culverts.
	08.04 Direct the movement of water away from installations.
09.0	Protect plants and equipment from adverse weather – the student will be able to:
	09.01 Monitor and interpret weather forecasts.
	09.02 Supervise procedures for protecting plants and equipment from adverse weather.
	09.03 Compare cost and efficiency of various methods of protecting plants and equipment from adverse weather.
10.0	Maintain and analyze records – the student will be able to:
	10.01 Maintain fertilizer and pesticide application records.
	10.02 Keep equipment maintenance and service records.
	10.03 Maintain sales and production records.
	10.04 Record labor and personnel information.
	10.05 Keep inventory records.
	10.06 Analyze cost and effectiveness of management practices.
	10.07 Determine plant production cost.

	10.08 Determine insurance needs.
	10.09 Prepare an annual budget.
	10.10 Prepare a five-year projection plan.
	10.11 Maintain accounts-receivable and accounts-payable records.
	10.12 Use computers in the landscape and horticulture operations.
11.0	Demonstrate employability skills – the student will be able to:
	11.01 Conduct a job search.
	11.02 Secure information about a job.
	11.03 Identify documents that may be required when applying for a job.
	11.04 Complete a job application form.
	11.05 Demonstrate competency in job interview techniques.
	11.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other person.
	11.07 Identify acceptable work habits.
	11.08 Demonstrate knowledge of how to make job changes.
	11.09 Demonstrate acceptable employee health habits.
12.0	Demonstrate managerial and supervisory skills – the student will be able to:
	12.01 Instruct employees in their tasks.
	12.02 Prepare daily work plans.
	12.03 Enforce safety regulations.
	12.04 Develop an outline for a policy manual.
	12.05 Organize and conduct employee training.
	12.06 Conduct employee grievance procedures.
	12.07 Evaluate performance of employees.

12.08	Prepare job descriptions.
12.09	Conduct job interviews.
12.10	Demonstrate effective communication skills.
12.11	Demonstrate computer literacy as related to landscape and horticulture operations.
Horticulture Specialization:	
13.0	Prepare growing media and seedbeds – the student will be able to:
13.01	Identify media materials.
13.02	Mix rooting and growing media according to plant requirements.
13.03	Sterilize rooting, potting, and growing media.
13.04	Collect and test a soil sample from field and potting media.
13.05	Adjust pH and nutritional levels of media.
13.06	Prepare planting beds and sites.
13.07	Fill and level benches and pots with media.
13.08	Demonstrate sanitation practices when handling and storing plant media materials.
14.0	Propagate plants – the student will be able to:
14.01	Collect propagation materials at proper time (seeds, cuttings, scions, bulbs, etc.).
14.02	Demonstrate propagation by grafting, budding, layering, separating, dividing, cutting, and tissue culturing.
14.03	Prepare flats and a seedbed and plant seeds.
14.04	Prepare a rooting bed.
14.05	Prepare propagation materials (seeds, cuttings, scions, etc.)
14.06	Apply growth stimulants to propagation materials.
14.07	Control propagation facility environment (moisture, temperature, light).
14.08	Transplant rooted propagation materials including tissue culture transplants.

	14.09 Describe advanced propagation techniques (tissue, culture, pre-germination, see irradiation, tree cuttings).
	14.10 Demonstrate sanitation and safety practices when propagating.
15.0	Grow plants – the student will be able to:
	15.01 Prepare media for containers.
	15.02 Prepare field site for transplants.
	15.03 Select plant containers.
	15.04 Determine plant spacing in the field and on container beds.
	15.05 Transplant propagated materials to various containers and to the field.
	15.06 Determine and provide light requirements of various plant types.
	15.07 Determine water requirements and apply water at proper rates.
	15.08 Identify weeds and apply herbicides.
	15.09 Determine fertilization requirements.
	15.10 Identify insect and insect-like disease problems and apply pesticides.
	15.11 Demonstrate safety practices when applying pesticides.
16.0	Protect plants and equipment from adverse weather – the student will be able to:
	16.01 Monitor and interpret weather forecasts.
	16.02 Supervise procedures for protecting plants and equipment from adverse weather.
	16.03 Compare cost and efficiency of various methods of protecting plants and equipment from adverse weather.
	16.04 List plants according to environmental tolerances (light, temperature, moisture, wind, salt, etc.).
17.0	Harvest, process, and ship plants – the student will be able to:
	17.01 Grade and harvest field-grown plants (ball, burlap, bare-root, “grow-bags”).
	17.02 Identify mechanical techniques for harvesting field-grown plants (tree spade and mechanical digger).
	17.03 Select, grade, and assemble container-grown plants.

	17.04 Prepare for shipment, loading, and transporting harvested plant materials.
	17.05 Use proper methods for preserving plant viability.
	17.06 Comply with regulation regarding the inspection and movement of plant materials.
	17.07 Demonstrate safety practices when harvesting, processing, and shipping nursery stock.
18.0	Market plants – the student will be able to:
	18.01 Identify, inventory, and label marketable plants.
	18.02 Identify market segments (commercial, residential, wholesale, retail, etc.)
	18.03 Identify methods of marketing (advertising, public relations, sales personnel, trade shows, etc.).
	18.04 Develop a marketing program (budget, displays, sales aids, price lists, etc.).
	18.05 Develop sales training program (product knowledge, customer relations, sales techniques, resource materials, etc.)
	18.06 Develop an annual sales calendar (seasonal sales, special promotion, etc.).
19.0	Design horticulture facilities – the student will be able to:
	19.01 Design a facility for propagating plants.
	19.02 Design a bedding-plants growing facility.
	19.03 Design a container growing facility.
	19.04 Design a field growing facility.
	19.05 Design a tropical foliage growing facility.
	19.06 Design a retail facility.
20.0	Design, install, and service nursery irrigation systems – the student will be able to:
	20.01 Determine irrigation requirements.
	20.02 Assess quality of irrigation water.
	20.03 Design and set up an irrigation system for propagation area, greenhouse or enclosed structure, shade house, retail display area, and field-growing area.
	20.04 Maintain electric and engine-driven pumps.

	20.05 Operate and service various types of irrigation systems.
	20.06 Calculate cost efficiency of irrigation system.
Landscape Specialization:	
21.0	Analyze and design the project (landscape and interiorscape) – the student will be able to:
	21.01 Determine the purpose, problems, or desired effect of the project.
	21.02 Analyze the environmental conditions of the landscape or interiorscape.
	21.03 Determine site analysis problems.
	21.04 Demonstrate working knowledge of Computer-Assisted Drafting (CAD) system.
	21.05 Design hardscape plan.
	21.06 Design and select appropriate plant materials for desired effect and function.
	21.07 Determine the method and form of presentation of the project.
22.0	Prepare, estimate, and establish contracts – the student will be able to:
	22.01 Develop a list of materials required for the project.
	22.02 Determine equipment needs.
	22.03 Estimate time and man hours.
	22.04 Determine cost of materials, equipment, and labor.
	22.05 Prepare a price for customer, based on specifications.
	22.06 Establish terms of a contract.
23.0	Analyze and organize the project – the student will be able to:
	23.01 Interpret plans and specifications.
	23.02 Identify safety requirements.
	23.03 Organize site preparation.
	23.04 Locate project materials.

	23.05 Determine personnel needs.
	23.06 Determine equipment needs.
	23.07 Establish project schedule.
24.0	Lay out and install landscape – the student will be able to:
	24.01 Locate existing utilities.
	24.02 Rough grade site.
	24.03 Install large materials.
	24.04 Install irrigation system.
	24.05 Construct hardscape (walls, walks, patio, drives, etc.)
	24.06 Lay out and install plants.
	24.07 Prepare interiorscape.
	24.08 Prepare final grade.
	24.09 Install lawns.
	24.10 Install mulch.
	24.11 Perform final clean up.
25.0	Plan and install a drainage system – the student will be able to:
	25.01 Plan the construction of an underground drainage system.
	25.02 Estimate and order appropriate fill materials.
	25.03 Establish proper elevations and grade a landscape site.
	25.04 Read soil and contour maps.
26.0	Maintain customer relations and observe follow-up procedures – the student will be able to:
	26.01 Conduct walk-through of project with client to ensure satisfaction.
	26.02 Identify current and future maintenance requirements.

	26.03 Analyze project records for profitability and employee performance.
27.0	Maintain landscape plants – the student will be able to:
	27.01 Determine water requirements and apply at proper rates.
	27.02 Identify weeds and apply herbicides safely.
	27.03 Determine fertilization requirements and apply at proper rates.
	27.04 Regulate growth of landscape plants through chemical or mechanical needs.
	27.05 Maintain turf viability (mow at proper height and frequency, aerate, edge, clip, and remove trash).
	27.06 Identify plant pest problems and apply corrective measures.
	27.07 Cultivate and mulch plants.
	27.08 Brace and repair trees.
28.0	Select, operate, and maintain landscape tools and equipment – the student will be able to:
	28.01 Determine equipment needs for the company.
	28.02 Select and operate equipment for the job.
	28.03 Supervise the service and maintenance of service equipment.
	28.04 Supervise the repair and maintenance of facilities.
	28.05 Instruct and supervise employees in the safe use of tools and equipment.
	28.06 Maintain an inventory of parts and supplies.
29.0	Plan, install, and service landscape irrigation systems – the student will be able to:
	29.01 Determine irrigation requirements.
	29.02 Assess quality of irrigation water.
	29.03 Plan an irrigation system.
	29.04 Supervise the installation of irrigation equipment.
	29.05 Service and maintain electric engine-driven pumps.

29.06	Operate and service low-volume irrigation system.
29.07	Operate and service overhead irrigation system.
29.08	Operate and maintain automatic system.
29.09	Calculate cost efficiency of an irrigation system.
29.10	Design and underground drainage system.

Additional Information

Laboratory Activities

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Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Landscape and Horticulture Professional (0101060504) – 18 credit hours
Landscape and Horticulture Specialist (0101060503) – 12 credit hours
Landscape and Horticulture Technician (0101060505) – 30 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Golf Course Operations**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101060701
Program Type	College Credit
Standard Length	69 credit hours
CTSO	N/A
SOC Codes (all applicable)	37-1012 - First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to supervise and manage the operations of a golf course. Instruction includes equipment management, pest control, fertilization, care, irrigation, record keeping, safety, laws and regulations, as well as leadership, public relations, human relations, employability and communication skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 69 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Supervise and manage the operation, maintenance and repair of golf course equipment.
02.0 Schedule irrigation and manage the design, installation and maintenance of golf course irrigation systems.
03.0 Prescribe, supervise and manage the application of agricultural chemicals for the prevention and control of pests.
04.0 Prescribe, supervise and manage the fertilization of turf and landscape.
05.0 Train and supervise employees in grooming and maintaining greens, tees, fairways, roughs and other areas.
06.0 Provide a safe environment for workers and patrons.
07.0 Keep and analyze maintenance, employee, equipment and inventory records.
08.0 Analyze and incorporate technical information into management practices
09.0 Observe local, state and federal laws and regulations.
10.0 Demonstrate leadership, communication, public relations, employability and human relations skills.

Florida Department of Education
Student Performance Standards

Program Title: Golf Course Operations
CIP Number: 1101060701
Program Length: 69 credit hours
SOC Code(s): 37-1012

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Supervise and manage the operation, maintenance and repair of golf course equipment--The student will be able to:
01.01	Define the role of the golf course equipment mechanic in relation to the organization.
01.02	Determine the essential power, shop and hand tools required in a golf course mechanics shop.
01.03	Design a shop layout.
01.04	Compile a list of equipment required in the operation of an 18-hole golf course.
01.05	Demonstrate knowledge and use of golf course equipment.
01.06	Develop and supervise a system of preventive maintenance.
01.07	Sharpen and grind blades and cutting surfaces on all mowing equipment.
01.08	Trouble-shoot and repair golf course equipment.
01.09	Demonstrate gas and electric arc welding techniques on golf course equipment.
01.10	Compile, stock and manage a parts inventory.
01.11	Monitor and record the use of fuel, lubricants and consumable shop supplies.
01.12	Maintain a safe clean shop.
01.13	Maintain current catalogs and online resources for supplies and equipment.
01.14	Maintain tires and tire pressure on golf course equipment.
01.15	Train and supervise employees in the safe use of tools and equipment.
02.0	Schedule irrigation and manage the design, installation and maintenance of golf course irrigation systems--The student will be able to:

02.01	Determine water requirements for a particular turf.
02.02	Analyze soil textures regarding their moisture holding capacities.
02.03	Analyze yearly, monthly and weekly rainfall amounts and distribution in various areas of Florida.
02.04	List the major water sources for irrigation purposes.
02.05	Operate and maintain hydraulically controlled, electrically controlled and thermo-hydraulically controlled irrigation valves.
02.06	Select and operate pumps used in sprinkler irrigation systems.
02.07	Illustrate the design, computations, pumping capacity and pipe sizing needed to irrigate a given operation.
02.08	Prepare a schedule for maintaining an irrigation system.
02.09	Schedule irrigation as required.
02.10	Manage drainage and run-off of excess rainfall.
03.0	Prescribe, supervise and manage the application of agricultural chemicals for the prevention and control of pests--The student will be able to:
03.01	Store and handle chemicals safely.
03.02	Recognize symptoms of agricultural chemical poisoning and apply first aid.
03.03	Dispose of chemical containers.
03.04	Read and interpret safety precautions provided on equipment and pesticide containers.
03.05	Instruct employees in the safe use of agricultural chemicals.
03.06	Select and check personal safety equipment.
03.07	Prepare proper proportions of chemicals and carrying agents.
03.08	Check application equipment for malfunction and wear.
03.09	Compute amounts of active ingredients of chemicals to be used.
03.10	Calibrate volume, pressure and output of equipment.
03.11	Weigh and measure chemicals.
03.12	Adjust height and width of equipment to achieve desired spray pattern.

	03.13 Recognize symptoms of pesticide damage.
	03.14 Identify fungi and bacteria.
	03.15 Recognize symptoms of insects and nematodes.
	03.16 Identify common insects, weeds, diseases and other pests common to golf courses.
	03.17 Clean and store sprayers.
	03.18 Develop a pest control management program following best management practices.
04.0	Prescribe, supervise and manage the fertilization of turf and landscape--The student will be able to:
	04.01 Take soil and leaf samples for chemical analysis.
	04.02 Adjust pH level of soil.
	04.03 Interpret soil and tissue chemical analysis results.
	04.04 Apply fertilizer in liquid form.
	04.05 Interpret labels on fertilizer containers.
	04.06 Apply dry fertilizers.
	04.07 Identify nutrient deficiency symptoms in turf and landscape plants.
	04.08 Determine kind and type of fertilizer to apply to a given area.
	04.09 Determine the nutrient requirements of various plants.
	04.10 Determine amount of fertilizer to apply to a given area.
	04.11 Analyze cost of various formulations and methods of application.
	04.12 Recognize fertilizer injury to plant materials.
05.0	Train and supervise employees in grooming and maintaining greens, tees, fairways, roughs and other areas--The student will be able to:
	05.01 Supervise the mowing of greens, collars, roughs, aprons, and fairways.
	05.02 Determine the placement and location of cups and tees.
	05.03 Supervise the repair of divots.

	05.04 Determine conditions necessary for verticuting and aerifying turf.
	05.05 Supervise the care and maintenance of sand traps.
	05.06 Prune trees and shrubs.
	05.07 Supervise the maintenance of water hazards.
	05.08 Develop maintenance schedule for grooming golf courses.
	05.09 Train and supervise employees in the care of golf courses.
	05.10 Follow written and verbal instructions.
06.0	Provide a safe environment for workers and patrons--The student will be able to:
	06.01 Provide instruction for the safe use of chemicals, tools and equipment.
	06.02 Inspect tools and equipment for safe operation.
	06.03 Apply emergency first aid.
	06.04 Post safety hazards.
	06.05 Monitor employees work habits.
	06.06 Maintain safety awareness.
07.0	Keep and analyze maintenance, employee, equipment and inventory records--The student will be able to:
	07.01 Maintain equipment use and maintenance records.
	07.02 Keep and file personnel records and information.
	07.03 Record and analyze time-on-task information.
	07.04 Maintain pesticide use information.
	07.05 Keep inventory records.
	07.06 Prepare a written report or summary based on records.
	07.07 Observe and make recommendations based on records.
	07.08 Evaluate employees, equipment and practices based on records.

	07.09 Develop annual budget for complete operation.
	07.10 Keep and file guarantees, warrantees, service contracts and operators manuals.
08.0	Analyze and incorporate technical information into management practices--The student will be able to:
	08.01 Maintain a current file of technical information.
	08.02 Update skills and knowledge through workshops and seminars.
	08.03 Analyze data relative to operation.
	08.04 Assess new materials, chemicals and procedures based on research or technical information.
	08.05 Interpret technical information relative to operation.
09.0	Observe local, state and federal laws and regulations--The student will be able to:
	09.01 Observe OSHA rules and regulations.
	09.02 Observe EPA rules and regulations.
	09.03 Secure and maintain permits, certificates and licenses appropriate to operation.
	09.04 Observe stream and groundwater regulations.
	09.05 Recognize responsibilities and liabilities of occupation or position.
	09.06 Maintain a list of agencies responsible for regulating the industry.
10.0	Demonstrate leadership, communication, public relations, employability and human relations skills--The student will be able to:
	10.01 Conduct a job search.
	10.02 Secure information about a job.
	10.03 Identify documents that may be required when applying for a job.
	10.04 Complete a job application form correctly.
	10.05 Demonstrate competence in job interview techniques.
	10.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	10.07 Identify acceptable work habits.

10.08	Demonstrate knowledge of how to make job changes appropriately.
10.09	Demonstrate acceptable employee health habits.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Zoo Animal Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101099901
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	39-2011 - Animal Trainers 19-1023 - Zoologists and Wildlife Biologists 39-2021 - Nonfarm Animal Caretakers 45-2021 - Animal Breeders 33-9011 - Animal Control Officers 45-2093 - Farmworkers, Farm, Ranch, and Aquacultural Animals

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to supervise and coordinate the activities of workers engaged in the care and exhibition of birds and animals. Subject matter also includes safety, diseases and parasites, feeding and nutrition, maintenance and repair, animal behavior, as well as leadership, communications, employability, human and public relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 66 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Prevent, treat and control diseases and parasites of animals.
02.0 Demonstrate interpretation and guest service skills
03.0 Develop and maintain Animal Management Techniques
04.0 Manage animal nutrition and feeding.
05.0 Operate and maintain instruments and equipment.
06.0 Provide first aid for animals.
07.0 Collect laboratory specimens.
08.0 Analyze and keep records.
09.0 Manage animal, visitor and worker safety.
10.0 Identify animal species.
11.0 Interpret and observe laws, rules and regulations relative to operation.
12.0 Dispense medicine and supplies.
13.0 Manage, maintain and repair facilities.
14.0 Demonstrate leadership, employability, communication, human and public relations skills.
15.0 Observe and interpret animal behavior.

Florida Department of Education
Student Performance Standards

Program Title: Zoo Animal Technology
CIP Number: 1101099901
Program Length: 66 credit hours
SOC Code(s): 19-1023, 39-2011, 39-2021

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Prevent, treat and control diseases and parasites of animals – the student will be able to:
01.01	Observe animals daily for symptoms of disease and parasites.
01.02	Recognize signs of disease requiring the quarantine or isolation of animals.
01.03	Vaccinate animals.
01.04	Provide special nutritional care for animals as required.
01.05	Maintain a quarantine program for new animal populations.
01.06	Perform pest control program.
01.07	Differentiate and treat trauma, nutritional disorders, infections, poisoning, zoonotic and genetic diseases.
01.08	Properly handle mortality cases for disposal or necropsy.
01.09	Practice basic cleanliness and orderliness in and around animal enclosures.
01.10	Identify specific sanitation procedures applicable to managing the collection and the various situations they would be used: quarantine, medical building, kitchen, public areas, storage buildings.
01.11	Properly dispose of animal waste, used food items and plant material.
02.0	Demonstrate interpretation and guest service skills – the student will be able to:
02.01	Handle guest questions and situations.
02.02	Interact with zoo guests in a positive and enthusiastic manner.
02.03	Understand their audience based on age, interest level and learning style.

	02.04 Communicate appropriately to all audiences.
	02.05 Uses and understands interpretative techniques.
	02.06 Demonstrate passion and professionalism.
	02.07 Create and deliver oral presentations.
	02.08 Interpret zoo policies to non-zoo staff.
03.0	Develop and maintain Animal Management Techniques – the student will be able to:
	03.01 Maintain environmental conditions required by species.
	03.02 Provide pre-natal and post-partum care for animals.
	03.03 Facilitate the breeding of various species.
	03.04 Identify and use techniques and equipment for the capture and restraint of animals.
	03.05 Identify circumstances justifying the capture and restraint of animals.
	03.06 Transport animals safely.
	03.07 Accurately collect and record various animal measurements.
04.0	Manage animal nutrition and feeding – the student will be able to:
	04.01 Identify and feed appropriate plant material.
	04.02 Prepare and dispense appropriate diets to maintain various species in captivity.
	04.03 Properly store, inventory and maintain animal food supplies.
	04.04 Recognize the need to adjust animal diets based on various factors such as breeding season, environmental changes, census changes and life stage.
	04.05 Present food to animals in the appropriate manner.
	04.06 Understand basic nutritional requirements of various animal species in the wild and in captivity.
05.0	Operate and maintain instruments and equipment – the student will be able to:
	05.01 Operate and maintain scales and balances.
	05.02 Identify, operate and maintain clinical instruments.

	05.03 Use and maintain capture and restraint equipment.
	05.04 Operate communications equipment.
	05.05 Identify and safely use hand and power tools.
06.0	Provide first aid for animals – the student will be able to:
	06.01 Identify injuries requiring first aid and provide emergency treatment.
	06.02 Prepare and maintain first aid equipment and supplies.
	06.03 Identify injuries requiring services of a veterinarian.
07.0	Collect laboratory specimens – the student will be able to:
	07.01 Collect urine specimens.
	07.02 Collect fecal specimens.
	07.03 Collect environmental samples.
	07.04 Properly package and handle specimens for shipment or analysis.
08.0	Analyze and keep records – the student will be able to:
	08.01 Keep exhibit maintenance records.
	08.02 Keep personnel records.
	08.03 Keep and maintain animal medical records.
	08.04 Keep record of animal feeding and diet.
	08.05 Maintain animal behavioral records.
	08.06 Keep records of chemical, pesticide and medication use.
09.0	Manage animal, visitor and worker safety – the student will be able to:
	09.01 Maintain the safety of animals.
	09.02 Manage and maintain safety of visitors.
	09.03 Handle animals in a safe and cautious manner.

	09.04 Operate tools and equipment in a safe manner.
	09.05 Prepare for and respond to emergencies.
10.0	Identify animal species – the student will be able to:
	10.01 Classify animals according to habitat and nutritional requirements.
	10.02 Recognize morphological characteristics of major animal groups.
	10.03 Identify animals to genus and species.
	10.04 Identify species of animals in specific collections.
11.0	Interpret and observe laws, rules and regulations relative to operation – the student will be able to:
	11.01 Observe local, state, federal and international laws and regulations.
	11.02 Maintain facilities up to standards of licenses, certificates, bonds and permits.
	11.03 Describe the regulation process.
	11.04 Identify agencies regulating the profession.
	11.05 Identify agencies accrediting the facility.
12.0	Dispense medicine and supplies – the student will be able to:
	12.01 Follow verbal and written instructions when administering medications.
	12.02 Interpret instructions and warnings on the labels of medicines and chemicals.
	12.03 Maintain security of medicines and chemicals.
	12.04 Identify medicines and chemicals commonly used in the profession.
	12.05 Carefully mix, measure and dispense medications.
	12.06 Maintain inventory of supplies and medications.
13.0	Manage, maintain and repair facilities – the student will be able to:
	13.01 Maintain grounds, facilities and exhibits according to master plan.
	13.02 Operate grounds keeping equipment.

	13.03 Paint wood, metal and masonry surfaces.
	13.04 Perform repairs on wooden structures.
	13.05 Observe safety precautions.
14.0	Demonstrate leadership, employability, communication, human and public relations skills – the student will be able to:
	14.01 Conduct a job search.
	14.02 Secure information about a job.
	14.03 Identify documents that may be required when applying for a job.
	14.04 Complete a job application form correctly.
	14.05 Demonstrate competence in job interview techniques.
	14.06 Respond positively to criticism from employer, supervisor, or other persons.
	14.07 Establish acceptable work habits: communication, time management, awareness, appropriate initiative, and responsibility
	14.08 Practice acceptable employee health habits.
15.0	Observe and interpret animal behavior – the student will be able to:
	15.01 Recognize animal breeding behavior.
	15.02 Provide appropriate breeding environment for animals.
	15.03 Identify behavior of pre and post parturition animals.
	15.04 Describe behavioral changes due to aging.
	15.05 Recognize normal behavioral characteristics of animals through observations.
	15.06 Identify behavioral problems.
	15.07 Describe training of animals and correction of behavior problems.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: **Biomass Cultivation**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101110302
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-4011 - Agricultural and Food Science Technicians 45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse 19-4099 - Precision Agriculture Technicians 45-2091 - Agricultural Equipment Operators 11-9013 - Farmers, Ranchers, and Other Agricultural Managers

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to manage land, water, machinery, financing, crops and facilities as well as make contracts, manage taxes, keep records, analyze records and technical reports, and demonstrate leadership, employability, communication and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Distinguish varieties of energy grasses.
02.0 Manage crops.
03.0 Manage machinery and equipment.
04.0 Demonstrate safe chemical handling and chemical waste removal.
05.0 Manage facilities.
06.0 Select sources and methods of financing the operation.
07.0 Keep and analyze production and financial records.
08.0 Market crops.
09.0 Interpret technical information and incorporate it into managerial practices.
10.0 Integrate state and federal regulations into operation.
11.0 Demonstrate leadership, communication, employability and human relations skills.

Florida Department of Education
Student Performance Standards

Program Title: **Biomass Cultivation**
CIP Number: **1101110302**
Program Length: **60 credit hours**
SOC Code(s): **19-4011, 45-2092, 19-4099, 45-2091, 11-9013**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Distinguish varieties of energy grasses – the student will be able to:
	01.01 List species used as bioenergy feedstock.
	01.02 Compare and contrast morphology and anatomy of energy grass species.
	01.03 Explain how biological features of energy grasses are important for cellulosic bioethanol production.
02.0	Manage crops – the student will be able to:
	02.01 Prepare a land use plan.
	02.02 Determine long-range conservation practices.
	02.03 Prepare soil for crops.
	02.04 Select crop varieties best suited for land, market and type of farm operation.
	02.05 Determine seeding/planting rate and spacing.
	02.06 Calibrate and adjust planting equipment.
	02.07 Plant crops.
	02.08 Select appropriate cultural practices including cultivation, fertilization and irrigation.
	02.09 Identify and control diseases, insects and pests.
	02.10 Determine maturity of crops.
	02.11 Harvest crops.
	02.12 Store crops.

	02.13 Determine the most advantageous method of marketing crops.
03.0	Manage machinery and equipment – the student will be able to:
	03.01 Assess needs for the purchases of new or replacement equipment.
	03.02 Maintain oil, fuel and hydraulic levels in equipment.
	03.03 Maintain tires, batteries and coolant system on all equipment and vehicles.
	03.04 Operate and service small gasoline engines.
	03.05 Replace hoses, belts and lines.
	03.06 Cut and weld with oxy-acetylene and arc welding equipment.
	03.07 Observe safety procedures when operating farm equipment.
	03.08 Develop a general maintenance schedule.
04.0	Demonstrate safe chemical handling and chemical waste removal – the student will be able to:
	04.01 Maintain records per state and federal regulations.
	04.02 Know and practice chemical handling according to the guidelines established by Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA).
	04.03 Demonstrate safe waste disposal practices.
05.0	Manage facilities – the student will be able to:
	05.01 Safely operate and maintain general farm shop tools and equipment.
	05.02 Install and maintain electrical wiring and equipment.
	05.03 Determine a bill of materials for a farm construction project.
	05.04 Build and repair fences.
	05.05 Develop a general maintenance schedule for facilities and equipment.
06.0	Select sources and methods of financing the operation – the student will be able to:
	06.01 List major sources of production credit.
	06.02 List sources of credit for capital items and real estate.

	06.03 Prepare a case using accepted forms for obtaining credit from farm lending institutions.
07.0	Keep and analyze financial and production records – the student will be able to:
	07.01 Keep fertilization and pesticide use records.
	07.02 Keep equipment maintenance and service records.
	07.03 Record cultural and production information.
	07.04 Determine cost efficiency of operations.
	07.05 Prepare a farm tax return.
	07.06 Prepare an annual budget.
	07.07 Determine credit, cash flow and investment returns.
	07.08 Review sources and kinds of farm insurance.
08.0	Market crops – the student will be able to:
	08.01 Secure and interpret market information.
	08.02 Select marketing channels for greatest profit.
	08.03 Interpret elements of marketing agreements.
	08.04 Sell crops.
	08.05 Provide for transportation of product to market.
09.0	Interpret technical information and incorporate it into managerial practices – the student will be able to:
	09.01 Keep and maintain a file of current technical information from universities, governmental and commercial agencies.
	09.02 Maintain a reference file for periodicals and other publications.
	09.03 Attend seminars and workshops to update skills and knowledge.
	09.04 Determine sources and advantages of using computer networking.
10.0	Integrate state and federal regulations into operation – the student will be able to:
	10.01 List agencies responsible for inspecting and regulating crop farming.

	10.02 Secure necessary inspection certificates and registrations.
	10.03 Identify reasons for the necessity of inspections, certifications and registrations.
11.0	Demonstrate leadership, communication, employability and human relations skills – the student will be able to:
	11.01 Develop citizenship awareness and responsibility.
	11.02 Demonstrate knowledge in organizing and conducting meetings.
	11.03 Demonstrate effective communication skills.
	11.04 Complete an employment application.
	11.05 Conduct a job search.
	11.06 Demonstrate job interview skills.
	11.07 Recognize appropriate work habits.
	11.08 Identify associations and societies associated with occupation.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Biomass Cultivation Specialist (0101110301) – 21 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Citrus Production Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1101110303
Program Type	College Credit
Standard Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to instruction that prepares individuals to produce citrus trees and fruit and manage services associated with citrus production. Subject matter includes pest control, propagation, nutrition, irrigation, equipment management and marketing, as well as leadership, communication, employability and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 62 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Classify and select citrus rootstocks and scions.
02.0 Identify varieties of citrus.
03.0 Manage the propagation of citrus.
04.0 Analyze nutritional disorders and develop a fertilization program.
05.0 Identify insects, diseases and other pathogens of citrus and develop a pest control management program.
06.0 Identify and control citrus weed problems.
07.0 Protect citrus from frost and freeze damage.
08.0 Calculate the irrigation requirements of citrus and manage an irrigation program.
09.0 Select, manage and maintain citrus production equipment.
10.0 Determine maturity and quality of citrus fruits.
11.0 Keep production, financial, personnel and maintenance records.
12.0 Market citrus nursery and grove products.
13.0 Manage the growth and culture of citrus.
14.0 Harvest citrus.
15.0 Interpret and incorporate technical information into management practices.
16.0 Demonstrate leadership, employability, communications and human relations skills.

Florida Department of Education
Student Performance Standards

Program Title: **Citrus Production Technology**
CIP Number: **1101110303**
Program Length: **60 credit hours**
SOC Code(s): **45-2092**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Classify and select citrus rootstocks and scions – the student will be able to:
01.01	Classify citrus rootstocks and scions according to taxonomy.
01.02	Select scion varieties best suited for specific soil types, rootstock compatibility, disease resistance, insect resistance, cold resistance and specific marketing purposes.
01.03	Select rootstocks best suited for specific soil types, scion compatibility, nematode resistance, insect resistance, cold resistance, disease and virus resistance and specific marketing purposes.
02.0	Identify varieties of citrus – the student will be able to:
02.01	Identify citrus fruit varieties by color, shape, texture, maturity, seeds and leaves.
02.02	Identify rootstock varieties by characteristic of fruit, leaves and stems.
03.0	Manage the propagation of citrus – the student will be able to:
03.01	Select a site for seedbeds and apply for site approval.
03.02	Supervise the preparation of site and plant certified seed.
03.03	Manage the culture and care of seedlings.
03.04	Select and cut certified budwood.
03.05	Manage the budding and wrapping of seedlings.
03.06	Train and supervise workers to maintain accurate records and counts in tagging and labeling rootstocks and scion varieties.
03.07	Supervise the culture and care of young budded nursery stock.
03.08	Supervise the digging and handling of nursery stock for potting or bareroot shipment.

	03.09 Maintain strict nursery sanitation practices.
04.0	Analyze nutritional disorders and develop a fertilization program – the student will be able to:
	04.01 Collect soil and plant tissue samples for analysis.
	04.02 Interpret results of soil and tissue analysis.
	04.03 Develop a fertilization program or schedule for grove and nursery.
	04.04 Identify nutritional disorders and deficiencies in grove and nursery.
	04.05 Calculate fertilization rates for citrus.
	04.06 Compare advantages and disadvantages of different sources and forms of plant nutrients.
	04.07 Calibrate fertilization equipment.
	04.08 Supervise application of fertilizer.
	04.09 Supervise cleaning and storage of fertilizer application equipment.
05.0	Identify insects, diseases and other pathogens of citrus and develop a pest control management program – the student will be able to:
	05.01 Identify insects, diseases and other pathogens of citrus.
	05.02 Determine extent and severity of pest infestation.
	05.03 Select and supervise the application of pesticides.
	05.04 Calibrate and adjust pesticide applications.
	05.05 Determine effectiveness of application or spray program.
	05.06 Develop a pest management program or schedule.
	05.07 Train workers in the safe use of pesticides.
	05.08 Recognize symptoms of pesticide poisoning and provide first aid.
	05.09 Safely dispose of pesticide containers.
	05.10 Observe and maintain grove and nursery sanitation practices.
	05.11 Supervise the cleaning and maintenance of pesticide application equipment.

06.0	Identify and control citrus weed problems – the student will be able to:
	06.01 Identify noxious weeds and vines of citrus.
	06.02 Select appropriate herbicide and supervise the application.
	06.03 Calibrate and adjust herbicide applicators.
	06.04 Develop a weed/vine control program or schedule.
	06.05 Determine appropriate conditions for effective and safe application of herbicides.
	06.06 Supervise mechanical weed and vine control.
07.0	Protect citrus from frost and freeze damage – the student will be able to:
	07.01 Monitor and interpret weather forecasts.
	07.02 Supervise the preparation and maintenance of grove, nursery and equipment for frost and freeze.
	07.03 Supervise procedures for protecting citrus from cold damage.
	07.04 Protect young trees from cold damage.
	07.05 Compare cost and efficiency of various methods of cold protection.
08.0	Calculate the irrigation requirements of citrus and manage an irrigation program – the student will be able to:
	08.01 Determine irrigation requirements.
	08.02 Plan an irrigation system.
	08.03 Supervise the installation of irrigation equipment.
	08.04 Service and maintain electric and engine driven pumps.
	08.05 Operate and service low volume irrigation system.
	08.06 Operate and service overhead irrigation system.
	08.07 Calculate cost efficiency of irrigation system.
09.0	Select, manage and maintain citrus production equipment – the student will be able to:
	09.01 Determine the equipment requirements for the citrus operation.

	09.02 Compare cost, efficiency and maintenance requirements of various models and makes of equipment.
	09.03 Determine equipment replacement schedule.
	09.04 Develop a schedule for servicing of equipment.
	09.05 Instruct workers in the safe and efficient use of equipment.
	09.06 Supervise the maintenance and repair of citrus equipment.
	09.07 Keep maintenance records.
10.0	Determine maturity and quality of citrus fruit – the student will be able to:
	10.01 Determine solids using refractometer.
	10.02 Interpret results of citrus juice analysis.
	10.03 Estimate quality grade of product.
	10.04 Estimate date of maturity of fruit.
11.0	Keep production, financial, personnel and maintenance records – the student will be able to:
	11.01 Maintain fertilizer and pesticide application records.
	11.02 Make grove plats.
	11.03 Keep equipment maintenance and service records.
	11.04 Keep inventory records.
	11.05 Record production information.
	11.06 Record labor and personnel information.
	11.07 Analyze cost and effectiveness of management practices.
	11.08 Prepare written reports.
	11.09 Determine insurance needs.
12.0	Market citrus nursery and grove products – the student will be able to:
	12.01 Determine market for product.

	12.02 Maintain customer service relations.
	12.03 Arrange for transportation of product.
	12.04 Evaluate market.
	12.05 Interpret and analyze marketing contracts.
	12.06 Locate sources of marketing information services.
13.0	Manage the growth and culture of citrus – the student will be able to:
	13.01 Supervise daily operations.
	13.02 Determine work schedules.
	13.03 Inspect grove/nursery properties.
	13.04 Hire, train and dismiss employees.
	13.05 Determine cultural practices.
	13.06 Implement instructions and requests.
14.0	Harvest citrus – the student will be able to:
	14.01 Make arrangements for harvesting crop.
	14.02 Interpret and analyze harvesting contract.
	14.03 Monitor harvesting operation.
	14.04 Prepare contingency plans for harvesting citrus.
15.0	Interpret and incorporate technical information into management practices – the student will be able to:
	15.01 Observe local, state and federal pesticide regulations.
	15.02 Observe grove and nursery site regulations.
	15.03 Observe and interpret marketing restrictions and agreements.
	15.04 Interpret and observe certification, licensing and inspection requirements.
	15.05 List agencies responsible for the regulation of the citrus industry.

	15.06 Attend workshops and seminars to upgrade skills and knowledge.
	15.07 Maintain a file for technical information, periodicals and other publications.
	15.08 Determine sources of up-to-date information and services.
	15.09 List societies, organizations and associations related to occupation or profession.
16.0	Demonstrate leadership, employability, communications and human relations skills – the student will be able to:
	16.01 Conduct a job search.
	16.02 Secure information about a job.
	16.03 Identify documents that may be required when applying for a job.
	16.04 Complete a job application form correctly.
	16.05 Demonstrate competence in job interview techniques.
	16.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	16.07 Identify acceptable work habits.
	16.08 Demonstrate knowledge of how to make job changes appropriately.
	16.09 Demonstrate acceptable employee health habits.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

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Florida Department of Education
Curriculum Framework

Program Title: **Marine Environmental Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1103060100
Program Type	College Credit
Standard Length	62 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-2041 - Environmental Scientists and Specialists, Including Health

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

This degree is designed to prepare students for a diverse set of employment opportunities in the field of marine environmental technology and other marine-oriented careers. During the program students will acquire the skills and knowledge necessary to enter the work force in a variety of marine oriented careers including technicians at environmental or research laboratories, environmental consulting industries, aquaculture/mariculture facilities, ecotourism, or marine conservation and restoration projects.

The purpose of this program is to provide technician level training and supply skilled employees for the growing workforce demand in marine related environmental industries. Graduates of this program will obtain the fundamental academic skills necessary to be successful at the technician level and demonstrate an understanding of the fundamental concepts behind marine environmental science. Graduates will demonstrate the ability to: (1) collect marine related data above and below the water (i.e. on scuba), (2) write technical reports, (3) navigate and operate marine vessels, and (4) understand basic business and management concepts.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 62 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

A. MET Core Learning Outcomes:

01.0 Demonstrate proficiency in underwater scientific research and marine data collection methods.
02.0 Demonstrate an understanding of the basic knowledge and practices that form the foundation of the marine sciences.
03.0 Compose scientific and/or technical reports.
04.0 Demonstrate basic knowledge and skills necessary to operate and maintain marine vessels.
05.0 Demonstrate an understanding of marine ecosystems, environmental management, and resource conservation
06.0 Demonstrate an understanding of the fundamental principles of biology.
07.0 Comprehension of fundamental principles governing business and entrepreneurship.
08.0 Demonstrate an understanding of the fundamental principles of marine aquaculture.

B. Marine Assessment and Restoration Specialization Learning Outcomes:

09.0 Demonstrate a basic knowledge and understanding of specific marine habitat assessment protocols.
10.0 Demonstrate a basic knowledge and understanding of several marine habitat restoration protocols.

C. Marine Mammal Specialization Learning Outcomes:

11.0 Demonstrate an understanding of the fundamental principles of marine mammal anatomy and evolution.
12.0 Demonstrate basic knowledge of marine mammal social structure and culture.
13.0 Demonstrate proficiency of basic marine mammal training and husbandry techniques.
14.0 Demonstrate knowledge of principle marine mammal laws and regulations.
15.0 Describe and discuss research focused on marine mammals.
16.0 Demonstrate knowledge of conservation issues involving marine mammals
17.0 Demonstrate an understanding of the guiding principles and practices of marine mammals in human care.

D. Marine Aquaculture Specialization Learning Outcomes:

18.0 Demonstrate a thorough knowledge of aquaculture best management practices.
19.0 Identify and diagnose common diseases and parasites that infect marine aquaculture organisms.
20.0 Demonstrate a moderate understanding of marine aquaculture systems.
21.0 Recognize appropriate nutritional requirements for the most common marine aquaculture organisms.
22.0 Demonstrate a basic understanding of marine aquaculture husbandry principles and practices.

Florida Department of Education
Student Performance Standards

Program Title: Marine Environmental Technology
CIP Number: 1103030100
Program Length: 62 credit hours
SOC Code(s): 19-2041

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
MET Core Learning Outcomes:	
01.0	Demonstrate proficiency in underwater scientific research and marine data collection methods – the student will be able to:
01.01	Demonstrate knowledge and competence at research diving techniques and procedures to support scientific research projects.
01.02	Demonstrate the use of transects and quadrants to quantify the distribution and abundance of sessile marine organisms within a defined research area.
01.03	Demonstrate methods for conducting quantitative surveys the distribution and abundance of fishes within a defined research area.
01.04	Demonstrate state-of-the-art underwater data collection, recording and preservation procedures necessary to support biological and archaeological research.
01.05	Demonstrate the basic knowledge necessary to conduct statistical analysis of the scientific data collected.
01.06	Synthesize what was learned about research diving and other data collection techniques through a presentation, project or case study.
02.0	Demonstrate an understanding of the basic knowledge and practices that form the foundation of the marine sciences – the student will be able to:
02.01	Define plate tectonic theory and distinguish between types of plate boundaries.
02.02	Illustrate the features of the sea floor that arise from tectonic activity.
02.03	Identify key oceanographic terms and apply them in discussion.
02.04	Describe the processes that created the earth and the ocean.
02.05	Explain how the physical and chemical properties of seawater are important in understanding the ocean.
02.06	Compare the physical, chemical and biological processes that affect the origin, transport and deposition of sediment.
02.07	Summarize the role of the ocean in weather and climate.

	02.08 Explain the mechanisms that create both surface and sub-surface ocean currents.
	02.09 Define four types of ocean waves and identify the forces that generate them.
	02.10 Explain how the ocean determines the shape, features and composition of the coast line.
	02.11 Describe the Scientific Method, and explain the nature and limitations of scientific investigation.
	02.12 Recognize and explain the basic features that define and differentiate major marine phyla.
	02.13 Describe the role of microbes in the ocean.
	02.14 Describe the major anatomical features and physiologic systems of bony and cartilaginous fishes.
	02.15 Explain the functional role of marine reptiles, seabirds and mammals in the marine environment.
03.0	Compose scientific and/or technical reports – the student will be able to:
	03.01 List the typical components of a peer-reviewed scientific article.
	03.02 Explain the peer-review process of publishing a scientific article.
	03.03 Explain the function of each section of a scientific paper or technical report.
	03.04 Critically analyze a scientific paper describing its thesis, methods, results and conclusions.
	03.05 Create at least two reports formatted according to a scientific publishing format.
04.0	Demonstrate basic knowledge and skills necessary to operate and maintain marine vessels – the student will be able to:
	04.01 Demonstrate coastwise navigation techniques using both dead reckoning and electronic methods.
	04.02 Demonstrate competence at using basic knots and marlinspike skills.
	04.03 Demonstrate mastery of the navigational “Rules of the Road” through the safe operation of a small vessel.
	04.04 Demonstrate proper man-overboard recovery procedures.
	04.05 Explain the concepts of stability, trim and hull form as they relate to vessel operation.
	04.06 Demonstrate basic safe boat handling skills.
	04.07 Demonstrate proper procedures for docking, anchoring, rafting and mooring a vessel.
	04.08 Explain the appropriate response to vessel emergencies such as stranding, fire and damage containment.

	04.09 Demonstrate proper marine radio operating procedures.
05.0	Demonstrate an understanding of marine ecosystems, environmental management, and resource conservation – the student will be able to:
	05.01 Explain the essential components of ecology, and how energy flows through an ecosystem.
	05.02 Explain the functional role of primary producers in the marine environment, and identify common species of marine plants and algae.
	05.03 Explain the essential components of intertidal ecology, and how energy flows through various types of intertidal ecosystems.
	05.04 Describe the features and functional systems in the intertidal, neritic, epipelagic and deep ocean regions.
	05.05 Explain the basic functional ecology and energy flow on a coral reef.
	05.06 List the various resources humans derived from the sea and what problems this presents.
	05.07 Explain how humankind has and continues to impact the marine environment.
	05.08 Describe methods and best practices currently in use to conserve marine ecosystems including but not limited to as marine spatial planning, integrated coastal zone management and marine protected areas.
	05.09 Explain the concepts of “Tragedy of the Commons” and “Precautionary Principle” as they relate to marine ecosystem and resource conservation.
06.0	Demonstrate an understanding of the fundamental principles of biology – the student will be able to:
	06.01 Describe the requirements/ingredients of life, its associated “machinery” and the special challenges of living in the sea.
	06.02 Identify biological processes including photosynthesis/chemosynthesis, respiration, and homeostasis.
	06.03 Explain the basic structure, growth, metabolism, reproduction, physiology, and genetics of cells and organisms.
	06.04 Recognize evolutionary relationships and diversity among living organisms, and appreciate the importance of biodiversity.
	06.05 Explain the characteristics and distinctive features of the domains and kingdoms of life.
	06.06 Identify and classify organisms within major taxonomic groups.
	06.07 Demonstrate basic biological laboratory techniques including the use of a microscope.
	06.08 Interpret laboratory data and summarize the results.
	06.09 Demonstrate the problem solving and critical thinking skills needed to assess and solve biologically-based questions.
07.0	Comprehension of fundamental principles governing business and entrepreneurship – the student will be able to:
	07.01 Demonstrate a familiarity of entrepreneurship by understanding the characteristics and mindset of entrepreneurs.

07.02	Identify and evaluate opportunities within the marketplace, both for new venture creation and within existing organizations.
07.03	Create the tools necessary to act on an entrepreneurial opportunity by writing a business plan, building a management team, financing the opportunity and creating an innovative marketing plan.
07.04	Describe successful strategies and common mistakes made by successful entrepreneurs.
07.05	Describe the legal requirements and obstacles in starting a business venture.
08.0	Demonstrate an understanding of the fundamental principles of marine aquaculture – the student will be able to:
08.01	Demonstrate a basic understanding of marine aquaculture husbandry principles and practices.
08.02	Demonstrate the skills required to culture phytoplankton and zooplankton required for larval rearing.
08.03	Describe the basic types of marine aquaculture systems.
08.04	Describe the various types of common organisms and techniques currently used during marine aquaculture operations.
08.05	Demonstrate a basic knowledge of common diseases and parasites during marine aquaculture and methods for their control.
Marine Assessment and Restoration Specialization Learning Outcomes:	
09.0	Demonstrate a basic knowledge and understanding of specific marine habitat assessment protocols – the student will be able to:
09.01	Describe specific marine habitat assessment methods.
09.02	Demonstrate a basic understanding of biodiversity concepts and assessment methods.
09.03	Identify and quantify marine organisms in specific marine habitats.
09.04	Perform successful marine habitat assessments.
10.0	Demonstrate a basic knowledge and understanding of several marine habitat restoration protocols – the student will be able to:
10.01	Understand the criteria used to identify areas where habitat restoration is required.
10.02	Describe specific marine habitat restoration methods.
10.03	Obtain (e.g. culture) organisms for restoration.
10.04	Perform successful marine habitat restorations.
Marine Mammal Specialization Learning Outcomes:	
11.0	Demonstrate an understanding of the fundamental principles of marine mammal anatomy and evolution – the student will be able to:

	11.01	Demonstrate an understanding of the external and internal aspects of dolphin anatomy and physiology, and their role in the successful survival of a mammal in the marine environment.
	11.02	Demonstrate knowledge of the anatomy and evolution of various marine mammals including other cetaceans, pinnipeds and sirenians.
	11.03	Demonstrate knowledge of the evolution of marine mammals.
12.0	Demonstrate basic knowledge of marine mammal social structure and culture – the student will be able to:	
	12.01	Demonstrate an understanding of basic dolphin ecology as related to communication, foraging, reproduction, calf rearing and social structure.
	12.02	Explain and outline marine mammal maternal characteristics, behaviorism human care and the wild, as well as prenatal care, birthing situations and maternity care of mother and neonate human care facilities.
	12.03	Explain how the natural social ecology of dolphins and the importance and impact of it on how they are managed at human care facility.
	12.04	Demonstrate an understanding of the basic social structure of other representative marine mammal taxa.
	12.05	Demonstrate how the term “culture” has been theorized to apply to certain aspects of cetacean societies and how that impacts our understanding of their cognition.
	12.06	Understand the portrayal of marine mammals in the media and how and why it has changed over time.
	12.07	Understand the application of animal assistance to humans throughout history and the more recent use of marine mammals in military service and how the latter has greatly contributed to our essential knowledge base of marine mammals overall.
13.0	Demonstrate proficiency of basic marine mammal training and husbandry techniques – the student will be able to:	
	13.01	Understand the philosophy and techniques of operant (behavioral) conditioning, with a focus on positive reinforcement in training behavior and its application to working with dolphins.
	13.02	Demonstrate operant conditioning techniques through the use of learned hand signals in communicating requests for various trained behaviors from the dolphin.
	13.03	Apply skills learned in animal care, handling and reinforcement during a live animal presentation for the general public.
	13.04	Construct a plan for basic marine mammal care, dietary and medical needs, and animal handling.
	13.05	Understand the medical issues unique to marine mammals, methods of treatment of bacterial, viral, fungal and parasitic disease, established preventive care practices.
	13.06	Demonstrate the use of operant conditioning in training a new behavior through outlining, developing, implementing and modifying a behavior chain through practical application with the animals.
	13.07	To sumarize the importance of voluntary medical behavior training, concepts and techniques used to desensitize animals to non-invasive medical equipment and rocedures. Understand the importance of the of trainer/animal relationship with regard to properly maintaining the health and well being of the animals.
	13.08	To investigate and understand the purpose and necessity of animal enrichment including cognitive, development, and social aspects. Design and implement enrichment activities to enhance the habitat and activities of the animals.
	13.09	To sumarize safety precautions and the social issues surrounding enrichment devices, habitat design, safety & maintenance social

		groupings, training and dolphin & sea lion nutrition & energetics.
	13.10	To critique various career pathways and opportunities available in the field of marine mammal care and training, including necessary academics, field experience, trainer forums, further experiential education in the field, networking, etc.
14.0	Demonstrate knowledge of principle marine mammal laws and regulations – the student will be able to:	
	14.01	Understand and explain the laws and regulating agencies, and their evolution, designed to protect marine mammals in both the wild and human care as well as regulate facilities.
	14.02	Understand the separate roles of both NOAA and the Department of Agriculture and how they impact marine mammals and marine mammal facilities.
15.0	Describe and discuss research focused on marine mammals – the student will be able to:	
	15.01	Describe the historical and current research efforts relating to dolphin cognition, behavior, acoustics, communication, strandings, physiology, reproduction and conservation.
	15.02	Sumarize basic medical procedures and the importance and implications of husbandry techniques to marine mammal research.
	15.03	Explain how research with dolphins in human care have expanded our understanding of their wild cousins and contributed to their conservation.
	15.04	Sumarize trends in basic dolphin ethology, past and ongoing studies related to cognition, behavior and communication and its application in research, as well as an understanding of passive observational data collection and facilitation of active cognitive research.
	15.05	Evaluate theories and research on dolphin echolocation and whistle production; implication of anthropogenic noise in the marine environment and ongoing research in the area.
	15.06	Conduct independent behavioral observations.
	15.07	Review research design and logistics as it applies to marine mammals in human care through a project design exercise conducted collaborativelythroughout the course, including an understanding of results analyses and interpretation.
	15.08	Critique career pathways and requirements toward becoming a marine mammal research scientist in human care settings (ex situ) and in the field (in situ).
16.0	Demonstrate knowledge of conservation issues involving marine mammals – the student will be able to:	
	16.01	Understand the current conservation issues of international/domestic concern which affect marine mammals and their environment, cumulative impacts both natural and human induced, as well asways in which individuals can affect the environment in a positive manner to conserve the species.
	16.02	Master the skills in synthesizing new information and experiences with prior conceptions of dolphins and the marine environment to clearly refine their opinions and knowledge base.
	16.03	Outline the organization of the Marine Mammal Stranding Network; procedures used in assisting and rehabilitating stranded marine mammals; international and domestic issues concerning threats to dolphins and the marine environment.
	16.04	List anthropogenic impacts affecting marine mammals and their environment, and demonstrate an understanding of research needed in this area, implications of impacts and associated research.
	16.05	Understand past and present state of whaling operations around the world and the processes and organizations that govern these activities.

	16.06 Understand status of certain endangered marine mammal species and conservation measures to sustain their populations.
17.0	Demonstrate an understanding of the guiding principles and practices of marine mammals in human care – the student will be able to:
	17.01 To diagram population management, including theories, tools and strategies for maintaining a population's genetic diversity and demographic stability in order to insure its long term persistence.
	17.02 Summarize specific concerns surrounding appropriate design, construction and maintenance of aquatic mammal habitats for marine mammals in human care.
Marine Aquaculture Specialization Learning Outcomes:	
18.0	Demonstrate a thorough knowledge of aquaculture best management practices – the student will be able to:
	18.01 Describe the concept of aquaculture Best Management Practices.
	18.02 Compile and analyze marine aquaculture industry management data.
	18.03 Identify and demonstrate proper use of key Quality Management tools.
	18.04 Develop and implement the key components and concepts of an aquaculture management plan.
19.0	Demonstrate a basic understanding of marine aquaculture husbandry principles and practices – the student will be able to:
	19.01 Identify the principles of water quality specific to marine aquaculture from a variety of marine taxa.
	19.02 Demonstrate a working knowledge of variety of husbandry techniques for most of the known marine species currently being cultured, including temperature and photoperiod control conducive to spawning and species specific life styles.
	19.03 Understand basic selective breeding techniques for enhanced phenotypic traits.
20.0	Identify and diagnose common diseases and parasites that infect marine aquaculture organisms – the student will be able to:
	20.01 Demonstrate an understanding of the basic principles of disease in marine aquatic systems.
	20.02 Demonstrate an understanding of how the culture environment is associated with the occurrence and outbreak of disease and parasites in marine aquaculture systems.
	20.03 Identify the differences between environmental, viral, bacterial, parasitic and fungal diseases of marine species.
	20.04 Demonstrate a basic understanding of methodologies for treatment of diseases commonly encountered during marine aquaculture operations.
	20.05 Demonstrate an understanding of the basic principles of marine aquatic health management and biosecurity.
21.0	Demonstrate a moderate understanding of marine aquaculture systems – the student will be able to:
	21.01 Describe the various types of marine aquaculture systems and demonstrate the ability to distinguish the primary components of specific marine aquaculture systems.

	21.02	Identify which systems are best for the culture and business model of the target species.
	21.03	Recognize the System requirements for Integrated Multi-Trophic Mariculture (IMTM) systems.
	21.04	Demonstrate an understanding of the impacts of specific marine aquaculture systems on the environment and especially marine ecosystems.
	21.05	Demonstrate basic skills for computer automated drafting.
22.0	Recognize appropriate nutritional requirements for the most common marine aquaculture organism – the student will be able to:	
	22.01	Recognize basic marine nutrient and biochemical energy fluxes (i.e. trophodynamics and bioenergetics) especially as they relate to species commonly associated with marine aquaculture.
	22.02	Demonstrate a rudimentary understanding of biochemistry (e.g. proteins, lipids, carbohydrates, etc.) and nutrient metabolism in common marine aquaculture species.
	22.03	Demonstrate an understanding of the metabolic role of vitamins and minerals and recognize symptoms of vitamin deficiency.
	22.04	Recognize appropriate feeding management practices based on metabolic requirements of marine aquaculture target species.
	22.05	Recognize the impacts of feeding strategies on the environment.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates

Marine Mammal Care and Basic Training (0103060101) – 15 credit hours
Tropical Ornamental Mariculture Technician (0103060102) – 30 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Daggered for deletion. Last year for new enrollment is 2019-20. Program will remain in inventory for teach-out projected for 2020-21. Last year to report enrollment is 2020-21

Program Title: **Turf Equipment Management**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1131030201
Program Type	College Credit
Standard Length	67 credit hours
CTSO	N/A
SOC Codes (all applicable)	49-3053 - Outdoor Power Equipment and Other Small Engine Mechanics

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to, instruction that prepares individuals to manage and maintain turf care equipment and to manage a shop facility. Instruction includes: hand tools, gasoline and diesel mechanics, paints and painting, sharpening and grinding, welding, hydraulics, electrical systems, training on specialized turf care equipment, record keeping, inventory control, safety, laws and regulations, public relations, human relations, shop management, professionalism, employability skills, communications skills, and management skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 67 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Disassemble, reassemble, adjust, repair, and diagnose the problems related to two and four-cycle engines.
02.0 Service electrical systems, fuels and lubricating systems, cooling systems, power train/hydraulic drives, and controls on turf equipment.
03.0 Adjust, sharpen, grind, and rebuild reel and rotary mowing units.
04.0 Demonstrate understanding of governmental regulations and compliances pertaining to golf courses.
05.0 Use shop tools and equipment, and organize a shop following appropriate safety, management, and inventory techniques.
06.0 Order and stock parts and keep shop records.
07.0 Perform basic welding tasks using both gas and arc welding techniques.
08.0 Identify and safely operate turf care equipment.
09.0 Demonstrate employability skills.
10.0 Identify the various professional organizations and publications that pertain to the turf management industry.
11.0 Design a functional golf course maintenance facility and select appropriate maintenance equipment.
12.0 Develop a preventive maintenance program for turf care equipment.
13.0 Develop human relations skills.
14.0 Perform decision making activities.
15.0 Identify and demonstrate management activities.
16.0 Develop a management and training program for new employees.
17.0 Identify turfgrasses used in the golf and landscape industry.
18.0 Develop a plan for the functional use of turf equipment management personnel.
19.0 Develop communications and business management skills.

Florida Department of Education
Student Performance Standards

Program Title: **Turf Equipment Technology**
CIP Number: **1131030201**
Program Length: **67 credit hours**
SOC Code(s): **49-3053**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Disassemble, reassemble, adjust, repair, and diagnose the problems related to two-cycle and four-cycle engines – the student will be able to:
	01.01 Evaluate horsepower and torque.
	01.02 Disassemble and reassemble a two-cycle and four-cycle engine.
	01.03 Identify crankcase and cylinder assembly.
	01.04 Identify and be able to assemble valves, piston assembly, crankshaft, cooling system, and air filters.
	01.05 Identify and assemble parts of the carburetor assembly.
	01.06 Identify and assemble the ignition system, governor, alternator, and starter system.
	01.07 Identify types of batteries.
	01.08 Follow safety rules and precautions when dealing with engines.
02.0	Service electrical systems, fuel and lubricating systems, power train/hydraulic drives, and controls on turf equipment – the student will be able to:
	02.01 Identify turf equipment electrical systems.
	02.02 Service hydraulic systems on a variety of turf equipment.
	02.03 Service turf equipment power train systems.
	02.04 Identify and service various lubricating systems and understand types of fuels and lubricants.
	02.05 Operate and repair the various mechanical and hydraulic controls on turf equipment.
	02.06 Repair the governor, ignition, alternator, and starter system on various pieces of turf equipment.

03.0	Adjust, sharpen, grind, and rebuild reel and rotary mowing units – the student will be able to:
	03.01 Repair and sharpen various types of reel mowers.
	03.02 Grind reel bedknives with various bedknife grinders.
	03.03 Lap reel mower blades.
	03.04 Follow safety procedures when using reel and bedknife grinders.
	03.05 Adjust reel mowers to produce proper cutting heights.
	03.06 Sharpen and balance rotary mower blades.
	03.07 Remove and replace rotary mower blades.
04.0	Demonstrate understanding of governmental regulations and compliances pertaining to golf courses – the student will be able to:
	04.01 Control pollution.
	04.02 Protect water quality.
	04.03 Demonstrate fire prevention methods.
	04.04 Identify and prevent health hazards and demonstrate proper first aid.
	04.05 Identify and manage hazardous waste on the golf course.
	04.06 Manage fertilizer storage demonstrating proper handling techniques.
	04.07 Demonstrate pesticide safety.
05.0	Use shop tools and equipment and organize a shop following appropriate safety, management and inventory techniques – the student will be able to:
	05.01 Follow basic OSHA safety regulations and shop fire prevention techniques.
	05.02 Perform basic first aid procedures.
	05.03 Establish a file system for shop records.
	05.04 Identify and use shop hand tools and equipment that relate to turf equipment maintenance.
	05.05 Select the appropriate fasteners, bearings, seals, belts, chains, fuels, and lubricants for various turf equipment.
	05.06 Establish and maintain appropriate shop space for specific shop tasks.

	05.07 Establish an appropriate equipment inventory system.
06.0	Order and stock parts and keep shop records – the student will be able to:
	06.01 Use the various equipment manuals to identify parts and service procedures.
	06.02 Order parts properly.
	06.03 Establish a system for stocking appropriate turf equipment parts.
	06.04 Gather the appropriate forms for establishing a recordkeeping system.
	06.05 Maintain computer-based inventory and record-keeping system.
07.0	Perform basic welding tasks using both gas and arc welding techniques – the student will be able to:
	07.01 Follow welding symbols, and safety practices.
	07.02 Connect and operate oxy-acetylene welding equipment.
	07.03 Run beads and weld various types of joints.
	07.04 Braze and solder metal.
	07.05 Cut metal with and oxy-acetylene torch.
	07.06 Select appropriate welding rods.
	07.07 Set up an electrical arc welding machine.
	07.08 Arc weld various types of joints.
08.0	Identify and safely operate turf care equipment – the student will be able to:
	08.01 Identify the appropriate use for commonly used turf care equipment.
	08.02 Identify the operation safety procedures for commonly used turf equipment.
	08.03 Operate properly all commonly used turf care equipment.
09.0	Demonstrate employability skills – the student will be able to:
	09.01 Conduct a job search.
	09.02 Secure information about a job.

	09.03 Identify documents which may be required when applying for a job interview.
	09.04 Complete a job application correctly.
	09.05 Demonstrate competence in a job interview.
	09.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	09.07 Identify acceptable work habits.
	09.08 Demonstrate knowledge or how to make job changes appropriately.
	09.09 Demonstrate acceptable employee health habits.
	09.10 Identify appropriate attire and grooming to maintain a functional and professional atmosphere in the equipment maintenance facility.
10.0	Identify the various professional organizations and publications that pertain to the turf management industry – the student will be able to:
	10.01 Identify major points in the history of the golf course/turf industry.
	10.02 Identify and understand various professional turf publications.
	10.03 Identify and understand the basic role of professional turf organizations.
	10.04 Identify the basics of the seed production and sod production industries.
	10.05 Identify the various classes of golf courses and turf maintenance organizations.
11.0	Design a functional golf course maintenance facility and select appropriate maintenance equipment – the student will be able to:
	11.01 Evaluate the organization and management styles utilized by various golf courses.
	11.02 Classify, by use, the various equipment used on a typical 18-hole golf course.
	11.03 List the equipment needed to properly maintain an 18-hole golf course.
	11.04 Design and organize a golf course maintenance complex.
	11.05 Develop an equipment budget for an 18-hole golf course.
12.0	Develop preventive maintenance programs for turf care equipment – the student will be able to:
	12.01 Use equipment manufacturers' manuals to implement proper service procedures.
	12.02 Develop a recordkeeping system to record equipment use.

	12.03 Develop a recordkeeping system to record service work performed on equipment.
13.0	Develop human relations skills – the student will be able to:
	13.01 Demonstrate appropriate work habits.
	13.02 Identify traits that promote good human relations and increase job performance.
	13.03 Develop an understanding of the role of the golf course superintendent and turf equipment service manager in the overall successful operations of the golf course.
14.0	Perform decision-making activities – the student will be able to:
	14.01 Develop the ability to solve problems in a logical sequence.
	14.02 Demonstrate the ability to determine proper work priorities.
	14.03 Prepare a day's work schedule for the superintendent.
	14.04 Choose appropriate action in situations requiring following a chain of command.
	14.05 Choose appropriate action in situations requiring effective time management.
	14.06 Choose appropriate action in situations requiring application of business ethics.
	14.07 Identify ways to assign work to others.
15.0	Identify and demonstrate management activities – the student will be able to:
	15.01 Define management.
	15.02 Identify different management styles.
	15.03 Identify the major functions of management.
	15.04 Demonstrate knowledge of the relationship between authority and responsibility to task accomplishment.
	15.05 Identify problems and make an appropriate decision.
	15.06 Develop an OJT training program for new employees.
16.0	Develop a management and training program for new employees – the student will be able to:
	16.01 Train new employees in proper shop management.
	16.02 Teach new employees how to properly use equipment manuals.

	16.03 Train equipment operators on proper and safe equipment operation.
	16.04 Train equipment operators how to properly adjust mowing height.
	16.05 Develop policies and procedures to be followed by employees caring for turf equipment.
17.0	Identify turfgrasses used in the golf and landscape industry – the student will be able to:
	17.01 Identify the differences between warm and cool season grasses.
	17.02 Demonstrate knowledge of basic management practices for various turfgrasses used in golf and landscape situations.
	17.03 Demonstrate knowledge of the interaction between proper turf care and the overall health of the grass plant.
18.0	Develop a plan for the functional use of turf equipment management personnel – the student will be able to:
	18.01 Determine the number of full-time and part-time staff needed.
	18.02 Develop a work schedule for turf equipment management personnel.
	18.03 Assign daily tasks to turf equipment management personnel.
	18.04 Schedule work for smooth operation during times of personnel changes: sick leave, emergency leave, vacations, etc.
	18.05 Provide the golf course superintendent with information on the use, maintenance, durability, and general characteristics of turf maintenance.
19.0	Develop communications and business management skills – the student will be able to:
	19.01 Read and understand service manuals and technical service data.
	19.02 Communicate effectively in writing and verbally to employees, supervisors, and small groups.
	19.03 Evaluate the components of a basic business plan.
	19.04 Demonstrate knowledge of effective management styles.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The Professional Turf Equipment Service Technicians Association (T.E.S.T.A.) is the appropriate industry association.

Planned and supervised occupational activities may be provided through directed laboratory experience, practicum or cooperative experience. Whenever the cooperative method of instruction is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal. The student may receive compensation for work performed.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Veterinary Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

	AS
CIP Number	1351080800
Program Type	College Credit
Standard Length	73 credit hours
CTSO	N/A
SOC Codes (all applicable)	29-2056 - Veterinary Technologists and Technicians

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to animal office procedure; animal pharmacy and pharmacology; animal examination room/area; animal surgical preparation and assisting; large and small animal nursing; laboratory animal procedures; animal radiology, and employability skills. The curriculum also includes general course material such as computer literacy and use, applied mathematics, biological science, communications skills, fundamentals of microbiology, and humanities or liberal arts.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 73 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate facility management skills utilizing traditional and electronic media and appropriate veterinary medical terminology and abbreviations
02.0 Determine methods to communicate in a professional manner in all formats - written, oral, non-verbal, and electronic.
03.0 Compare and contrast laws and the veterinary technology profession's ethical codes to provide high quality care to patients.
04.0 Discuss safe and effective methods to administer prescribed drugs to patients.
05.0 Explain prescribed drugs to clients.
06.0 Demonstrate patient assessment techniques in a variety of animal species.
07.0 Demonstrate husbandry, nutrition, therapeutic and dentistry techniques appropriate to various animal species.
08.0 Manage and maintain patients in all phases of anesthesia.
09.0 Utilize and maintain anesthetic delivery and monitoring instruments and equipment.
10.0 Integrate all aspects of patient management for common surgical procedures in a variety of animal species.
11.0 Provide the appropriate instruments, supplies and environment to maintain asepsis during surgical procedures.
12.0 Demonstrate proper handling, packaging and storage of specimens for laboratory analysis to ensure safety of patients, clients, and staff.
13.0 Properly perform analysis of laboratory specimens.
14.0 Produce diagnostic radiographic and non-radiographic images.
15.0 Handle common laboratory animals used in animal research.
16.0 Provide safe and effective care for birds, reptiles, amphibians, guinea pigs, hamsters, gerbils, and ferrets.

Florida Department of Education
Student Performance Standards

Program Title: **Veterinary Technology**
CIP Number: **1351080800**
Program Length: **73 credit hours**
SOC Code(s): **29-2056**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate facility management skills utilizing traditional and electronic media and appropriate veterinary medical terminology and abbreviations- the student will be able to:
01.01	Schedule appointments, admit, discharge and triage according to client, patient and facility needs through phone and in-person contact* • Recognize and respond to veterinary medical emergencies*
01.02	Create and maintain individual client records, vaccination certificates, and other appropriate forms*: • develop computer skills* • be able to utilize veterinary practice management software* • be familiar with veterinary on-line services* (e.g. laboratory submissions, client financing plans, continuing education, discussion groups)
01.03	Perform basic filing of medical records, radiographs, lab reports, etc.*
01.04	Create and maintain all appropriate facility records and logs in compliance with regulatory guidelines (e.g., radiography, surgery, anesthesia, laboratory, controlled substance)*
01.05	Manage inventory control*
01.06	Recognize roles of appropriate regulatory agencies*
01.07	Maintain appropriate disposal protocols for hazardous materials*
01.08	Establish and maintain appropriate sanitation and infection control protocols for a veterinary facility, including patient and laboratory area*
01.09	Handle daily client-based financial transactions*
01.10	Demonstrate an understanding of interpersonal skills and team dynamics*
01.11	Utilize appropriate interpersonal and public relations skills*
01.12	Demonstrate telephone etiquette* (e.g. through role playing, educational resources, etc.)

	01.13	Recognize the legality of the veterinary-client-patient relationship*
	01.14	Develop and provide client education in a clear and accurate manner at a level the client understands (i.e., oral and written form, including educational handouts)*
	01.15	Apply crisis intervention/grief management skills with clients*
02.0	Compare and contrast laws and the veterinary technology profession's ethical codes to provide high quality care to patients.	
	02.01	Understand and observe legal boundaries of veterinary health care team members*
	02.02	Interact professionally with clients and fellow staff members*
	02.03	Demonstrate a commitment to high quality patient care*
	02.04	Respect and protect the confidentiality of client and patient information*
03.0	Discuss safe and effective methods to administer prescribed drugs to patients.- the student will be able to:	
	03.01	Read and follow veterinarian's pharmacy orders*
	03.02	Recognize groups of drugs, their mechanisms, and clinically relevant side effects*
	03.03	Recognize the safe and effective manner in which vaccines must be administered; recognize and explain common side effects*
	03.04	Accurately perform appropriate calculations; use weights and measures correctly*
	03.05	Safely and effectively administer drugs by common parenteral and enteral routes; explain appropriate routes and methods and when used*
	03.06	Monitor therapeutic responses*
	03.07	Demonstrate the ability to accurately record medical information*
	03.08	Demonstrate understanding of controlled substance regulations*
	03.09	Demonstrate compliance with all federal regulatory guidelines for drug purchase, storage, administration, withdrawal, dispensing, disposal, and inventory control (e.g., biologics and therapeutic agents, pesticides, and hazardous wastes)*
04.0	Explain prescribed drugs to clients.- the student will be able to	
	04.01	Given a drug order, properly prepare medications for dispensing, including performing accurate calculations*
	04.02	Demonstrate compliance with regulations governing prescription drugs versus over-the-counter drugs*
	04.03	Demonstrate understanding of regulations governing maintenance of controlled substances log book*
	04.04	Demonstrate compliance with all federal regulatory guidelines for drug purchase, storage, administration, withdrawal, dispensing, disposal, and inventory control (e.g., biologics and therapeutic agents, pesticides, and hazardous wastes)*

	04.05	Relay drug information to clients (e.g., handling, storage, administration, side-effects, drug interactions, safety, reasons for use of drug)*
05.0	Demonstrate patient assessment techniques in a variety of animal species.	
	05.01	Recognize common domestic animal species and breeds*
	05.02	Describe and use common animal identification methods*

	05.03	Demonstrate effective and appropriate restraint techniques for various animal species:
		• properly restrain dogs and cats for procedures*
		• encage and remove small animals from cages*
		• apply dog muzzle safely*
		• apply Elizabethan collar*
		• use restraint pole and other restraint aids*[GROUP]
		• halter, tie, and lead horses*
		• restrain birds*
		• restrain pocket pets and exotics
		• restrain cattle and horses*
		  ○ apply twitch (horses)*[GROUP]
		  ○ apply bovine tail restraint*
		  ○ apply bovine halter*
		• restrain sheep and pigs
		• load large animals
		• safely operate cattle chute*[GROUP]

	05.04	Obtain a thorough patient history*
	05.05	Demonstrate the ability to obtain objective patient data: • temperature (dog, cat, horse, cow)* • pulse (dog, cat, horse, cow)* • respiration (dog, cat, horse, cow)* • auscultate heart/lungs* (dog, cat, horse, cow) • assess hydration status
	05.06	Properly collect diagnostic specimens for analysis (ex: urine, blood, feces, specimens for cytology)*
	05.07	Perform venipuncture: • cephalic (dog, cat)* • jugular (dog, cat, horse, ruminant)* • saphenous (dog, cat)* • sublingual (dog) • ear (pig, rabbit) • coccygeal (cow)

	• anterior vena cava (pig)
05.08	Collect urine sample: • catheterize male dog* [GROUP] • catheterize female dog • catheterize female cat • catheterize male cat • collect voided urine sample (small animal)* • perform cystocentesis (small animal)*[GROUP] • catheterize large animal
05.09	Prepare diagnostic specimens for shipment*
06.0	Demonstrate husbandry, nutrition, therapeutic and dentistry techniques appropriate to various animal species.
06.01	Grooming: • Demonstrate understanding of therapeutic bathing, basic grooming, and dipping of small animals* • trim nails (dog, cat)* • trim hooves (ruminant, horse) • apply equine tail and leg wraps* • express canine anal sacs* • clean and medicate ears (dog, cat)* • clean sheath (horse)
06.02	Perform microchip scanning and implantation
06.03	Environmental conditions: implement sanitation procedures for animal holding and housing areas*
06.04	Demonstrate understanding of permanent identification*
06.05	Demonstrate understanding of breeding/reproduction techniques*
06.06	Demonstrate understanding of care of orphan animals
06.07	Demonstrate understanding of nursing care of newborns*
06.08	Understand life stage energy and nutrient requirements of well animals (dog, cat, horse, cow)*
06.09	Identify common grains and forages
06.10	Understand key nutritional factors in disease conditions* • be familiar with therapeutic foods*
06.11	Understand current developments in nutritional supplements and additives including benefits and potential toxicities*
06.12	Understand and identify substances that when ingested result in toxicity:

	• identify common poisonous plants* • be familiar with substances (organic and inorganic) that cause toxicity*
06.13	Develop and communicate hospital nutrition protocols*
06.14	Administer parenteral medications: • subcutaneous (dog, cat, ruminant)* • intramuscular (dog, cat, horse)* • intradermal (ruminant, dog) • intramammary (mastitis therapy only) (ruminant) • intravenous (dog, cat, ruminant, horse)*
06.15	Administer enteral medications: • balling gun (ruminant)* • dose syringe (ruminant, horse)* • gastric intubation (small animal)*[GROUP] • hand pilling (dog, cat)* • gastric lavage (dog) • dose syringe (pig) • oral speculum and stomach tube (ruminant) • nasogastric intubation (small animal, horse)
06.16	Administer topical medications (including ophthalmic)*
06.17	Perform ocular diagnostic tests (including tonometry, fluorescein staining and Schirmer tear test)*
06.18	Administer enemas*[GROUP]
06.19	Collect/evaluate skin scrapings*
06.20	Fluid therapy: • administer subcutaneous fluids* • place intravenous catheters (cephalic*, saphenous*, jugular) • maintain and care for catheters* • determine/maintain fluid infusion rate* • monitor patient hydration status* • develop familiarity with fluid delivery systems*
06.21	Apply and remove bandages and splints*
06.22	Remove casts
06.23	Develop understanding of wound management and abscess care*
06.24	Perform critical care: • maintain chest, tracheostomy, esophagostomy tubes

		• collect and crossmatch blood for transfusion*[GROUP] • blood typing • perform blood transfusions (autotransfusions may be considered)
	06.25	Apply established emergency protocols: • maintain emergency medical supplies/crash cart* • perform first aid and cardiopulmonary resuscitation (simulation acceptable)* • use resuscitation bag* • apply emergency splints and bandages*
	06.26	Perform routine dental prophylaxis (manual and machine)*
	06.27	Understand client education regarding home care*
	06.28	Float teeth
	06.29	Clip teeth
	06.30	Perform routine dental radiographic imaging techniques
07.0	Manage and maintain patients in all phases of anesthesia.- the student will be able to:	
	07.01	Calculate dosages of appropriate anesthetic-related drugs*
	07.02	Administer anesthetic-related drugs (injection, endotracheal tube, mask)*
	07.03	Place endotracheal tubes in patients*
	07.04	Utilize clinical signs and appropriate equipment to monitor patient status during anesthetic procedures* (e.g., esophageal stethoscope, blood pressure monitor, capnometer, electrocardiogram, pulse oximeter)*
	07.05	Evaluate patient and implement pain management protocols as directed*
	07.06	Recognize and respond appropriately to patients in compromised states*
	07.07	Perform appropriate resuscitation procedures as needed (e.g., calculate and administer appropriate anesthetic antagonists and emergency drugs as directed)*
	07.08	Complete controlled substance log* (does not need to be official controlled substance log; mock logs may be utilized)
08.0	Utilize and maintain anesthetic delivery and monitoring instruments and equipment.- the student will be able to:	
	08.01	Maintain and operate anesthetic delivery and monitoring equipment: • pulse oximeter* • capnometer* • esophageal stethoscope* • electrocardiograph (e.g., recognize abnormal rhythms/audible sounds, properly apply leads)* • anesthetic machines, including rebreathing systems, non-rebreathing systems and masks*

	• endotracheal tubes* • resuscitation bag* • scavenging systems* • oxygen sources* • blood pressure monitoring devices* • laryngoscopes* • ventilator • defibrillator • temperature monitoring device* (e.g. thermometer, etc.)
09.0	Integrate all aspects of patient management for common surgical procedures in a variety of animal species.- the student will be able to
09.01	Properly identify patients and surgical procedures*
09.02	Patient assessment • organize medical records/consent forms* • review pre-operative evaluation* • evaluate current patient status* • organize and implement anesthesia*
09.03	Palpate the urinary bladder and express it if needed*
09.04	Prepare surgical site using appropriate aseptic techniques*
09.05	Position patient for common procedures*
09.06	Provide surgical assistance: • demonstrate proper operating room conduct and asepsis* • assist with care of exposed tissues and organs* • properly handle and pass instruments and supplies* • operate and maintain suction and cautery machines* • understand the principles of operation and maintenance of fiber optic equipment* • record and maintain operative/surgical records* • perform basic suturing techniques
09.07	Coordinate pain management with the anesthesia/surgical team*
09.08	Provide post-operative care: • pain management* • fluid therapy* • adequate nutrition* • wound management* • bandaging* • discharge instructions*

	• suture removal*
10.0	Provide the appropriate instruments, supplies and environment to maintain asepsis during surgical procedures.- the student will be able to:
	10.01 Prepare surgical instruments and supplies*
	10.02 Prepare gowns, masks, gloves, and drapes*
	10.03 Operate and maintain autoclaves*
	10.04 Sterilize instruments and supplies using appropriate methods*
	10.05 Perform pre-surgical set-up*
	10.06 Identify and know proper use for instruments*
	10.07 Identify common suture materials, types, and sizes*
	10.08 Provide operating room sanitation and care*
	10.09 Maintain proper operating room conduct and asepsis*
	10.10 Perform post-surgical clean-up (e.g., equipment, instruments, room, proper disposal of hazardous medical waste)*
11.0	Demonstrate proper handling, packaging and storage of specimens for laboratory analysis to ensure safety of patients, clients, and staff.- the student will be able to:
	11.01 Select and maintain laboratory equipment*
	11.02 Implement quality control measures*[GROUP]
	11.03 Understand how to ensure safety of patients, clients, and staff*
	11.04 Prepare, label, package, and store specimens for laboratory analysis*
12.0	Perform analysis of laboratory specimens.-the student will be able to:
	12.01 Perform urinalysis: • determine physical properties (e.g., color, clarity, specific gravity)* • test chemical properties* • examine and identify sediment*
	12.02 Perform CBC to include: • hemoglobin* • packed cell volume* • total protein* • white cell count*

	• red cell count*
12.03	Perform microscopic exam of blood film: • prepare film and stain using a variety of techniques* • perform leukocyte differential – normal vs abnormal* • evaluate erythrocyte morphology – normal vs abnormal* • estimate platelet numbers* • calculate absolute values* • correct white blood cell counts for nucleated cells*
12.04	Calculate hematologic indices*
12.05	Coagulation tests – perform one of the following*:[GROUP] • buccal mucosal bleeding time • activated clotting time (ACT) • prothrombin time (PT) • partial thromboplastin time (PTT) • fibrinogen assay
12.06	Perform blood chemistry tests (BUN, glucose, common enzymes)*
12.07	Perform serologic test (ELISA, slide/card agglutinations)*
12.08	Identify blood parasites: • Dirofilaria sp/Acanthocheilonema sp (formerly Dipetalonema sp)* • Hemotropic Mycoplasma sp (Hemoplasmas)* (formerly Haemobartonella sp and Eperythrozoon sp) • Anaplasma sp • Babesia sp • Trypanosoma sp • Eperythrozoan sp • Ehrlichia sp
12.09	Perform parasitologic procedures for external parasites and identify: • mites* • lice* • ticks* • fleas* • flies*
12.10	Perform diagnostics procedures for parasites: • Antigen kit*, direct*, filter, Knotts* [GROUP] • floatation solution preparation • fecal flotations* • fecal sedimentation*

- direct smears*
- centrifugation with flotation*
- adhesive tape retrieval of pinworm ova
- perform fecal egg count using McMaster method

12.11 Identify common parasitic forms:
- nematodes*
- trematodes*
- cestodes*
- protozoa*

12.12 Perform coprologic tests

12.13 Perform microbiologic procedures/evaluations:
- collect representative samples*
- culture bacteria and perform sensitivity tests*
- identify common animal pathogens using commercially available media and reagents*[GROUP]
- collect milk samples and conduct mastitis testing (e.g., CMT, bacterial culture)*[GROUP]
- perform common biochemical tests*[GROUP]
- perform staining procedures*
- culture and identify common dermatophytes*

12.14 Perform cytologic evaluation
- assist in collecting, preparing and evaluating transudate, exudate and cytologic specimens (joint, cerebrospinal, airway, body cavity)
- perform fine needle tissue aspirates and impression smear preparation (differentiate benign vs. malignant)
- prepare and stain bone marrow specimens
- collect, prepare, and evaluate ear cytology*
- collect, prepare, and evaluate canine vaginal smears*[GROUP]
- evaluate semen
- understand timing and types of pregnancy testing
- assist with artificial insemination

12.15 Perform necropsy procedures:
- perform a postmortem examination or dissection on non-preserved animal*[GROUP]
- collect samples, store and ship according to laboratory protocols*[GROUP]
- explain how to handle rabies suspects and samples safely*
- handle disposal of dead animals
- perform humane euthanasia procedures

13.0 Produce diagnostic radiographic and non-radiographic images.- the student will be able to:

13.01 Implement and observe recommended radiation safety measures*

13.02	Implement radiographic quality control measures*
13.03	Develop and properly utilize radiographic technique charts*[GROUP]
13.04	Position dogs*, cats*, horses*, and birds to create diagnostic images
13.05	Demonstrate an understanding of the modifications of diagnostic imaging techniques as they apply to mice, rats, guinea pigs, lizards, and amphibians*
13.06	Utilize radiographic equipment to properly radiograph live animals (fixed and portable)*
13.07	Create diagnostic dental radiographic images*
13.08	Process exposed films to create diagnostic radiographic images (automatic*, hand, and digital processing)
13.09	Appropriately label, file, and store images*
13.10	Complete radiographic logs, reports, files and records*
13.11	Perform radiographic contrast studies — perform one of the following*:[GROUP] • GI Series • Pneumocystogram • Intravenous pyelogram • Other
13.12	Perform on a sedated canine radiographic techniques utilized in screening for canine hip dysplasia*[GROUP]
13.13	Demonstrate proper maintenance of radiographic equipment, including recognition of faulty equipment operation*
13.14	Use and care of ultrasonography equipment
13.15	Use and care of endoscopic equipment
14.0	Demonstrate safe and effective handling of common laboratory animals used in animal research.- the student will be able to
14.01	Recognize and restrain (mouse, rat, rabbit)*
14.02	Determine sex and understand reproduction (mouse, rat, rabbit)*
14.03	Perform and/or supervise basic care procedures: • handling (mouse, rat, rabbit)* • nutritional needs/diet* • provide food, water, and enrichment in a species-appropriate manner (mouse, rat, rabbit)* • trim nails • identification*
14.04	Perform methods of injection:

	• subcutaneous (mouse, rat, rabbit)* • intramuscular (rabbit) • intradermal (rabbit) • intraperitoneal (mouse)* [GROUP] • intravenous
14.05	Collect blood samples • Retro-orbital (mice, rats) [GROUP] • Intravenous (rat [GROUP], rabbit)*
14.06	Perform oral dosing (mouse, rat)* [GROUP]
14.07	Have working knowledge of anesthetic and recovery procedures*
14.08	Identify and describe clinical signs of common diseases*
14.09	Perform necropsy and collect specimens
14.10	Clean and medicate ears (rabbit)
14.11	Anesthetize mouse, rat, and rabbit
14.12	Understand restraint of non-human primates
14.13	Demonstrate knowledge of zoonotic diseases and modes of transmission
15.0	Provide safe and effective care for birds, reptiles, amphibians, guinea pigs, hamsters, gerbils, and ferrets.- the student will be able to:
15.01	Recognize, understand, and perform restraint techniques of birds*, reptiles, amphibians, and ferrets
15.02	Understand unique husbandry issues for each species (birds, reptiles, amphibians, guinea pigs, hamsters, gerbils, and ferrets) and provide client education*: • nutritional needs/diet • watering • caging (temperature, humidity, light) • aquarium care • understand reproduction • basic grooming (beak, wing, and nail clipping) • appropriate transportation methods
15.03	Demonstrate the ability to obtain objective data: birds*, reptiles, amphibians, and ferrets
15.04	Perform nail trim (bird*, exotic, small mammal)
15.05	Perform injections using appropriate sites • subcutaneous

• intramuscular • intradermal • intraperitoneal • intravenous
15.06 Perform oral dosing
15.07 Administer drugs or medicaments using appropriate sites and routes
15.08 Understand appropriate sites for catheter placement
15.09 Understand tube feeding in birds
15.10 Perform laboratory procedures
15.11 Anesthetize birds and exotic animals
15.12 Recognize normal and abnormal behavior patterns
15.13 Explain inadvisability of keeping wildlife as pets
15.14 Collect blood samples

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

AVMA Student Essential and Recommended Skills

In order to properly prepare students for certification please refer to Appendix I in the certification manual for the most up to date listings of Essential and Recommended skills required of students. This list is based on the AVMA Student Essential and Recommended Skills. It can be updated whenever the AVMA skills are updated.

Required tasks are denoted by an asterisk (*).

Italicized text denotes hands-on (psychomotor) skills; all other text denotes didactic (knowledge-based) skills. The term "demonstrate" along with a didactic (knowledge-based) skill means that the instructor is free to determine the best method(s) for the student to demonstrate mastery or understanding of that particular skill to the instructor. The term "demonstrate" is not synonymous with "hands-on".

Skills indicated by the designation [GROUP] may be performed by a group of program students. The appropriate size of the group will be determined by the task being performed taking into account humane treatment of the subject animal. Each member of the group must play an active role in the completion of the task.

Students are expected to physically perform skills that are *italicized*.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Environmental Science Technology**
Career Cluster: **Agriculture, Food and Natural Resources**

AS	
CIP Number	1703010401
Program Type	College Credit
Standard Length	64 credit hours
CTSO	N/A
SOC Codes (all applicable)	19-4091 - Environmental Science and Protection Technicians, Including Health

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to conducting environmental surveys, and investigations and evaluations of noise, air and water conditions to determine compliance with public laws and regulations.

Reinforcement of basic skills in English, mathematics, and science appropriate for the job preparatory programs is provided through vocational classroom instruction and applied laboratory procedures or practice. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the public service industry; planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues and health, safety and environmental issues.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 64 credit hours.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of the principles of managing water pollution through prevention and remediation
02.0 Demonstrate knowledge of the principles of managing air pollution through prevention and remediation
03.0 Demonstrate awareness of environmental noise sources and their monitoring.
04.0 Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants.
05.0 Sample, analyze and calculate data related to air, water and soil pollutants.
06.0 Demonstrate an awareness of radiation monitoring and radioactive contamination control.
07.0 Demonstrate and awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems.
08.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Environmental Science Technology**
CIP Number: **1703010401**
Program Length: **64 credit hours**
SOC Code(s): **19-4091**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of the principles of managing water pollution through prevention and remediation – the student will be able to:
01.01	Determine chemical and physical properties of surface water and groundwater.
01.02	Describe microbial systems related to water pollution.
01.03	Describe surface water, groundwater systems, hydrologic cycle, ~~and~~ potable water and wastewater treatment processes.
01.04	Identify types and sources of surface water and groundwater contamination.
01.05	Describe legal aspects, laws, rules and consequences of related to surface and groundwater pollution.
01.06	Collect water samples for field and laboratory analysis.
01.07	Identify the water quality standards for effluent from domestic and various industrial wastewater facilities.
01.08	Describe ambient water quality criteria.
01.09	Demonstrate the technology and methods applied to non-point source pollution control (stormwater and agriculture runoff).
02.0	Demonstrate knowledge of the principles of managing air pollution through prevention and remediation – the student will be able to:
02.01	Define and discuss atmosphere, meteorology and topography.
02.02	Collect and analyze ambient and process air samples.
02.03	Describe legal aspects, laws, rules and consequences related to air pollution.
02.04	Describe legal aspects and consequences of air pollution.
02.05	List the regulated parameters of emission for selected industrial sources.
02.06	List the types of air pollution control devices used to control emissions of sulfur oxides, nitrogen oxides, particulates and volatile

	organic contaminants.
02.07	Measure air pollutants from a specific source.
02.08	Describe ambient air quality criteria.
02.09	Record, interpret and report laboratory analyses.
03.0	Demonstrate awareness of environmental noise sources and their monitoring – the student will be able to:
03.01	Define and discuss the physical properties of sound.
03.02	Discuss the threshold of hearing, tolerance, and hearing loss.
03.03	Discuss environmental noise, its effect on humans, and solutions to noise pollution.
03.04	Describe legal aspects, laws, rules and consequences related to noise pollution.
03.05	List the sources of noise.
03.06	Identify the regulatory agencies that monitor and control~~s~~ noise sources.
03.07	List the control devices for different noise sources.
04.0	Operate and calibrate laboratory and field instruments used in quantitative and qualitative analysis of pollutants – the student will be able to:
04.01	Demonstrate knowledge of basic laboratory operation.
04.02	Operate and calibrate selected laboratory instruments.
04.03	Operate and calibrate selected field instruments and equipment.
05.0	Sample, analyze and calculate data related to air, water and soil pollutants – the student will be able to:
05.01	Gather and analyze selected samples.
05.02	Manipulate data and reach confident conclusions.
05.03	Write formal technical reports.
05.04	Identify and perform the correct analysis for selected air pollutants listed with state and federal regulations.
05.05	Identify and perform the correct analysis for selected parameters listed with state and federal regulations for wastewater effluent, surface water and groundwater.
06.0	Demonstrate an awareness of radiation monitoring and radioactive contamination control – the student will be able to:

	06.01 Discuss atomic structure, radiation and radioactive decay.
	06.02 Discuss types and sources of radiation.
	06.03 Demonstrate knowledge of radiation exposure and dosimetry measurements.
	06.04 Discuss the immediate and long range effects of radiation on animals and plants.
	06.05 Discuss nuclear power plant design, nuclear power hazards, and safety features.
	06.06 Discuss nuclear fuel reprocessing and storage and waste disposal.
	06.07 Discuss legal aspects, laws, rules, and consequences related to radioactive pollution.
07.0	Demonstrate an awareness of solid waste, the problems engendered by solid waste accumulation and disposal and solutions to those problems – the student will be able to:
	07.01 Discuss the composition, sources and quantity of solid waste.
	07.02 Discuss methods of solid waste disposal.
	07.03 Discuss various solutions to solid waste accumulations and disposal.
	07.04 Discuss legal aspects, laws, rules, and consequences related to solid waste pollution.
	07.05 Identify the solid wastes from domestic households, municipalities and industry.
	07.06 Identify a sanitary landfill.
	07.07 Discuss the construction features of a safe landfill.
	07.08 Discuss the possibilities of contaminates (leachates) seeping into the groundwater.
	07.09 Discuss the purpose for installing monitoring wells located around a sanitary landfill.
	07.10 Discuss the kinds of wastes that are permitted by state and federal regulation to be disposed at a landfill site.
08.0	Demonstrate employability skills – the student will be able to:
	08.01 Conduct a job search.
	08.02 Secure information about a job.
	08.03 Create a resume package, including a cover letter.
	08.04 Identify documents that may be required when applying for a job.

08.05	Complete a job application.
08.06	Demonstrate competence in job interview techniques.
08.07	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
08.08	Identify acceptable work habits.
08.09	Demonstrate knowledge of how to make job changes appropriately.
08.10	Demonstrate acceptable employee health habits and safety skills.
08.11	Demonstrate time management skills.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Environmental Science Technician (0703010407 – 30 credit hours
Hazardous Materials Specialist (0703010403) – 14 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Veterinary Assisting**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	A010512
CIP Number	0151080810
Grade Level	30, 31
Standard Length	750 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	N/A
SOC Codes (all applicable)	31-9096 - Veterinary Assistants and Laboratory Animal Caretakers 29-2056 - Veterinary Technologists and Technicians
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the veterinary assisting industry within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to broad, transferable skills and stresses understanding and demonstration of the following elements of the veterinary assisting industry: planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues and health, safety and environmental issues. The program also provides supplemental training for persons previously or currently employed as veterinary assistants.

Program Structure

This program is a planned sequence of instruction consisting three postsecondary adult courses that comprise three occupational completion points. Planned and Supervised Agricultural Experiences (SAE) must be provided through one or more of the following: (1) directed laboratory experience, (2) student project, (3) placement for experience, or (4) cooperative education.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the post-secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	ATE0006	Veterinary Assistants and Laboratory Animal Caretakers 1	AGRICULTUR 1 @2 AGRI @2 AG SUPPLI @7 G VET ASSIST 7G	450 hours	31-9096
B	ATE0070	Veterinary Assistants and Laboratory Animal Caretakers 2		150 hours	31-9096
C	ATE0072	Veterinary Assistant		150 hours	29-2056

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe veterinary science and the role of animals in society.
02.0 Describe the socioeconomic role of veterinary sciences on the companion animal livestock industries.
03.0 Discuss the human-animal bond and its effects on human health.
04.0 Demonstrate the proper use of veterinary science terminology.
05.0 Identify careers in the animal industry.
06.0 Practice safety.
07.0 Recognize normal and abnormal animal behaviors.
08.0 Restrain and control companion and livestock animals.
09.0 Identify common breeds of companion animals and husbandry practices
10.0 Demonstrate human-relations, communications and leadership through FFA activities.
11.0 Demonstrate basic first aid for companion and livestock animals.
12.0 Demonstrate the use of tools, equipment, and instruments in the veterinary science and companion animal industry
13.0 Demonstrate proper techniques in taking vital signs.
14.0 Investigate the common breeds and husbandry practices for several species of animals
15.0 Identify parts and functions of various systems of common companion and livestock animals.
16.0 Explain the various methods of animal identification.
17.0 Demonstrate knowledge of animal control and animal welfare organizations.
18.0 Describe the problems, causes, and solutions of animal overpopulation.
19.0 Locate and interpret animal-related laws, in state statutes, or local ordinances
20.0 Identify the different digestive systems of animals and the nutritional requirements of selected species.
21.0 Explain the reproductive system and breeding of common companion and livestock animals.
22.0 Investigate the common husbandry practices and daily care of companion animals and exotic animals and fish.
23.0 Demonstrate knowledge of preventive medicine and disease control.
24.0 Demonstrate human-relations, communications, leadership and employability skills.
25.0 Differentiate between animal welfare and animal rights.
26.0 Explain the role of animals in research.
27.0 Maintain and analyze records.
28.0 Explain proper sanitation for animal facilities
29.0 Explain diagnostic testing and use of equipment
30.0 Describe internal and external parasites and control methods.
31.0 Groom selected companion and livestock animals.
32.0 Describe exotic animals and the effects of captivity on them.
33.0 Assess techniques used in surgical assisting and surgical preparation.
34.0 Explain principles of pharmacology
35.0 Explain proper methods of syringe and hypodermic needle use.

Florida Department of Education
Student Performance Standards

Program Title: Veterinary Assisting
Career Certificate Program Number: A010512

Benchmarks that appear in bold within the framework are skills or competencies that have been taken directly from the FVMA Skills Competency Validation list. The most up to date validation list can be found on the FVMA website.

Course Number: ATE0006 **Occupational Completion Point: A** **Veterinary Assistants and Laboratory Animal Caretakers 1– 450 Hours – SOC Code 31-9096**	
01.0	Describe veterinary science and the role of animals in society – the students will be able to:
	01.01 Define veterinary science.
	01.02 Identify key components in the domestication of animals.
	01.03 Choose current issues facing the animal industry today and describe the effect of each on society.
02.0	Describe the socioeconomic role of veterinary sciences on the companion animal and livestock industries – the students will be able to:
	02.01 Summarize the history of the veterinary science, companion animal and livestock industry.
	02.02 Discuss the role of companion animals on the veterinary science industry.
	02.03 Discuss the role of livestock animals on the veterinary science industry.
03.0	Discuss the human-animal bond and its effects on human health – the students will be able to:
	03.01 Describe the human-animal bond and its influence on veterinary care.
	03.02 Compare and contrast different types of human-animal bonds for companion animals, working animals and livestock.
	03.03 Discuss the positive health effects on people resulting from their interaction with animals.
	03.04 Discuss programs that use human-animal interaction as a therapy tool.
	03.05 Describe the characteristics of animals used in the animal-facilitated therapy programs.
	03.06 Describe national and local programs that use animal-facilitated therapy.

	03.07 Discuss stages of grief of animal loss.
04.0	Demonstrate the proper use of veterinary science terminology – the students will be able to:
	04.01 Define common veterinary and medical terms, including directional terminology.
	04.02 Compile a list of prefixes, suffixes, and root words for veterinary medical terminology.
	04.03 Categorize gender and species-related terminology.
	04.04 List common medical and veterinary abbreviations
05.0	Identify careers in the animal industry – the students will be able to:
	05.01 Differentiate between entry and advanced level animal-industry careers.
	05.02 Identify professional organizations and trade journals in the animal industry.
	05.03 Investigate career opportunities in the veterinary science, companion animal, and large animal industry; also identify degree or credential needed to prepare for those careers.
	05.04 Using national or state credentialing agencies as a reference, distinguish between a Veterinary Assistant, Credentialed Veterinary Assistant, Veterinary Technician, Credentialed Veterinary Technician, and Veterinary Technologist.
	05.05 Investigate requirements necessary to earn and maintain Veterinary Assisting Certification.
06.0	Practice safety – the students will be able to:
	06.01 Recognize and avoid potential safety hazards (physical, chemical, biological and zoonotic).
	06.02 Utilize proper safety precautions and procedures when working in the hospital and/or animal handling areas.
	06.03 Demonstrate knowledge on how to use personal protective equipment- PPE (wears gloves, goggles, face mask, ear plugs, apron, gown, cap, and shoe covers when needed)
	06.04 Locate and demonstrates use of an eye wash solution or station
	06.05 Locate first aid kit and fire extinguisher
	06.06 Explain OSHA (Occupational Safety and Health Act) and its regulations pertaining to a veterinary practice, including sanitation, safety of employees and the employee's right to know of potential work place hazards through SDS (Safety Data Sheets) and the written hazard communication plan
	06.07 Demonstrate knowledge of OSHA regulations regarding the handling, placement and disposition of sharps and bio-hazardous material
	06.08 Handle and uses disposable "sharps" containers in a safe manner
	06.09 Explain correct labeling of secondary containers with appropriate safety information

	06.10 Practice safety precautions around animals, list the most common causes of animal related accidents.
07.0	Recognize normal and abnormal animal behaviors – the students will be able to:
	07.01 Identify instinctive and learned behaviors.
	07.02 Differentiate between normal and abnormal behavioral characteristics of animals.
	07.03 Recognize signs of aggressive animal behaviors.
	07.04 Describe behavioral changes due to aging.
08.0	Restrain and control companion and livestock animals – the students will be able to:
	08.01 Discuss the proper method for placing large animals in a stall, paddock, and trailer.
	08.02 Safely handle and restrain dogs, cats, and other animals for exams, procedures, and treatment to prevent undue stress or harm to either animals or humans. • *Lifting positioning and restraining animals* • *Position an animal in sternal dorsal and lateral recumbency* • *restraint of a small dog on an exam table* • *restraint of a cat on an exam table* • *restraint of a large dog on and exam table, lift table, and on the floor* • *place a lead on a dog slip lead and standard leash*
	08.03 Demonstrate verbal and physical restraint of animals.
	08.04 Demonstrate how to match appropriate level of restraint for an individual animal's level of resistance and situation.
	08.05 Explain appropriate methods for placing and removing animals from kennels
	08.06 Identify venipuncture sites and accepted restraint for companion and livestock animals; [ex. cephalic vein (cat & dog), jugular vein (cat & dog), femoral vein (cat), saphenous vein (dog)jugular (horse & goat), tail (cow & pig)]
	08.07 Demonstrate use of muzzle on a dog using commercial, leash, and gauze muzzles of appropriate size.
	08.08 Demonstrate currently accepted standards for restraint of the cat including towels, scruff technique, commercial muzzles, cat bags, leather gloves, and the squeeze cage
	08.09 Explain methods of restraint for exotic and avian animals.
	08.10 Identify the appropriate restraining methods for the following: • Halter, tie and lead horses and cattle • Application of twitch, nose tongs • Restrain sheep, goats and swine • Restrain poultry

	08.11 Discuss chemical restraints of animals.
09.0	Identify common breeds of companion animals and husbandry practices. – the students will be able to:
	09.01 Identify canine breeds and list breed characteristics and husbandry practices.
	09.02 Identify feline breeds and list breed characteristics and husbandry practices.
10.0	Demonstrate human-relations, communications and leadership through FFA activities – the student will be able to:
	10.01 Identify the opportunities for leadership development available through the National FFA Organization and/or professional organizations.
	10.02 Delineate the major events in the history of the FFA.
	10.03 Develop, implement, and maintain work-based learning through a Supervised Agricultural Experience (SAE) program.
11.0	Demonstrate basic first aid for companion and livestock animals – the students will be able to:
	11.01 Recognize emergency health (physical and behavioral) status.
	11.02 Describe procedures to restrain and move injured animals.
	11.03 Demonstrate hemorrhage control.
	11.04 Dress wounds and punctures.
	11.05 Demonstrate the correct emergency procedures for shock, burns, heatstroke, and fractures.
	11.06 Demonstrate companion animal CPR.
	11.07 Recognize allergic reactions and toxicity
12.0	Demonstrate the use of tools, equipment, and instruments in the veterinary science and companion animal industry – the students will be able to:
	12.01 Identify, demonstrate and maintain the proper tools, equipment, and instruments for common veterinary procedures.
	12.02 Demonstrate the ability to use an equipment or instrument manual.
13.0	Demonstrate proper techniques in taking vital signs – the student will be able to:
	13.01 Obtain and record the TPR (temperature, pulse, and respiratory rate) , MM (mucus membrane color), CRT(capillary refill time) with minimal discomfort to pet.
	13.02 Demonstrate how to use, clean, and store thermometers.
	13.03 Identify normal and abnormal range for each parameter (TPR, MM, and CRT).

14.0	Investigate the common breeds and husbandry practices for several species of animals – the students will be able to:	
	14.01 Identify bovine breeds and their characteristics, and husbandry practices.	
	14.02 Identify ovine breeds and their characteristics and husbandry practices.	
	14.03 Identify caprine breeds and their characteristics and husbandry practices.	
	14.04 Identify porcine breeds and their characteristics and husbandry practices.	
	14.05 Identify equine breeds and their characteristics and husbandry practices.	
	14.06 Identify poultry breeds and their characteristics and husbandry practices.	
15.0	Identify parts and functions of various systems of common companion and livestock animals – the students will be able to:	
	15.01 Identify internal and external anatomy of common companion and livestock animals.	
	15.02 Identify parts and functions of the following systems of animals using correct terminology:	
	15.02.1	*Identify the general function of the respiratory system and the major organs*
	15.02.2	*Identify the general function of the skeletal system and the major bones of the axial and appendicular skeleton*
	15.02.3	*Identify the general function of the muscular system and major groups of muscles*
	15.02.4	*Identify the general function of the digestive system and the major organs*
	15.02.5	*Identify the general function of the cardiovascular system and the major organs*
	15.02.6	*Identify the general function of the respiratory system and the major organs*
	15.02.7	*Identify the general function of the endocrine and the major organs*
	15.02.8	*Identify the general function of the urinary system and the major organs*
	15.02.9	*Identify the general function of the reproductive system and both male and female organs*
	15.02.10	*Identify the general function of the nervous system and the major organs*
	15.02.11	*Identify the general function of the integumentary system and the major organs*
	15.02.12	*Explain the differences in the teeth and eating habits for omnivores, carnivores and herbivores*
16.0	Explain the various methods of animal identification – the student will be able to:	

	16.01 Explain types of identification tags and their use.
	16.02 Explain the use of microchips for animal identification.
	16.03 Explain types of tattoos for animals and the use in both companion and production animals.
	16.04 Explain the types of ear tags and their use in production animals.
	16.05 Explain types of ear notching and use for identification.
17.0	Demonstrate knowledge of animal control and animal welfare organizations – the students will be able to:
	17.01 Differentiate between animal control agencies and animal welfare organizations.
	17.02 Describe the responsibilities and goals of animal control agencies and animal welfare organizations
	17.03 Identify and locate local animal control agencies and animal welfare organizations.
18.0	Describe the problems, causes, and solutions of animal overpopulation – the students will be able to:
	18.01 Explain the cause and effect of overpopulation in animals.
	18.02 Define euthanasia and describe its role in animal overpopulation.
	18.03 Explain the pet owners' and societies' responsibilities concerning animal overpopulation.
	18.04 Discuss the medical benefits of spaying and neutering.
19.0	Locate and interpret animal-related laws, in state statutes, or local ordinances – the students will be able to:
	19.01 Describe local animal control laws.
	19.02 Describe permitting requirements for exotic and wildlife animals.
	19.03 Demonstrate knowledge of local and state animal regulations.
	19.04 Determine the legal limitations of duties of an employee in the animal services industry.
	19.05 Identify when an Animal Health Certificate is required.
	19.06 Explain the laws governing the sale of animals and the disposal of animals.
	19.07 List the legal options for euthanasia.
	19.08 List the legal options for disposal of the pet's body.

20.0	Identify the different digestive systems of animals and the nutritional requirements of selected species – the students will be able to:
	20.01 Differentiate between ruminants and non-ruminants (monogastric and hind gut fermentors).
	20.02 Differentiate the teeth and eating habits of omnivores, carnivores, and herbivores.
	20.03 Describe the basic nutritional requirements of selected species.
	20.04 Analyze different feed labels and identify feed ingredients.
	20.05 Explain the appropriate storage for dry and canned dog or cat food.
	20.06 Explain nutritional needs based on life stage and size of animal and choose appropriate food and amount for specific animals for general care.
	20.07 Explain potential problems with feeding therapeutic foods incorrectly or to the wrong patient.
21.0	Explain the reproductive system and breeding of common companion and livestock animals – the students will be able to:
	21.01 Explain the male and female reproductive systems of common companion and livestock animals.
	21.02 Determine sex of animals.
	21.03 Determine appropriate age or weight for breeding.
	21.04 Identify gestation length.
	21.05 Describe estrous cycle.
	21.06 Describe breeding techniques (ex. Natural, artificial insemination etc.…)
	21.07 Identify selection criteria of males and females for reproduction.
	21.08 Describe care of breeding stock.
22.0	Investigate the common husbandry practices and daily care of companion animals and exotic animals and fish – the students will be able to:
	22.01 Describe breeds, characteristics and husbandry and care of guinea pigs.
	22.02 Describe breeds, characteristics and husbandry and care of chinchillas and degus.
	22.03 Describe breeds, characteristics and husbandry and care of ferrets.
	22.04 Describe breeds, characteristics and husbandry and care of amphibians.
	22.05 Describe breeds, characteristics and husbandry and care of reptiles.

	22.06 Describe breeds, characteristics and husbandry and care of birds.
	22.07 Describe breeds, characteristics and husbandry and care of fish.
	22.08 Describe breeds, characteristics and husbandry and care of avian species.
	22.09 Describe breeds, characteristics and husbandry and care of reptile species.
	22.10 Describe breeds, characteristics and husbandry and care of fish.
	22.11 Describe breeds, characteristics and husbandry and care of rabbits.
	22.12 Describe breeds, characteristics and husbandry and care of rodents.
23.0	Demonstrate knowledge of preventive medicine and disease control- the students will be able to:
	23.01 Describe the importance of preventive medicine for animal health.
	23.02 Differentiate between healthy and sick animals.
	23.03 Describe common infectious and noninfectious diseases of animals to include bacterial, viral, fungal, prion and zoonotic.
	23.04 Describe vaccinations available for disease prevention and vaccination procedures.
	23.05 Describe isolation or quarantine procedures for new or sick animals. • Describe methods of preventive medicine and quarantine for disease control in a kennel, cattery, paddock, rabbitry, and zoo.
	23.06 Discuss the terms immunology and active and passive immunity as it applies to disease and vaccination.
	23.07 Describe concepts for periodic health check-up.
	23.08 *List and discuss common zoonotic diseases.*
24.0	Demonstrate human-relations, communications, leadership and employability skills – the students will be able to:
	24.01 Follow oral and written directions with understanding; ask questions that clarify directions, as needed.
	24.02 Communicate effectively in verbal, written, and nonverbal modes; demonstrate effective telephone skills.
	24.03 Conduct small, informal, formal, and group meetings using basic parliamentary procedure.
	24.04 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
	24.05 Demonstrate acceptable employee hygiene habits.
	24.06 Complete pertinent forms for employment, such as a resume, a job application, a W-4 form.

24.07	Demonstrate job interview techniques.
24.08	*Student avoids misrepresentation, slander, violating client confidentiality, substandard patient care, substance abuse, or animal abuse/neglect.*
24.09	*Explain the veterinarian-client-patient relationships*
24.10	*Explain the importance of keeping their credentials current with continuing education credits*
24.11	*Conforms to safety and professional dress code by dressing in well- fitting scrubs or uniforms, closed- toed shoes, avoids excessive or loose jewelry, or excessive and visible body-piercings or tattoos, avoids long or fake nails, and keeps hair short or tied back.*
24.12	*Actively observe his/her working environment and animals, promptly reporting observations and concerns to the veterinary technician or veterinarian as needed.*
24.13	*Demonstrate initiative to complete tasks.*
24.14	*Accurately follow both oral and written instructions.*
24.15	*Discuss ways to resolve complaints or conflicts with either pet owners/clients or co-workers in a professional manner.*

Course Number: ATE0070 Occupational Completion Point: B Veterinary Assistants and Laboratory Animal Caretakers 2– 150 Hours – SOC Code 31-9096	
25.0	Differentiate between animal welfare and animal rights – the students will be able to:
25.01	Define animal welfare and animal rights.
25.02	Compare and contrast between animal welfare and animal rights.
25.03	Identify animal welfare and animal rights advocate groups.
25.04	Debate current events concerning animal welfare and animal rights.
25.05	Describe animal cruelty and the consequences of cruel treatment of animals.
26.0	Explain the role of animals in research – the students will be able to:
26.01	Describe the history of the role of animals in research.
26.02	Discuss medical advances made possible through the use of animals in research.
26.03	Define USDA and explain its roles in using animals for research.
26.04	Describe the role of the Institutional Animal Care and Use Committee (IACUC) with regard to animal research facilities.
26.05	Explain the controversy over using animals in research.

	26.06 Identify organizations that are in favor of and those that are against the use of animals in research.
	26.07 Develop a personal position on the use of animals in research and support that position.
	26.08 Explain how biotechnology has affected animal research.
	26.09 Debate the use of cloning for research purposes.
27.0	Maintain and analyze records – the students will be able to:
	27.01 Discuss the legal requirements of maintaining animal health records, and maintain and analyze animal health records.
	27.02 Maintain and analyze basic business records (inventory, depreciation, receipts, expenses), using computer applications.
	27.03 Explain the process of scheduling appointments.
	27.04 Demonstrate admissions and discharges for boarders or non-medical cases.
	27.05 Demonstrate filing and retrieving of records from both numerical and alphabetical filing systems.
	27.06 Demonstrate computer and keyboarding skills.
	27.07 Demonstrate data collection from organized records.
	27.08 Discuss legal requirements of veterinary medical records to include:: (1)establish veterinarian-client-patient relationship, (2)contain owner and patient information, (3)contain patient history, and (4) contain contemporaneously written medical procedures
	27.09 Describe the duties of an office or hospital staff member as outlined by NAVTA which includes: • *Greet pet owner/client, identifies his/herself by name and as veterinary assistant in a professional manner* • *Obtain or confirm pet owner/client and pet information including pet owner/client's name, address and phone numbers; pet's name, species, breed, color, sex and neutered/not neutered, and age or birth date* • *Discuss process for recording new information and/or confirms existing information on medical record using appropriate medical terminology and concise notations. Include current date and reason for appointment.* • *Obtain and record the pet's vital signs (TPR, MM, & CRT) and weight with minimal restraint to the pet.* • *Leave the exam room courteously indicating the veterinarian will be right in.*
	27.10 Explain the importance of client/patient confidentiality.
28.0	Explain proper sanitation for animal facilities– the students will be able to:
	28.01 Demonstrate proper sanitation techniques for an examination room, hospital facilities, surgical suites, kennel, cattery, paddock, rabbit hutch, and zoo.
	28.01.01 Keep assigned work areas clean and organized
	28.01.02 Explain sanitary procedures including physical cleaning, disinfecting, and sterilizing

28.01.03	*Demonstrate proper cleaning protocols for kennels, runs, and enclosures including cleaning and disinfecting all sides of the kennel (floor, ceiling, walls, & door) and all items in the kennel (bowls, blankets, toys, etc.)*
28.01.04	*List precautions to take when mixing or using multiple cleaning and disinfecting agents i.e. NEVER mix bleach with ammonia containing cleaners or disinfectants*
28.01.05	*Change bedding materials in a timely and efficient manner.*
28.01.06	*Demonstrate of the proper disposal of bedding and waste materials.*
28.01.07	*Notify supervisor of needed repair or maintenance on cages, kennels, or stalls*
29.0	Explain diagnostic testing and use of equipment – the students will be able to:
29.01	*Explain the proper placement of a slide in the microscope and focus on 100X and 400X magnification*
29.02	*Explain appropriate materials for cleaning the microscope*
29.03	*Demonstrate the centrifugation of a sample*
29.04	*Explain the purpose of the blood analyzer machine.*
29.05	Explain a urinalysis including:
29.05.01	*List methods for urine collection commonly used in the veterinary practice*
29.05.02	*Collect a free-caught urine sample using proper techniques for dogs*
29.05.03	*Identify time and storage parameters for urine samples*
29.05.04	*List precautions and safety factors in handling urine samples including personal protection equipment*
29.06	*Explain fecal test including:*
29.06.01	*Explain methods of collecting fecal samples.*
29.06.02	*Identify time and storage parameters for fecal samples.*
29.06.03	*Identify appropriate volume of feces for each method of testing.*
29.06.04	*Demonstrate the correct technique for handling and preparing the fecal samples for analysis by flotation, sedimentation, and direct smear.*
29.06.05	*Explain appropriate method of placing sample on microscope slide or cover slip.*
29.06.06	*List precautions and safety factors in handling fecal samples including personal protection equipment.*
29.07	Examine radiology, electrocardiogram and ultrasound imaging techniques and safety.

29.07.01	*Discuss restrictions from radiation exposure for pregnant women and minors.*
29.07.02	*Explain what a dosimeter badge does and who wears it and when.*
29.07.03	*Describe the area of exposure in the radiology room including direct beam and scatter radiation.*
29.07.04	*Explain the correct use of personal protection equipment including lead-shielded gowns, lead gloves, lead thyroid shield, lead glasses, and other lead protective wear.*
29.07.05	*Explain methods of restraint for positioning for radiographs including chemical restraint.*
29.07.06	*Explain the proper handling of radiographic film including safe light use.*
29.07.07	*Demonstrate the appropriate labeling of a radiograph including date, patient. name, view or side of patient, machine settings, and film developing*
29.07.08	*Maintain radiograph log and filing of films.*
29.07.09	*Explain how digital radiography differs from film.*
29.08	Describe the process for handling a suspected rabies patient, and the process for other deceased animals.
29.08.01	*List the common species which may transmit rabies to humans.*
29.08.02	*Explain the methods of transmission of rabies to animals and humans.*
29.08.03	*List the symptoms associated with rabies.*
29.08.04	*Explain the proper safety measures to follow when handling an animal suspected of having rabies.*
29.08.05	*Explain the procedure for euthanasia suitable as an explanation for a pet owner.*
29.08.06	*Discuss the grief process that an owner may experience on the loss of the pet.*
29.08.07	*Discuss the importance of presenting the body of the pet in a respectful and empathetic way.*
30.0	Describe internal and external parasites and control methods – the students will be able to:
30.01	*Set up fecal flotations or centrifuged fecal samples*
30.02	*Identify ectoparasites fleas, ticks, lice, and mites and explain the life cycle and treatment and prevention methods*
30.03	*Identify ova of endoparasites roundworms, hookworms, whipworms, strongyles and explain the life cycle and treatment and prevention methods*
30.04	*Identify adult endoparasites roundworms, hookworms, whipworms, strongyles and heartworms*
30.05	*Identify giardia and coccidia in fecal samples*

	30.06 Identify tapeworm segments in fecal sample or on pet

Course Number: ATE0072 Occupational Completion Point: C Veterinary Assistant -150 Hours – SOC Code 29-2056	
31.0	Groom selected companion and livestock animals – the students will be able to:
	31.01 Discuss using a variety of brushes, combs, flea combs, mat splitters, undercoat rakes, etc. to groom animal hair/fur as needed for both cosmetic and therapeutic reasons.
	31.02 Explain using clippers to cut animal hair/fur as needed for both cosmetic and therapeutic reasons.
	31.03 Explain the necessity of following written and oral instructions and all label directions regarding shampoos for bathing and therapeutic or flea rinses (dips).
	31.04 List precautions in bathing and dipping including avoiding soap or chemicals in the eyes, lathering the entire body, timing the shampoo application according to directions, and towel or blow drying.
	31.05 Identify the area of blood and nerve supply of the nail in the dog and cat and common pets such as rabbits and ferrets.
	31.06 Identify appropriate instrument or nail trimmer for small and large dogs and cats.
	31.07 Demonstrate comfortable handling of paw or limb during nail trim for dog and cat.
	31.08 Explain methods for hemostasis if nail is accidentally trimmed too short.
	31.09 Notify supervisor of abnormalities including in-grown nails and abnormal growth or shape.
	31.10 Describe the steps in expressing anal sacs using the external method.
	31.11 Discuss proper hoof care and hoof trimming needs.
32.0	Describe exotic animals and the effects of captivity on them – the students will be able to:
	32.01 Define exotic animal, zoo animal, invasive and native animals.
	32.02 Identify exotic animals native and invasive to Florida.
	32.03 Explain the effects of urban sprawl on the wildlife population.
	32.04 Describe the roles of the Florida Fish and Wildlife Conservation Commission in wildlife management.
	32.05 Explain state, national, and international laws affecting the purchase and transport of exotic animals.
33.0	Assess techniques used in surgical assisting and surgical preparation – the students will be able to:
	33.01 Prepare and sterilize surgical equipment and supplies.

	• *Explain standard procedure for cleaning and lubricating all stainless steel instruments.* • *Explain appropriate use of ultrasonic instrument cleaning and proper solutions.* • *Explain cold sterilization trays and appropriate solutions.* • *Demonstrate assembly and wrapping of surgical packs for sterilization.* • *Demonstrate folding and wrapping a surgical gown for sterilization.* • *Explain proper procedure for sterilizations methods including the autoclave and gas sterilization (ethylene oxide) including safety precautions with each.*
33.02	*Describe components of surgical assisting.* • *Explain aseptic protocol for maintaining sterility of the surgical field* • *Demonstrate what can and cannot be touched when assisting in a surgical environment.* • *Demonstrate how suture material might be removed from its outer packaging and passed to the surgeon while maintaining sterility*
33.03	*Summarize procedures necessary of patient preparation.* • *Explain reason for pre-surgical fasting and appropriate time interval.* • *List methods to identify animal for surgery and confirm identity.* • *Demonstrate dorsal and sternal recumbancy positioning and securing animal in each on the surgery table under anesthesia as instructed by the veterinary technician or veterinarian.* • *Demonstrate clipping or shaving surgical field as instructed by the veterinary technician or veterinarian.* • *Demonstrate cleaning and disinfecting the surgical field using currently accepted standards for aseptic technique and surgical scrub.*
33.04	*Identify proper post-surgical care techniques.* • *List parameters to monitor during recovery and signs of distress in the recovery period.* • *Explain the swallow reflex and the appropriate time and method for endotracheal tube removal.* • *Explain appropriate transfer of animal from surgery to recovery kennel, positioning in kennel, and precautions in kennel.* • *Confirm "No food or water" or similar instructions on recovery kennel.*
34.0	Explain principles of pharmacology – the students will be able to:
34.01	*Identify forms of medication including tablet, capsule, liquid, powder, granules, topical creams, liquids, and gels.*
34.02	*Explain the application of topical flea medication.*
34.03	*Demonstrate the reconstitution of vaccine using appropriate diluents and amounts of diluents.*
34.04	*Demonstrate administration oral medications on companion and livestock animals.*
34.05	*List the components that must be present on a prescription label.*
34.06	*Observe and understand controlled substances logs and security*
34.07	*Inventory pharmacy supplies and notify supervisor of low supplies*

	34.08 Identify expiration date on labels and notify supervisor of expired drugs
	34.09 Maintain clean shelves and storage areas for pharmaceuticals
	34.10 Describe the process for administering medications by injection, oral, nasal and topical.
	34.11 Describe the procedure for safe disposal of medications.
	34.12 Determine methods to observe animals for medicine side effects or allergies.
35.0	Explain proper methods of syringe and hypodermic needle use – the student will be able to:
	35.01 Identify and give the correct alignment from smallest to largest of hypodermic needles including but not limited to;12 g, 18g, 20 g, 22 g and 25 g.
	35.02 Identify and align from smallest to largest commonly used syringes including but not limited to 3cc, 6cc, 12cc, 20cc, 35cc, 60cc and 1cc tuberculin or insulin syringe.
	35.03 Demonstrate the ability to read the precise volume of medication in a syringe and to fill a syringe with medication to a specified volume when requested.
	35.04 Describe appropriate SQ, IM, and IV injection sites.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Benchmarks that appear in italics within the framework are skills or competencies that have been taken directly from the FVMA Skills Competency Validation list. The most up to date validation list can be found on the FVMA website.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills (if applicable)

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9, Language 9, and Reading 9. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Nursery Management**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	A010616
CIP Number	0101060602
Grade Level	30, 31
Standard Length	900 hours
Teacher Certification	Refer to **Program Structure** table.
CTSO	N/A
SOC Codes (all applicable)	45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse 11-9013 - Farmers, Ranchers, and Other Agricultural Managers
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the horticulture and landscape industries within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety and environmental issues.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. Planned and Supervised Agricultural Experiences (SAE) must be provided through one or more of the following: (1) directed laboratory experience, (2) student project, (3) placement for experience, or (4) cooperative education.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	ORH0862	Nursery Workers	AGRICULTUR 1 @2 HORTICULT #7	300 hours	45-2092
B	ORH0863	Nursery and Greenhouse Managers 1	AGRICULTUR 1 @2 AGRI @2 HORTICULT #7	450 hours	11-9013
C	ORH0864	Nursery and Greenhouse Managers 2		150 hours	11-9013

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe the horticulture industry.
02.0 Identify safety procedures in the workplace.
03.0 Identify and classify plants.
04.0 Demonstrate plant propagation techniques
05.0 Identify growing media and apply fertilizers.
06.0 Apply irrigation skills for plants and turf.
07.0 Demonstrate integrated pest management approaches.
08.0 Describe the principles and requirements for plant growth.
09.0 Apply best management practices in horticulture industry.
10.0 Identify principles of landscape design.
11.0 Apply safety procedures in the workplace
12.0 Classify plants based on scientific principles
13.0 Demonstrate proper use of growing media and fertilizers
14.0 Demonstrate Integrated Pest Management approaches
15.0 Identify the principles and requirements of plant growth
16.0 Apply best management practices in landscape design
17.0 Apply principles of landscape design and maintenance
18.0 Harvest, transport, and install plant materials
19.0 Identify procedures to operate, repair, and maintain tools and equipment
20.0 Identify emerging technologies in the horticulture industry
21.0 Demonstrate leadership, employability, communications and human relations skills
22.0 Apply knowledge to identify and classify plants.
23.0 Control pests.
24.0 Operate tools and equipment.
25.0 Prepare growing media.
26.0 Irrigate plants.
27.0 Demonstrate proper fertilizing techniques.
28.0 Demonstrate abilities to maintain and analyze records
29.0 Maintain tools and equipment
30.0 Demonstrate application of chemicals and calibrate spray equipment
31.0 Develop irrigation and drainage plan.
32.0 Raise crop too point of sale.
33.0 Prune and shape nursery stock.
34.0 Harvest, process, and ship nursery stock.
35.0 Market nursery stock.
36.0 Operate, repair, and maintain nursery equipment and facilities
37.0 Identify business principles

Florida Department of Education
Student Performance Standards

Program Title: Nursery Management
Career Certificate Program Number: A010616

Course Number: ORH0862 **Occupational Completion Point: A** **Nursery Workers – 300 Hours – SOC Code 45-2092**	
01.0	Describe the horticulture industry – the student will be able to:
01.01	Describe the importance of horticulture to the American and global economies.
01.02	Identify career opportunities in horticulture and educational requirements and continuing education opportunities for horticulture careers.
01.03	Describe the importance of horticulture to the environment, including sustainability practices
01.04	Identify professional organizations and certifications for the horticultural industry.
02.0	Identify safety procedures in the workplace – the student will be able to:
02.01	Identify the common causes of accidents in the horticulture industry.
02.02	Demonstrate proper safety precautions and use of personal protective equipment specific to the horticulture industry.
02.03	Explain, identify and utilize pertinent information from a container label and/or Material Safety Data Sheet (MSDS) according to Environmental Protection Agency (EPA), Worker Protection Standard and Occupational Safety and Health Agency (OHSA) Regulations.
03.0	Identify and classify plants – the student will be able to:
03.01	Identify plants by scientific and common names.
03.02	Classify plants botanically.
03.03	Write scientific names for plants.
04.0	Demonstrate plant propagation techniques – the student will be able to:
04.01	Identify propagating and growing facilities and structures.
04.02	Prepare propagation media.
04.03	Select and collect propagation materials.

	04.04 Demonstrate propagation by sexual and asexual methods.
	04.05 Demonstrate environmental controls for propagation materials.
	04.06 Identify and select proper rooting hormones based on plant characteristics.
05.0	Identify growing media and fertilizers – the student will be able to:
	05.01 Identify soil and media materials.
	05.02 Identify nutritional needs of plants.
	05.03 Identify symptoms of nutritional deficiencies and toxicities of plants.
	05.04 Identify types and kinds of fertilizers.
	05.05 Identify methods of distributing fertilizers.
	05.06 Interpret information on a label of fertilizer used in Florida.
06.0	Apply irrigation skills for plants and turf – the student will be able to:
	06.01 Identify water needs of plants.
	06.02 Irrigate plants at recommended rates.
	06.03 Identify the symptoms of excessive water and water stress in plants.
	06.04 Describe the basic irrigation systems and principles used in the landscape and nursery.
07.0	Demonstrate Integrated Pest Management approaches – the student will be able to:
	07.01 Identify common pests of plants.
	07.02 Describe life cycles of common pests of plants.
	07.03 Recognize signs of damage from pests.
08.0	Describe the principles and requirements of plant growth – the student will be able to:
	08.01 Explain how the energy of sunlight is converted to chemical energy through the process of photosynthesis.
	08.02 Explain how photosynthesis in plants is directly affected by various environmental factors such as light and temperature.
	08.03 Explain the process of respiration and the flow of energy in plants.

	08.04 Describe the influence of light and temperature on plant growth including photo tropism.
09.0	Apply best management practices in the horticulture industry – the student will be able to:
	09.01 Identify and apply Best Management Practices to reduce pollution and conserve water.
	09.02 Identify and apply Best Management Practices on fertilizer recommendations for Florida plants and turf.
10.0	Identify principles of landscape design – the student will be able to:
	10.01 Compare and contrast the use of line, form, texture and color in designing landscapes.
	10.02 Identify the principles of design (unity, repetition, balance, emphasis and scale) as they apply to landscapes.
	10.03 Identify points of emphasis and major design areas in the residential landscape.
	10.04 Identify plant selection for a residential landscape using Florida Friendly Landscape Principles.
	10.05 Read and interpret a landscape plan.
	10.06 Develop skills for drawing and identifying symbols.
	10.07 Draw and design a landscape plan for a small garden.
	10.08 Construct a landscape display.
11.0	Apply safety procedures in the workplace – the student will be able to:
	11.01 Describe emergency procedures in the horticulture workplace.
	11.02 Create preventive measures to avoid hazardous situations.
	11.03 Apply problem solving skills to correct a hazardous situation.
12.0	Classify plants based on scientific principles – the student will be able to:
	12.01 Describe principles of plant biology and growth.
	12.02 Explain the role of plants in the ecosystem.
	12.03 Describe the major classifications of plants based on life cycle.
	12.04 Demonstrate the use of scientific and common names of plants including genus and specific epithet and cultivar.
	12.05 Demonstrate proper use of scientific names.

13.0	Demonstrate proper use of growing media and fertilizers – the student will be able to:
	13.01 Apply information on a label of fertilizer used in Florida.
	13.02 Apply fertilizer and soil amendments.
	13.03 Identify materials that are needed to alter pH and calculate the amount to apply to change the pH.
	13.04 Demonstrate the procedure for calibrating a fertilizer spreader or injector using appropriate mathematical concepts.
	13.05 Identify essential elements and nutrients in plant growth including macronutrients and micronutrients.
	13.06 Using references make fertilizer recommendations for ornamental plants, turf grass, and palms.
14.0	Demonstrate Integrated Pest Management approaches – the student will be able to:
	14.01 Classify insects according to feeding habits.
	14.02 Describe biological, chemical, and cultural methods of controlling plant pests.
	14.03 Diagnose and outline a plan for controlling pests on a horticultural crop.
	14.04 Describe methods of controlling nematode pests on ornamental plants.
	14.05 Develop a pest control program for a horticultural crop using Integrated Pest Management.
15.0	Identify the principles and requirements of plant growth – the student will be able to:
	15.01 Demonstrate methods of pruning plants.
	15.02 Identify appropriate time to prune plants.
	15.03 Identify and select pruning tools.
	15.04 Demonstrate proper use of pruning tools and care.
	15.05 Identify Plant Growth Regulators and their use on horticulture and landscape plants.
	15.06 Outline and use a record book for the use of a plant growth regulator on a horticultural or nursery crop.
	15.07 Identify specific cultural, mechanical, chemical, and biological methods of weed management.
16.0	Apply best management practices in landscape design – the student will be able to:
	16.01 Identify and apply Best Management Practices for the design and installation of landscapes.

	16.02 Identify and apply Best Management Practices on the management and handling of pesticides.
17.0	Apply principles of landscape design and maintenance – the student will be able to:
	17.01 Demonstrate the use of line, form, texture and color in designing landscapes.
	17.02 Demonstrate the principles of design (unity, repetition, balance, emphasis and scale) as they apply to landscapes.
	17.03 Apply points of emphasis and major design areas in the commercial landscape.
	17.04 Identify plant selection for a commercial landscape using Florida Friendly Landscape Principles.
	17.05 Create a landscape plan for a residential or commercial property.
	17.06 Calculate materials needed according to the identified landscape plan.
	17.07 Identify factors in selecting turf for landscape installation.
18.0	Harvest, transport, and install plant materials – the student will be able to:
	18.01 Determine requirements for preserving plant viability.
	18.02 Demonstrate proper landscape plant establishment techniques.
	18.03 Select and prepare plants for transporting and transplanting.
	18.04 Select horticultural products according to Florida grades and standards.
19.0	Identify procedures to operate, repair, and maintain tools and equipment – the student will be able to:
	19.01 Perform equipment pre-operational check.
	19.02 Identify, maintain, and operate hand tools and power tools.
20.0	Identify emerging technologies in the horticulture industry – the student will be able to:
	20.01 Investigate DNA and genetics applications in horticulture including the theory of probability.
	20.02 Evaluate advances in biotechnology that impact horticulture. (e.g. transgenic crops, biological controls, micro propagation etc.).
21.0	Demonstrate leadership, employability, communications and human relations skills – the student will be able to:
	21.01 Identify acceptable work habits and personal characteristics.
	21.02 Identify acceptable employee hygiene habits.

	21.03 Identify or demonstrate appropriate responses to criticism from employer,
	21.04 Describe the importance of industry certifications.

Course Number: ORH0863 Occupational Completion Point: B Nursery and Greenhouse Managers 1– 450 Hours – SOC Code 11-9013	
22.0	Apply knowledge to identify and classify plants – the student will be able to:
	22.01 Classify plants as monocots or dicots.
	22.02 Classify plants as annuals, biennials, and perennials.
	22.03 Identify plants appropriate to a region.
	22.04 Classify plants according to growth habit.
	22.05 Prepare propagation materials (seeds, cuttings, etc.) for planting.
	22.06 Apply growth stimulants to propagation materials.
	22.07 Demonstrate sanitation and safety practices when propagating.
	22.08 Prepare flats and seedbeds and plant seeds.
23.0	Control pests – the student will be able to:
	23.01 Report insect and disease damage.
	23.02 Identify chemical spray damage.
	23.03 Select proper IPM practices (biological, chemical and physical) for control of insects, diseases, vertebrates and weeds.
	23.04 Evaluate the efficacy and phytotoxicity of a chemical prior to inclusion in a growing program.
24.0	Operate tools and equipment – the student will be able to:
	24.01 Identify, operate, and maintain tractor and power equipment.
	24.02 Load, secure, and transport equipment.

25.0	Prepare growing media – the student will be able to:
	25.01 Sterilize rooting, potting, and growing media.
	25.02 Adjust pH and nutritional levels of media.
	25.03 Fill and level benches and pots with media.
	25.04 Demonstrate sanitation practices when handling and storing plant media materials.
26.0	Irrigate plants – the student will be able to:
	26.01 Set up an irrigation system for a propagation area.
	26.02 Set up an irrigation system for a growing structure.
	26.03 Set up an irrigation system for a retail display.
	26.04 Maintain and repair an irrigation system.
	26.05 Identify and use various types of irrigation systems (low volume, ebb and flow, drip, mat, recirculating, etc.).
	26.06 Explain and apply Best Management Practices as they apply to irrigation.
27.0	Demonstrate proper fertilizing techniques – the student will be able to:
	27.01 Collect soil and leaf tissue samples for analysis.
	27.02 Interpret and evaluate the results of soil and leaf tissue analysis and determine corrective actions.
	27.03 Demonstrate proper handling and storage of fertilizers, observing safety precautions.
	27.04 Evaluate, operate, and maintain fertilizer distribution equipment.
	27.05 Develop a fertilization schedule for various plant species.
	27.06 Determine rate of fertilizer application.
28.0	Demonstrate abilities to maintain and analyze records – the student will be able to:
	28.01 Create a plant and inventory supply list.
	28.02 Maintain current plant and supply inventory.
	28.03 Maintain job records, daily log sheets, and inventory.

	28.04 Calculate labor costs involved with product pricing.
	28.05 Analyze and maintain production and sales records.
	28.06 Determine plant production costs.
	28.07 Prepare a budget.
29.0	Maintain tools and equipment – the student will be able to:
	29.01 Maintain oil level in engines of power equipment.
	29.02 Check and maintain tire air pressure on equipment.
	29.03 Maintain fuel levels using proper fuel or fuel mixtures.
	29.04 Demonstrate proper equipment operations.
	29.05 Identify, operate, and maintain tractor and power equipment.

Course Number: ORH0864 Occupational Completion Point: C Nursery and Greenhouse Managers 2– 150 Hours – SOC Code 11-9013	
30.0	Demonstrate application of chemicals and calibrate spray equipment – the student will be able to:
	30.01 Select, mix, and apply a non-restricted chemical according to the label and local, state, federal, and EPA regulations.
	30.02 Discuss appropriate responses to chemical or fertilizer spills.
	30.03 Identify and report insect and disease damage on plants and turf.
	30.04 Diagnose a plant or disease problem on turf.
31.0	Develop irrigation and drainage plan – the student will be able to:
	31.01 Identify drainage components for different types of drainage systems.
	31.02 Install irrigation systems with control valves and clocks.
	31.03 Set up an irrigation system for a growing area.
	31.04 Comply with local, state and federal conservation guidelines.

32.0	Raise crop too point of sale – the student will be able to:
	32.01 Choose plant, container, media, and growing structure.
	32.02 Apply sound cultural practices.
	32.03 Use chemicals to raise crop (i.e. fertilizer, growth retardants, pesticides).
	32.04 Schedule crop for sale.
	32.05 Maintain production records
33.0	Prune and shape nursery stock – the student will be able to:
	33.01 Prune plants to achieve desired growth and shape.
	33.02 Select and use chemical growth regulators.
	33.03 Identify techniques for pruning specialty items (topiary, bonsai).
	33.04 Set up an irrigation system for a growing area.
34.0	Harvest, process, and ship nursery stock – the student will be able to:
	34.01 Determine customer needs per landscape plan.
	34.02 Grade and harvest field-grown plants (ball, burlap, bare-root, "grow bags").
	34.03 Identify mechanical techniques for harvesting field-grown plants (tree spade and mechanical digger).
	34.04 Select and assemble container-grown plants using industry-accepted grades and standards.
	34.05 Prepare for shipment, loading, and transporting harvested plant materials.
	34.06 Comply with regulations regarding the inspection and movement of plant materials.
	34.07 Demonstrate safety practices when harvesting, processing, and shipping nursery stock.
	34.08 Determine proper shipping environment.
35.0	Market nursery stock – the student will be able to:
	35.01 Label and merchandise plants including plant care tags, bar codes, and shipping instructions.
	35.02 Maintain clean and attractive merchandising and display areas safely.

	35.03 Use various advertising methods to promote sales.
	35.04 Take telephone orders.
	35.05 Use sales catalog.
	35.06 Greet customers and close sales.
	35.07 Describe care and use of plants and related products to customers.
	35.08 Handle customer complaints and problems.
36.0	Operate, repair, and maintain nursery equipment and facilities – the student will be able to:
	36.01 Determine equipment needs for the job.
	36.02 Order parts and supplies.
	36.03 Perform simple electrical repairs.
	36.04 Build or repair frames, benches, and other greenhouse or nursery facilities.
	36.05 Demonstrate safety practices when working with equipment and facilities.
37.0	Identify business principles – the student will be able to:
	37.01 Describe principles of business management.
	37.02 Describe business organizational structures.
	37.03 Cite financial management methods.
	37.04 Interpret laws, regulations, and codes pertinent to the nursery industry.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Extended Student Supervision

Because of the production and marketing cycle of the agricultural industries, this program requires individual instruction and supervision of students for the entire period beyond the 180-day school year.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills (if applicable)

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9, Language 9, and Reading 9. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Landscape & Turf Management**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	A200100
CIP Number	0101060703
Grade Level	30, 31
Standard Length	900 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	N/A
SOC Codes (all applicable)	45-2092- Farmworkers and Laborers, Crop, Nursery, and Greenhouse 37-3011 - Landscaping and Groundskeeping Workers 37-1012 - First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the horticulture and landscape industries within the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety and environmental issues.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. Planned and Supervised Agricultural Experiences (SAE) must be provided through one or more of the following: (1) directed laboratory experience, (2) student project, (3) placement for experience, or (4) cooperative education.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	ORH0862	Nursery Workers	AGRICULTUR 1 @2 HORTICULT #7	300 hours	45-2092
B	ORH0802	Landscaping and Grounds keeping		450 hours	37-3011
C	ORH0803	Landscaping And Grounds keeping Supervisors		150 hours	37-1012

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe the horticulture industry.
02.0 Identify safety procedures in the workplace.
03.0 Identify and classify plants.
04.0 Demonstrate plant propagation techniques
05.0 Identify growing media and apply fertilizers.
06.0 Apply irrigation skills for plants and turf.
07.0 Demonstrate integrated pest management approaches.
08.0 Describe the principles and requirements for plant growth.
09.0 Apply best management practices in horticulture industry.
10.0 Identify principles of landscape design.
11.0 Apply safety procedures in the workplace
12.0 Classify plants based on scientific principles
13.0 Demonstrate proper use of growing media and fertilizers
14.0 Demonstrate Integrated Pest Management approaches
15.0 Identify the principles and requirements of plant growth
16.0 Apply best management practices in landscape design
17.0 Apply principles of landscape design and maintenance
18.0 Harvest, transport, and install plant materials
19.0 Identify procedures to operate, repair, and maintain tools and equipment
20.0 Identify emerging technologies in the horticulture industry
21.0 Demonstrate leadership, employability, communications and human relations skills
22.0 Maintain tools and equipment
23.0 Demonstrate application of chemicals and calibrate spray equipment
24.0 Classify plants and turfgrass
25.0 Demonstrate fertilization skills
26.0 Irrigate plants and turf
27.0 Layout and install landscape and/or interiorscape
28.0 Maintain landscape
29.0 Maintain customer relations and observe follow-up procedures
30.0 Analyze and design landscape
31.0 Prepare estimates, contracts, and presentation
32.0 Lay out and install landscape and turf
33.0 Conduct final walk-through of landscape installation
34.0 Identify components of athletic fields
35.0 Maintain athletic fields
36.0 Develop recreational areas
37.0 Maintain sports turf

38.0 Establish turfgrass
39.0 Tending and rejuvenating turf

Florida Department of Education
Student Performance Standards

Program Title: Landscape & Turf Management
Career Certificate Program Number: A200100

Course Number: ORH0862 **Occupational Completion Point: A** **Nursery Workers – 300 Hours – SOC Code 45-2092**	
01.0	Describe the horticulture industry – the student will be able to:
01.01	Describe the importance of horticulture to the American and global economies.
01.02	Identify career opportunities in horticulture and educational requirements and continuing education opportunities for horticulture careers.
01.03	Describe the importance of horticulture to the environment, including sustainability practices
01.04	Identify professional organizations and certifications for the horticultural industry.
02.0	Identify safety procedures in the workplace – the student will be able to:
02.01	Identify the common causes of accidents in the horticulture industry.
02.02	Demonstrate proper safety precautions and use of personal protective equipment specific to the horticulture industry.
02.03	Explain, identify and utilize pertinent information from a container label and/or Material Safety Data Sheet (MSDS) according to Environmental Protection Agency (EPA), Worker Protection Standard and Occupational Safety and Health Agency (OHSA) Regulations.
03.0	Identify and classify plants – the student will be able to:
03.01	Identify plants by scientific and common names.
03.02	Classify plants botanically.
03.03	Write scientific names for plants.
04.0	Demonstrate plant propagation techniques – the student will be able to:
04.01	Identify propagating and growing facilities and structures.
04.02	Prepare propagation media.

	04.03 Select and collect propagation materials.
	04.04 Demonstrate propagation by sexual and asexual methods.
	04.05 Demonstrate environmental controls for propagation materials.
	04.06 Identify and select proper rooting hormones based on plant characteristics.
05.0	Identify growing media and fertilizers – the student will be able to:
	05.01 Identify soil and media materials.
	05.02 Identify nutritional needs of plants.
	05.03 Identify symptoms of nutritional deficiencies and toxicities of plants.
	05.04 Identify types and kinds of fertilizers.
	05.05 Identify methods of distributing fertilizers.
	05.06 Interpret information on a label of fertilizer used in Florida.
06.0	Apply irrigation skills for plants and turf – the student will be able to:
	06.01 Identify water needs of plants.
	06.02 Irrigate plants at recommended rates.
	06.03 Identify the symptoms of excessive water and water stress in plants.
	06.04 Describe the basic irrigation systems and principles used in the landscape and nursery.
07.0	Demonstrate Integrated Pest Management approaches – the student will be able to:
	07.01 Identify common pests of plants.
	07.02 Describe life cycles of common pests of plants.
	07.03 Recognize signs of damage from pests.
08.0	Describe the principles and requirements of plant growth – the student will be able to:
	08.01 Explain how the energy of sunlight is converted to chemical energy through the process of photosynthesis.
	08.02 Explain how photosynthesis in plants is directly affected by various environmental factors such as light and temperature.

	08.03 Explain the process of respiration and the flow of energy in plants.
	08.04 Describe the influence of light and temperature on plant growth including photo tropism.
09.0	Apply best management practices in the horticulture industry – the student will be able to:
	09.01 Identify and apply Best Management Practices to reduce pollution and conserve water.
	09.02 Identify and apply Best Management Practices on fertilizer recommendations for Florida plants and turf.
10.0	Identify principles of landscape design – the student will be able to:
	10.01 Compare and contrast the use of line, form, texture and color in designing landscapes.
	10.02 Identify the principles of design (unity, repetition, balance, emphasis and scale) as they apply to landscapes.
	10.03 Identify points of emphasis and major design areas in the residential landscape.
	10.04 Identify plant selection for a residential landscape using Florida Friendly Landscape Principles.
	10.05 Read and interpret a landscape plan.
	10.06 Develop skills for drawing and identifying symbols.
	10.07 Draw and design a landscape plan for a small garden.
	10.08 Construct a landscape display.
11.0	Apply safety procedures in the workplace – the student will be able to:
	11.01 Describe emergency procedures in the horticulture workplace.
	11.02 Create preventive measures to avoid hazardous situations.
	11.03 Apply problem solving skills to correct a hazardous situation.
12.0	Classify plants based on scientific principles – the student will be able to:
	12.01 Describe principles of plant biology and growth.
	12.02 Explain the role of plants in the ecosystem.
	12.03 Describe the major classifications of plants based on life cycle.
	12.04 Demonstrate the use of scientific and common names of plants including genus and specific epithet and cultivar.

	12.05 Demonstrate proper use of scientific names.
13.0	Demonstrate proper use of growing media and fertilizers – the student will be able to:
	13.01 Apply information on a label of fertilizer used in Florida.
	13.02 Apply fertilizer and soil amendments.
	13.03 Identify materials that are needed to alter pH and calculate the amount to apply to change the pH.
	13.04 Demonstrate the procedure for calibrating a fertilizer spreader or injector using appropriate mathematical concepts.
	13.05 Identify essential elements and nutrients in plant growth including macronutrients and micronutrients.
	13.06 Using references make fertilizer recommendations for ornamental plants, turf grass, and palms.
14.0	Demonstrate Integrated Pest Management approaches – the student will be able to:
	14.01 Classify insects according to feeding habits.
	14.02 Describe biological, chemical, and cultural methods of controlling plant pests.
	14.03 Diagnose and outline a plan for controlling pests on a horticultural crop.
	14.04 Describe methods of controlling nematode pests on ornamental plants.
	14.05 Develop a pest control program for a horticultural crop using Integrated Pest Management.
15.0	Identify the principles and requirements of plant growth – the student will be able to:
	15.01 Demonstrate methods of pruning plants.
	15.02 Identify appropriate time to prune plants.
	15.03 Identify and select pruning tools.
	15.04 Demonstrate proper use of pruning tools and care.
	15.05 Identify Plant Growth Regulators and their use on horticulture and landscape plants.
	15.06 Outline and use a record book for the use of a plant growth regulator on a horticultural or nursery crop.
	15.07 Identify specific cultural, mechanical, chemical, and biological methods of weed management.
16.0	Apply best management practices in landscape design – the student will be able to:

	16.01 Identify and apply Best Management Practices for the design and installation of landscapes.
	16.02 Identify and apply Best Management Practices on the management and handling of pesticides.
17.0	Apply principles of landscape design and maintenance – the student will be able to:
	17.01 Demonstrate the use of line, form, texture and color in designing landscapes.
	17.02 Demonstrate the principles of design (unity, repetition, balance, emphasis and scale) as they apply to landscapes.
	17.03 Apply points of emphasis and major design areas in the commercial landscape.
	17.04 Identify plant selection for a commercial landscape using Florida Friendly Landscape Principles.
	17.05 Create a landscape plan for a residential or commercial property.
	17.06 Calculate materials needed according to the identified landscape plan.
	17.07 Identify factors in selecting turf for landscape installation.
18.0	Harvest, transport, and install plant materials – the student will be able to:
	18.01 Determine requirements for preserving plant viability.
	18.02 Demonstrate proper landscape plant establishment techniques.
	18.03 Select and prepare plants for transporting and transplanting.
	18.04 Select horticultural products according to Florida grades and standards.
19.0	Identify procedures to operate, repair, and maintain tools and equipment – the student will be able to:
	19.01 Perform equipment pre-operational check.
	19.02 Identify, maintain, and operate hand tools and power tools.
20.0	Identify emerging technologies in the horticulture industry – the student will be able to:
	20.01 Investigate DNA and genetics applications in horticulture including the theory of probability.
	20.02 Evaluate advances in biotechnology that impact horticulture. (e.g. transgenic crops, biological controls, micro propagation etc.).
21.0	Demonstrate leadership, employability, communications and human relations skills – the student will be able to:
	21.01 Identify acceptable work habits and personal characteristics.

21.02	Identify acceptable employee hygiene habits.
21.03	Identify or demonstrate appropriate responses to criticism from employer,
21.04	Describe the importance of industry certifications.

Course Number: ORH0802 Occupational Completion Point: B Landscaping and Groundskeeping – 450 Hours – SOC Code 37-1011	
22.0	Maintain tools and equipment – the student will be able to:
22.01	Maintain oil level in engines of power equipment.
22.02	Check and maintain tire air pressure on equipment.
22.03	Maintain fuel levels using proper fuel or fuel mixtures.
22.04	Operate manual transmissions.
22.05	Identify, operate, and maintain tractor and power equipment.
22.06	Service and maintain battery and electrical systems.
22.07	Perform minor tune-up on engines.
22.08	Load, secure, and transport equipment.
22.09	Demonstrate safety precautions while working with tools and equipment.
23.0	Demonstrate application of chemicals and calibrate spray equipment – the student will be able to:
23.01	Select, mix, and apply a non-restricted chemical according to the label and local, state, federal, and EPA regulations.
23.02	Calibrate spray and spread equipment.
23.03	Discuss appropriate responses to chemical or fertilizer spills.
23.04	Identify and report insect and disease damage on plants and turf.
23.05	Diagnose a plant or disease problem on turf.
23.06	Identify and report insect and disease damage.

	23.07 Determine chemical compatibility.
	23.08 Determine appropriate time frequency and method of chemical application.
24.0	Classify plants and turfgrass – the student will be able to:
	24.01 Classify plants and turfgrass as annuals, biennials, and perennials.
	24.02 Identify plants and turfgrass that are specific to a region.
	24.03 Identify common weeds in Florida turf grasses.
25.0	Demonstrate fertilization skills – the students will be able to:
	25.01 Develop a fertilization schedule.
	25.02 Interpret fertilizer charts and develop recommendations according to turf species.
	25.03 Calibrate fertilizer equipment.
26.0	Irrigate plants and turf – the student will be able to:
	26.01 Identify various types of irrigation systems.
	26.02 Install and maintain piping and water distribution components.
	26.03 Install valves, timers, rain shut-offs, moisture sensors, and back flow prevention devices.
	26.04 Design a microirragation system.
	26.05 List problems associated with improper design, installation and maintenance.
27.0	Layout and install landscape and/or interiorscape – the student will be able to:
	27.01 Prepare landscape and/or interiorscape
	27.02 Prepare final grade.
	27.03 Install mulch and perform final cleanup.
	27.04 Calculate labor costs associated with installation.
	27.05 Layout plants based on a landscape plan.
	27.06 Plant site using sound cultural practices.

	27.07 Install mulch and perform final cleanup.
28.0	Maintain landscape – the student will be able to:
	28.01 Perform maintenance inspection of the project.
	28.02 Determine water requirements and apply at proper rates.
	28.03 Identify weeds and apply herbicides safely.
	28.04 Determine fertilization requirements and apply at proper rates.
	28.05 Identify plant pest and disease problems and apply corrective measures.
	28.06 Trim and prune landscape plants.
	28.07 Maintain turf viability; mow at proper height and frequency, blade edge, line trim, and remove trash.
	28.08 Explain cause and effect of soil compaction and thatch buildups, and determine appropriate methods of correction.
	28.09 Cultivate and mulch plants.
	28.10 Prune trees based on ANSI (American National Standard Institute) standards.
	28.11 Provide protection for plants from adverse weather conditions.
	28.12 Comply with local, state, and federal regulations regarding landscape maintenance and pesticide applications.
	28.13 Demonstrate sanitation and safety practices when maintaining landscape.
29.0	Maintain customer relations and observe follow-up procedures – the student will be able to:
	29.01 Conduct walk-through of project with client to assure satisfaction.
	29.02 Identify current and future maintenance requirements.
	29.03 Analyze project records for profitability and employee performance.

Course Number: ORH0803 Occupational Completion Point: C Landscape and Grounds keeping Supervisors– 150 Hours – SOC Code 37-1012	
30.0	Analyze and design landscape – the student will be able to:
	30.01 Analyze and interpret plans, specifications, and environmental conditions of the project.
	30.02 Design the project.
	30.03 Identify and locate project materials.
	30.04 Determine personnel and equipment needs and safety requirements for the project.
	30.05 Establish project schedule.
31.0	Prepare estimates, contracts, and presentation – the student will be able to:
	31.01 Determine costs of materials, equipment, and labor.
	31.02 Prepare a price for the project and terms of contract.
	31.03 Prepare written contract, using standard rules of English, including punctuation, spelling, sentence structure and references.
	31.04 Prepare and give oral presentation of the project design using standard rules of English, including punctuation and sentence structure.
	31.05 Maintain job records, daily log sheets, and inventory.
32.0	Lay out and install landscape and turf – the student will be able to:
	32.01 Locate existing utilities and secure a permit.
	32.02 Prepare and rough grade the site.
	32.03 Determine procedures for installation of large materials.
	32.04 Install and test irrigation system.
	32.05 Describe procedures for constructing hardscape (walls, walks, patios, drives, etc.).
33.0	Conduct final walk-through of landscape installation – the student will be able to:
	33.01 Conduct walk-through of installation project with client to assure customer satisfaction.
	33.02 Analyze project records for profitability and employee performance.
34.0	Identify components of athletic fields – the student will be able to:

	34.01 Identify turf selection for various athletic fields.
	34.02 Identify appropriate dimensions for different athletic fields and specific requirements.
35.0	Maintain athletic fields – the student will be able to:
	35.01 Apply proper line marks for athletic fields.
	35.02 Painting fields (school logos or names)
	35.03 Apply proper techniques for clay maintenance.
	35.04 Mow grass to appropriate height for field use.
36.0	Develop recreational areas – the student will be able to:
	36.01 Establish plant beds with annuals, biennials, and perennials.
	36.02 Plant accent trees and shrubs in a recreational area.
	36.03 Establish sports turf.
37.0	Maintain sports turf – the student will be able to:
	37.01 Mow sport turf with reel mowers.
	37.02 Irrigate turf.
	37.03 Verticut turf.
	37.04 Aerate turf and remove debris.
38.0	Establish turfgrass – the student will be able to:
	38.01 Level seedbed.
	38.02 Plant turf by sprigs, plugs or sod.
	38.03 Remove sod with sod cutter.
39.0	Tending and rejuvenating turf – the student will be able to:
	39.01 Apply top dressing.
	39.02 Overseed turf.

39.03 Irrigate turf.
39.04 Aerate turf.
39.05 Apply fertilizer.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Extended Student Supervision

Because of the production and marketing cycle of the agricultural industries, this program requires individual instruction and supervision of students for the entire period beyond the 180-day school year.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills (if applicable)

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9, Language 9, and Reading 9. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Water Treatment Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	P150507
CIP Number	0715050603
Grade Level	30, 31
Standard Length	405 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	N/A
SOC Codes (all applicable)	51-8031 - Water and Wastewater Treatment Plant and System Operators
Basic Skills Level	Mathematics: N/A Language: N/A Reading: N/A

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the career Agriculture, Food and Natural Resources cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Water Treatment sector of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to source water or influent characteristics; treatment facility unit processes and operational techniques; water quality and identification; identifying treatment goals and measuring their achievement; disinfection; process control techniques; sampling, testing, and laboratory analysis; supervision; operation maintenance and inspection of facility equipment; application of current DEP regulations and standards; facility administration and management techniques; and troubleshooting operational control problems. The emphasis is on skills that are needed for effective treatment process control and troubleshooting.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	EVS0133	Water Treatment Plant Operator C	WSP OPER 7G	155 hours	51-8031
B	EVS0143	Water Treatment Plant Operator B		130 hours	51-8031
C	EVS0153	Water Treatment Plant Operator A		120 hours	51-8031

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify professions related to the water technology field.
02.0 Identify scientific concepts common in water and wastewater treatment.
03.0 Identify safety hazards associated with water technologies.
04.0 Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.
05.0 Solve basic math problems common to water technologies.
06.0 Define pumping and basic hydraulic principles.
07.0 Define principles of disinfection.
08.0 Define sampling techniques.
09.0 Define federal, state, and local regulations that apply to water technologies.
10.0 Demonstrate employability skills.
11.0 Identify sampling techniques and explain the significance of the steps.
12.0 Identify chemical, biological, and physical constituents of water entering the water-treatment facility or distribution systems.
13.0 Describe the principles, operational and troubleshooting practices of the aeration process.
14.0 Describe the principles, operational and troubleshooting practices of the mixing, coagulation, and flocculation processes.
15.0 Describe the principles, operational and troubleshooting practices of the sedimentation process.
16.0 Describe the principles, operational and troubleshooting practices of the filtration process.
17.0 Describe the principles, operational and troubleshooting practices of the water-softening process.
18.0 Describe the principles, operational and troubleshooting practices of the stabilization process.
19.0 Describe the principles, operational and troubleshooting practices of the corrosion-control process.
20.0 Describe the principles, operational and troubleshooting practices of the disinfection process.
21.0 Describe the principles, operational and troubleshooting practices for the control and treatment of trihalomethanes.
22.0 Describe the principles, operational and troubleshooting practices of the iron-and manganese-removal processes.
23.0 Describe the principles, operational and troubleshooting practices for taste and odor control.
24.0 Describe the principles, operational and troubleshooting practices of the demineralization processes.
25.0 Describe the principles, operational and troubleshooting practices of the fluoridation process.
26.0 Identify facility operational problems.
27.0 Describe basic hydraulics and pumping operations.
28.0 Identify appropriate federal, state, and local regulations for the operation and maintenance of a public potable-water facility.
29.0 Perform equipment inspection, and identify basic maintenance for the treatment train, treatment residuals disposal, and solids management.
30.0 Analyze the constituents of water and select the appropriate treatment.
31.0 Identify advanced sampling techniques and interpret the results.
32.0 Solve algebra, ratio, and proportion problems in the water treatment process.
33.0 Demonstrate process optimization for water treatment.
34.0 Analyze and correct facility operational problems.
35.0 Demonstrate equipment inspection and preventive maintenance for water treatment.
36.0 Apply appropriate federal, state and local regulations for operation and management of a public potable water facility.
37.0 Apply federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.

38.0 Describe energy conservation and identify ways to conserve energy in the water treatment facility.
39.0 Demonstrate supervisory skills.
40.0 Describe theoretical facility management skills.
41.0 Demonstrate methods of organization and control.
42.0 Develop a plan for cost management.
43.0 Prepare budgets and personnel assignments.
44.0 Develop standard operating procedures for the training and orientation of new employees.
45.0 Demonstrate personnel selection and discipline.
46.0 Demonstrate contingency planning.
47.0 Develop a plan for energy conservation.
48.0 Describe record keeping and use of computer applications in planning.
49.0 Explain process optimization for water or wastewater treatment facilities.
50.0 Interpret permits and blueprints.
51.0 Develop a laboratory plan for process control.
52.0 Discuss public-relations skills in community interactions.

Florida Department of Education
Student Performance Standards

Program Title: Water Treatment Technologies
Career Certificate Program Number: P150507

Course Number: EVS0133 **Occupational Completion Point: A** **Water Treatment Plant Operator C – 155 Hours – SOC Code 51-8031**	
01.0	Identify professions related to the water technology field – the student will be able to:
01.01	List duties of water technology workers such as wastewater operator, water operator, systems operator, stormwater operator, residual (bio-solids) hauler operator, cross connection operator, pretreatment operator, and meter reading/maintenance operator.
01.02	Identify the basic terms and concepts involved in processes used in these professions.
01.03	List potential employers in the water technology field: federal, municipal, county, state and private.
01.04	Identify resources to assist in finding employment in the field.
01.05	Identify professional organizations related to the water technology field.
01.06	Identify career ladder levels in the water technology field: trainee, C Level, B Level, A Level.
02.0	Identify scientific concepts common in water and wastewater treatment – the student will be able to:
02.01	Identify chemical symbols used in water and wastewater treatment.
02.02	Describe the hydrologic cycle.
02.03	Describe the basic concepts of the pH scale and its importance in the treatment process.
02.04	Identify the differences between mixtures, elements, and compounds, and organic and inorganic chemicals.
02.05	Identify principle states of matter: liquid, solid, and gas.
02.06	Identify the basic nitrogen, phosphorous, and carbon cycles.
03.0	Identify safety hazards associated with water technologies – the student will be able to:
03.01	Identify the types of hazards common to water technology facilities.
03.02	Recognize unsafe conditions and prescribe corrective measures.
03.03	Identify and safely handle hazardous chemicals common to water technology facilities.

	03.04 Recognize electrical hazards.
	03.05 Recognize fire hazards, identify types of fires, and describe appropriate extinguishing techniques.
04.0	Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials – the student will be able to:
	04.01 Identify the kinds of information presented on Material Safety Data Sheets (MSDS).
	04.02 Describe requirements for in-plant training and the accessibility of information on hazardous and toxic substances (chapter 442, F.S.).
05.0	Solve basic math problems common to water technologies – the student will be able to:
	05.01 Perform basic arithmetic problems, including addition, subtraction, multiplication, division, fractions, decimals, percentages, rounding (significant figures), graphing, etc.
	05.02 Identify metric measurements and perform conversions.
	05.03 Perform calculations that involve areas, volumes, capacities, retention times, pounds, mg/L, velocities, flow rates, pressure, and head.
06.0	Define pumping and basic hydraulic principles – the student will be able to:
	06.01 Identify types of pumps.
	06.02 Discuss application and use of different types of pumps.
	06.03 Identify components/characteristics of pumps including pump operation and basic pump curves including centrifugal pumps, positive displacement pumps, and air lift pumps.
	06.04 Identify types of pipes, valves, and fittings.
	06.05 Define cross connections.
	06.06 Identify the appropriate equipment used in the treatment processes.
07.0	Define principles of disinfection – the student will be able to:
	07.01 List the need/reasons for disinfection (list of waterborne diseases).
	07.02 Define concepts related to disinfection.
	07.03 List methods and chemicals used in disinfection.
	07.04 Define the physical properties of chlorine.
	07.05 List kinds of disinfection equipment used.
08.0	Define sampling techniques – the student will be able to:

	08.01 Define the reasons for sampling and types of samples.
	08.02 Define methods of sample collection and handling.
	08.03 Define the basic procedure for quality control and quality assurance in sampling.
	08.04 Define the chain of custody for samples.
	08.05 Perform total and free chlorine residual analysis.
	08.06 Perform pH analysis.
09.0	Define federal, state, and local regulations that apply to water technologies – the student will be able to:
	09.01 List regulatory agencies and their roles in monitoring the water technology field.
	09.02 Define regulations associated with the appropriate federal, state or local agencies.
	09.03 Define training and certification requirements for water technology workers.
10.0	Demonstrate employability skills – the student will be able to:
	10.01 Conduct a job search.
	10.02 Secure information about a job.
	10.03 Develop a detailed and complete resume.
	10.04 Complete a job application.
	10.05 Demonstrate competence in job-interview techniques.
	10.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	10.07 Identify acceptable work habits.
	10.08 Demonstrate knowledge of how to make job changes appropriately.
	10.09 Demonstrate acceptable employee-health habits for the treatment facility environment.
	10.10 Identify materials and documents needed for a professional library.
	10.11 Demonstrate productive and positive customer interactions.
	10.12 Demonstrate effective interpersonal communication skills.

11.0	Identify sampling techniques and explain the significance of the steps – the student will be able to:
	11.01 Identify the laboratory tests that are commonly performed by operators in Florida water-treatment facilities, including those required by the Safe Drinking Water Regulation.
	11.02 Define pathogenic organisms, including bacteria, protozoa, and virus, and describe their disease associations.
	11.03 Describe the laboratory test performed for the presence of bacteria.
	11.04 Describe the correct procedure for obtaining a bacteriological sample.
	11.05 Describe correct sample collection procedures for inorganic and organic analyses.
	11.06 Describe the laboratory quality-control checks and required documentation.
	11.07 Identify the chain of custody for a sample.
12.0	Identify chemical, biological, and physical constituents of water entering the water-treatment facility or distribution systems – the student will be able to:
	12.01 Determine which constituents are inherent to groundwater and/or surface water.
	12.02 Describe the relationship between turbidity and the microbiological quality of water.
	12.03 Describe the uses of chemical analysis in water-treatment operations.
	12.04 Identify symbols and common names for elements and chemical compounds.
	12.05 Select the primary constituents to be measured and the most commonly used units of measurement for each.
	12.06 Explain the importance of water treatment for the control of coliform bacteria and algae.
13.0	Describe the principles, operational and troubleshooting practices of the aeration process – the student will be able to:
	13.01 Describe the aeration and air stripping processes, and explain how they differ.
	13.02 Identify the types of aeration systems.
	13.03 Identify the benefits of aeration.
	13.04 Describe the components of an air-stripping system.
	13.05 Troubleshoot aeration and air stripping processes.
14.0	Describe the principles, operational and troubleshooting practices of the mixing, coagulation, and flocculation processes – the student will be able to:
	14.01 Define concepts such as turbidity, color, coagulation, and flocculation.

	14.02 Define the difference between sweep and enhanced coagulation.
	14.03 Identify the kinds of equipment used in the coagulation process.
	14.04 Identify coagulant chemicals used in water-treatment facilities.
	14.05 Identify coagulant chemicals used in water-treatment facilities.
	14.06 Identify the steps of coagulation, in order.
	14.07 Identify the specific sampling locations for process control in a coagulation process.
	14.08 Identify factors that would contribute to poor floc formation.
	14.09 Compute the feed rate in pounds per day (lbs/d) when the chemical coagulant (mg/1) and flow rate (MGD) are known.
	14.10 Compute the dosage (mg/1) of coagulant when the rate of flow (MGD) and the feed rate (lbs/day) of the chemical coagulant are known.
	14.11 Compute the dosage rate that is needed to treat a different flow (MGD) at the current dosage when the current rate of flow (MGD) and the current coagulant feed rate (lbs/d) are known.
	14.12 Describe troubleshooting techniques for basic mixing, coagulation, and flocculation processes.
15.0	Describe the principles, operational and troubleshooting practices of the sedimentation process – the student will be able to:
	15.01 Describe an upflow clarifier and basin sedimentation.
	15.02 Identify factors that affect efficient sedimentation.
	15.03 Identify the measures that would be effective in preventing or controlling algae growth on surfaces of coagulation and sedimentation basins.
	15.04 Identify methods of sludge removal from sedimentation basins.
	15.05 Describe troubleshooting techniques for sedimentation and upflow clarifier processes.
16.0	Describe the principles, operational and troubleshooting practices of the filtration process – the student will be able to:
	16.01 Explain concepts related to filtration, including types of filters, filter-system components, and the steps for normal filtration operations.
	16.02 Explain common problems of filtering systems, including head loss, mudballs, and filter media loss.
	16.03 Determine when to backwash a filter.
	16.04 Identify the steps for backwashing a filter.
	16.05 Describe troubleshooting techniques for filtration processes.

17.0	Describe the principles, operational and troubleshooting practices of the water-softening process – the student will be able to:
17.01	Describe the two types of hardness.
17.02	Identify the appropriate chemical(s) to use in chemical-precipitation softening processes for the two kinds of hardness.
17.03	Describe alkalinity and its components.
17.04	Identify treatment processes used for water softening.
17.05	Calculate the distribution of bicarbonate, carbonate, and/or hydroxide ions when given the total alkalinity and phenolphthalein alkalinity.
17.06	Describe selective carbonate removal.
17.07	Identify the important zones of an upflow clarifier unit.
17.08	Describe the lime soda ash softening process, including its control.
17.09	Compute lime demand from raw-water analyses.
17.10	Describe the reasons for recarbonation.
17.11	Compute carbon dioxide demands for recarbonation.
17.12	Compute hardness removal when the ion-exchange capacity is known.
17.13	Describe troubleshooting techniques for water-softening processes.
18.0	Describe the principles, operational and troubleshooting practices of the stabilization process – the student will be able to:
18.01	Identify the chemicals used in stabilization.
18.02	Identify two stabilization indices.
18.03	Determine water stability, using the Langelier index, the marble test, and CCPP method.
18.04	Troubleshoot stabilization processes.
19.0	Describe the principles, operational and troubleshooting practices of the corrosion control process – the student will be able to:
19.01	Identify the factors that influence corrosion.
19.02	Describe the problems that can be created by corrosive waters.
19.03	Describe the basic concepts related to electrolysis.

	19.04	Define electrochemical reaction.
	19.05	Identify the chemicals used in corrosion control.
	19.06	Describe the conditions for calcium carbonate film formation.
	19.07	Define cathode film formation.
	19.08	Define cathodic protection and describe its application in water-treatment facilities.
	19.09	Describe troubleshooting techniques for corrosion-control processes.
20.0	Describe the principles, operational and troubleshooting practices of the disinfection process – the student will be able to:	
	20.01	Identify the chemicals used in primary disinfection.
	20.02	Identify commonly used chlorinators and hypochlorinators.
	20.03	Determine the maximum amount of chlorine gas (in pounds) that may be taken from a cylinder in a 24-hour period.
	20.04	Identify proper maintenance procedures for equipment chlorination.
	20.05	Identify terminology related to chlorination and disinfection.
	20.06	Identify common safety problems or emergency situations that might occur during chlorination.
	20.07	Identify the properties of chlorine and describe its use in water treatment.
	20.08	Explain the points at which chlorine is applied most effectively in water treatment.
	20.09	Compute the feed rate (lbs/d) when given the rate of flow (MGD) and dosage of chlorine (mg/1).
	20.10	Compute the feed rate (lbs/d) of a hypochlorite compound that contains a given percentage of available chlorine when given a problem where the rate of flow (MGD) and the chlorine dosage (mg/1) are known.
	20.11	Compute the new rate of flow and the feed rate that will be needed to maintain the current dosage when given the current rate of flow (MGD), the current chlorine feed rate (lbs/d), and the amount by which the rate of flow is to be increased or decreased.
	20.12	Compute the feed rate needed to treat a given amount of water when given a chlorine demand and the desired chlorine residual.
	20.13	Describe troubleshooting techniques for disinfection processes.
21.0	Describe the principles, operational and troubleshooting practices for the control and treatment of trihalomethanes – the student will be able to:	
	21.01	Describe the formation of total trihalomethanes (TTHM).
	21.02	Identify the specific procedure for collecting samples to determine trihalomethane levels.

	21.03 Compute the quarterly average and the annual TTHM measurements when sample results are given.
	21.04 Identify processes that remove trihalomethane precursors.
	21.05 Identify processes that remove trihalomethanes after they are formed.
	21.06 Identify the benefits of alternate disinfectants.
	21.07 Describe chloramination as a control of TTHM.
	21.08 Describe troubleshooting techniques for the control and treatment of trihalomethanes.
22.0	Describe the principles, operational and troubleshooting practices of the iron- and manganese-removal processes – the student will be able to:
	22.01 Explain the occurrence of iron and manganese in source water and in treated water.
	22.02 Describe the importance of controlling iron and manganese.
	22.03 Describe sample-collection and analysis procedures for iron and manganese.
	22.04 Describe remedial processes for controlling iron and manganese.
	22.05 Compute the potassium permanganate dosage for a known concentration of iron and manganese in the water being treated.
	22.06 Describe troubleshooting techniques for iron and manganese-removal processes.
23.0	Describe the principles, operational and troubleshooting practices for taste and odor control – the student will be able to:
	23.01 Identify common types of complaints about water quality.
	23.02 Identify causes of tastes and odors.
	23.03 Describe how microbial growths affect tastes and odors.
	23.04 Describe how eutrophication contributes to surface-water tastes and odors.
	23.05 Describe a cross-connection.
	23.06 Identify the chemicals used in the control and treatment of tastes and odors.
	23.07 Describe the Threshold Odor Number (TON) test.
	23.08 Determine the TON when dilution volumes and positive samples are given.
	23.09 Describe troubleshooting techniques for taste and odor control.

24.0	Describe the principles, operational and troubleshooting practices of the demineralization processes – the student will be able to:
24.01	Define concepts related to demineralization, such as reverse osmosis (RO), flux, feedwater, permeate, and salinity.
24.02	Describe the structure, composition, and performance of an RO membrane.
24.03	Describe feedwater impurities, physical parameters, and conditions potentially harmful to the RO process.
24.04	Identify items included in a typical RO-facility-operation checklist.
24.05	Describe the common causes of membrane damage.
24.06	Describe the procedure for membrane cleaning.
24.07	Compute the percent of recovery when product flow and feed flow are known.
24.08	Compute the percent of mineral rejection when total dissolved solids are known for the feedwater and product water.
24.09	Describe the basic concepts of electrodialysis (ED), such as the cathode and anode relationship and the removal of typical inorganic salts.
24.10	Describe the most common problem of ED operation in a facility.
24.11	Explain how the cation membrane and the anion membrane differ.
24.12	Describe the multi-compartment unit used in the ED process.
24.13	Describe ED operating procedures in detail.
24.14	Describe the two most common chemical solutions used to flush ED stack membranes.
25.0	Describe the principles, operational and troubleshooting practices of the fluoridation process – the student will be able to:
25.01	Define the basic concepts related to fluoridation, including its purpose and the kinds of chemicals used.
25.02	Identify the properties of fluoride and describe its use.
25.03	Identify the types of equipment used in fluoridation.
25.04	Describe proper maintenance procedures for fluoridation equipment.
25.05	Describe potential safety problems or emergency situations in the fluoridation process, and ways to avoid them.
25.06	Compute the feed rate of chemicals used in the fluoridation process.
25.07	Describe troubleshooting techniques for the fluoridation processes.

26.0	Identify facility operational problems – the student will be able to:
	26.01 Respond to customer questions about taste or odor in the water.
	26.02 Respond to customer questions about red water or rust stains.
	26.03 Identify the probable cause(s) for a sudden change in chlorine demand; take corrective action.
27.0	Describe basic hydraulics and pumping operations – the student will be able to:
	27.01 Describe the relationship between the system head and pressure, and make conversions between them.
	27.02 Describe three types of head, i.e., pressure, suction, and atmospheric.
	27.03 Describe proper operation of centrifugal and displacement pumps.
	27.04 Describe causes and solutions that are effective in preventing “water hammer “
	27.05 Describe causes and solutions that are effective in preventing cavitation.
	27.06 Troubleshoot pump operations.
28.0	Identify appropriate federal, state, and local regulations for the operation and maintenance of a public potable-water facility – the student will be able to:
	28.01 Complete the Drinking Water Bacteriological Analysis Form correctly.
	28.02 Complete the DEP daily operation report (DOR) form correctly.
	28.03 Complete the DEP monthly operation report (MOR) form correctly.
	28.04 Identify the DEP requirements for the operation of standby and emergency equipment.
	28.05 Identify the DEP requirements for microbiological monitoring and analyses.
	28.06 Identify the DEP requirements for sampling and testing.
29.0	Perform equipment inspection, and identify basic maintenance for the treatment train, treatment residuals disposal, and solids management – the student will be able to:
	29.01 Identify the appropriate equipment used in the treatment train, treatment residuals disposal, and solids management.
	29.02 Describe a preliminary site inspection of the equipment used in the treatment train, treatment residuals disposal, and solids management.
	29.03 Identify the maintenance needs of equipment used in the treatment train, treatment residuals disposal, and solids management, including safe procedures for maintenance.
	29.04 Describe proper record keeping for preventive and corrective maintenance.

	29.05 Describe preventive and corrective maintenance procedures for equipment used in the treatment process, treatment residuals disposal, and solids management

Course Number: EVS0143 Occupational Completion Point: B Water Treatment Plant Operator B – 130 Hours – SOC Code 51-8031	
30.0	Analyze the constituents of water, and select the appropriate treatment – the student will be able to:
	30.01 Describe the water-treatment processes common in Florida.
	30.02 Describe those processes that may reduce or control a contaminant for which maximum contaminant levels (MCL) exist.
31.0	Identify advanced sampling techniques, and interpret the results – the student will be able to:
	31.01 Demonstrate the need for chemical analyses in water treatment.
	31.02 Select the appropriate treatment for a problem identified through laboratory testing.
	31.03 Determine whether the finished water is acceptable or unacceptable according to laboratory results.
32.0	Solve algebra, ratio, and proportion problems in the water-treatment process – the student will be able to:
	32.01 Perform advanced math problems including ratio and proportion.
	32.02 Identify metric measurements and perform conversions.
	32.03 Perform algebraic calculations essential to water treatment, when given values for components.
33.0	Demonstrate process optimization for water treatment – the student will be able to:
	33.01 Describe the advanced principles and operational practices of sweep and enhanced coagulation and flocculation.
	33.02 Describe the advanced principles and operational practices of sedimentation.
	33.03 Describe the advanced principles and operational practices of disinfection.
	33.04 Describe the advanced principles and operational practices of filtration.
	33.05 Describe the advanced principles and operational practices of corrosion control.
	33.06 Describe the advanced principles and operational practices of taste and odor control.
	33.07 Describe the advanced principles and operational practices of iron and manganese control.
	33.08 Describe the advanced principles and operational practices of fluoridation.

	33.09 Describe the advanced principles and operational practices of softening.
	33.10 Describe the advanced principles and operational practices of demineralization.
	33.11 Describe the advanced principles, operational practices, and control of trihalomethanes and HAA5.
	33.12 Demonstrate process optimization for coagulation and flocculation.
	33.13 Demonstrate process optimization for sedimentation.
	33.14 Demonstrate process optimization for disinfection.
	33.15 Demonstrate process optimization for filtration.
	33.16 Demonstrate process optimization for corrosion control.
	33.17 Demonstrate process optimization for taste and odor control.
	33.18 Demonstrate process optimization for iron and manganese control.
	33.19 Demonstrate process optimization for fluoridation.
	33.20 Demonstrate process optimization for softening.
	33.21 Demonstrate process optimization for demineralization.
	33.22 Demonstrate process optimization for trihalomethanes and HAA5.
34.0	Analyze and correct facility operational problems – the student will be able to:
	34.01 Demonstrate troubleshooting techniques and corrective action for sweep and enhanced coagulation and flocculation.
	34.02 Demonstrate troubleshooting techniques and corrective action for sedimentation.
	34.03 Demonstrate troubleshooting techniques and corrective action for disinfection.
	34.04 Demonstrate troubleshooting techniques and corrective action for filtration.
	34.05 Demonstrate troubleshooting techniques and corrective action for corrosion control.
	34.06 Demonstrate troubleshooting techniques and corrective action for taste and odor control.
	34.07 Demonstrate troubleshooting techniques and corrective action for iron and manganese control.
	34.08 Demonstrate troubleshooting techniques and corrective action for fluoridation.

	34.09 Demonstrate troubleshooting techniques and corrective action for softening.
	34.10 Demonstrate troubleshooting techniques and corrective action for demineralization.
	34.11 Demonstrate troubleshooting techniques and corrective action for trihalomethanes and HAA5.
35.0	Demonstrate equipment inspection and preventive maintenance procedures – the student will be able to:
	35.01 Identify the components of a preventive maintenance plan.
	35.02 Use trend analysis in preventive maintenance.
	35.03 Perform a site inspection.
	35.04 Develop a training plan (for a new employee) for inspection of equipment.
36.0	Apply appropriate federal, state, and local regulations for the operation and maintenance of a public potable-water facility – the student will be able to:
	36.01 Explain the regulations in Chapter 62-602, F.A.C., covering duties, responsibilities, certification requirements, testing, renewal, staffing, and facility classification.
	36.02 Explain the regulations in Chapter 62-550, F.A.C. concerning samples and analyses at water-treatment facilities.
	36.03 Explain the regulation of Chapter 62-555, FAC concerning the construction and maintenance of water plants.
	36.04 Explain DEP regulations that apply to procedures such as reclaiming water and managing residuals.
	36.05 Apply regulations concerning facility management.
	36.06 Apply regulations concerning samples and analyses.
	36.07 Apply regulations concerning laboratory management.
37.0	Apply federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials – the student will be able to:
	37.01 Identify the reporting requirements as specified in SARA Title III and Chapter 252, F.S.
	37.02 Describe the responsibilities toward the community as specified in SARA Title III and Chapter 252, F.S.
38.0	Describe energy conservation, and identify ways to conserve energy in the water-treatment facility – the student will be able to:
	38.01 Identify the causes of energy loss.
	38.02 Rank various pieces of equipment in order of energy consumption.
	38.03 Describe procedures for performing an energy survey.

	38.04 Describe methods to conserve energy, such as equipment and process adjustments.
39.0	Demonstrate supervisory skills – the student will be able to:
	39.01 Identify supervisory skills and various leadership styles.
	39.02 Delegate responsibility and assign tasks to employees.
	39.03 Follow the proper procedure for handling employee grievances.
	39.04 Follow the proper procedure for disciplining employees.
	39.05 Follow staffing guidelines in planning.
	39.06 Conduct an orientation of a new employee, and follow the training program.
	39.07 Evaluate employees objectively.
	39.08 Identify emergency situations and respond appropriately.
	39.09 Identify the components of the budgeting process.
	39.10 Demonstrate inventory-control procedures.
	39.11 Explain the importance of ethics in supervision.
	39.12 Identify the role of the supervisor in a facility safety program.
	39.13 Identify the role of the supervisor in customer relations.

Course Number: EVS0153 Occupational Completion Point: C Water Treatment Plant Operator A – 120 Hours – SOC Code 51-8031	
40.0	Describe theoretical facility-management skills – the student will be able to:
	40.01 Describe the principles of management and supervision.
	40.02 Describe concepts related to management and supervision.
41.0	Demonstrate methods of organization and control – the student will be able to:
	41.01 Demonstrate organizational methods.
	41.02 Develop an organizational chart.

	41.03 Develop a staffing pattern.
	41.04 Identify formal and informal lines of communication.
42.0	Develop a plan for cost management – the student will be able to:
	42.01 Identify the costs of operation, such as personnel, inventory, operations, energy consumption, and equipment maintenance.
	42.02 Perform cost surveys.
	42.03 Develop a plan for efficient operations.
	42.04 Explain system-efficiency balance.
43.0	Prepare budgets and personnel assignments – the student will be able to:
	43.01 Identify budget activities and categories of expense accounts related to water- or wastewater-treatment facilities.
	43.02 Identify techniques of budget control.
	43.03 Prepare a budget, including long-range projections.
	43.04 Prepare a staffing schedule, including the appropriate levels of staff for all required shifts.
44.0	Develop standard operating procedures for the training and orientation of new employees – the student will be able to:
	44.01 Develop a written plan for an in-house orientation program for new employees.
	44.02 Identify information that a supervisor should give new employees, including leave procedures, insurance procedures, safety procedures, chain of command, etc.
	44.03 Develop a written plan for an in-house training program that includes safety measures and hazardous or toxic materials in the work place.
	44.04 Develop a written plan for a cross-training program in facility operations.
45.0	Demonstrate personnel selection and discipline – the student will be able to:
	45.01 Identify appropriate interviewing and hiring practices.
	45.02 Develop a job description and identify the essential functions of the job.
	45.03 Identify control factors that are important in an organizational plan and that set limits on delegated authority.
	45.04 Identify appropriate actions of the supervisor, the employee, etc., in a grievance procedure.
	45.05 Identify characteristics important to the role of a supervisor.

	45.06 Determine requirements for a new position.
	45.07 Advertise for the position, including the job description, job responsibilities, education requirements, and job conditions.
	45.08 Analyze job applications to select qualified candidates to interview.
	45.09 Conduct interviews.
	45.10 Notify interviewees of the results, and conduct follow-up activities.
	45.11 Use appropriate human-relations and communication skills.
	45.12 Train, evaluate, and discipline employees objectively.
	45.13 Identify appropriate actions of a supervisor in evaluating personnel performance.
46.0	Demonstrate contingency planning – the student will be able to:
	46.01 Analyze potential emergency situations that can occur in a facility.
	46.02 Develop a plan for handling problems caused by emergency situations, including what equipment would be used and what sampling would be needed.
	46.03 Develop procedures for responding to customer complaints.
	46.04 Develop procedures to ensure employee safety.
	46.05 Develop procedures to ensure continuous operations, including preventive maintenance, alternative procedures, etc.
47.0	Develop a plan for energy conservation – the student will be able to:
	47.01 Describe concepts related to energy conservation.
	47.02 Identify energy-conservation measures.
48.0	Describe record-keeping and use of computer applications in planning – the student will be able to:
	48.01 Develop a plan for inventory control.
	48.02 Develop a plan for an analysis of operation and maintenance (O&M) logs and for the optimum operation of equipment.
	48.03 Identify the various types of facility automation.
	48.04 Review available hardware and software, based on record-keeping needs.
49.0	Describe process optimization for water or wastewater treatment facilities – the student will be able to:

	49.01 Develop a plan for process control to achieve efficient, energy-saving, cost-effective operation.
	49.02 Develop a plan for testing and analyzing the treatment operations for use in long-range facility operations.
	49.03 Develop a plan for the systematic troubleshooting of operational problems.
	49.04 Develop a plan for documenting operations and problems in order to anticipate and avoid potential problems.
50.0	Interpret permits and blueprints – the student will be able to:
	50.01 Read and interpret blueprints for water and wastewater facilities.
	50.02 Read the facility construction and operating permits, and relate permit requirements to facility operations.
51.0	Develop a laboratory plan for process control – the student will be able to:
	51.01 Identify laboratory equipment for process control.
	51.02 Develop a plan for equipment calibration and maintenance.
	51.03 Develop a laboratory-staffing plan.
	51.04 Determine whether in-house laboratory operations are cost-effective.
	51.05 Review procedures for quality assurance/quality control in a facility laboratory.
	51.06 Review procedures for obtaining certification for a facility laboratory.
	51.07 Develop a sampling/analysis schedule for effective process control.
52.0	Employ public-relations skills in community interactions – the student will be able to:
	52.01 Plan facility tours for the public.
	52.02 Demonstrate how to handle press and public inquiries appropriately.
	52.03 Demonstrate how to inform the public if a potential emergency situation arises.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Advanced Water Treatment Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	P150509
CIP Number	0715050606
Grade Level	30, 31
Standard Length	612 hours
Teacher Certification	Refer to Program Structure table
CTSO	N/A
SOC Codes (all applicable)	51-8031 - Water and Wastewater Treatment Plant and System Operators
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the water treatment sector of the Agriculture, Food and Natural Resources career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the water treatment sector of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to an understanding of various feed waters; various water treatment schemes, power generation, pharmaceutical, biotech, semiconductor and other applications; safety and troubleshooting of water treatment systems; piping and instrumentation diagrams; pumps, valves, gauges and meters; the pretreatment technologies required to produce safe drinking water as well as the pretreated water required for advanced technologies; the theory, process and equipment of common membrane water treatment systems; and the initial monitoring and troubleshooting skills required to effectively operate and maintain a membrane water treatment system.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

The following table illustrates the post-secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	EVS0355	Membrane Water Treatment Specialist	WSP OPER 7G	306 hours	51-8031
B	EVS0357	High Purity Water Treatment Specialist		306 hours	51-8031

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify jobs related to the advanced water treatment field.
02.0 Identify safety hazards associated with advanced water technologies.
03.0 Explain the importance of each section on a Material Safety Data Sheet (MSDS).
04.0 Solve basic math problems common to advanced water treatment technologies.
05.0 Describe how various pumps work and basic hydraulic principles.
06.0 Identify various valves and the differences in different piping materials.
07.0 Compare and contrast the characteristics of drinking water, boiler feed water, semiconductor rinse water and pharmaceutical water.
08.0 Demonstrate job interviewing skills and resume/cover letter writing skills.
09.0 Describe the different types of contaminants in various feed waters.
10.0 Demonstrate how to use piping & instrumentation diagrams (P & ID) and process flow diagrams (PFD) to understand a water treatment process.
11.0 Describe the theory, equipment, and practice of scaling-control pretreatment technologies.
12.0 Describe the theory, equipment, and practice of fouling-control pretreatment technologies.
13.0 Describe the theory, equipment, and practice of chemical attack-control pretreatment technologies.
14.0 Describe the theory, equipment, and practice of chlorination and chloramination.
15.0 Identify where in a water treatment system various contaminants are removed.
16.0 Explain how reverse osmosis (RO) works.
17.0 Describe the rejection capabilities of each type of membrane.
18.0 Explain how to chemically clean a membrane unit.
19.0 Explain how to monitor before, during, and after chemical cleaning.
20.0 Explain which type, or types, of membrane to use in different water treatment applications.
21.0 Describe the pretreatment requirements for different membrane technologies.
22.0 Explain why conventional water treatment has difficulty removing Cryptosporidium and Giardia cysts and which membrane technologies to use.
23.0 Describe the three most common problems with nanofiltration and RO membranes.
24.0 Describe the instruments and the monitoring required to catch performance problems at an early stage.
25.0 Describe the common methods used to control scaling, fouling and chemical attack in membrane units.
26.0 Explain the differences between designing for well water and designing for surface water.
27.0 Demonstrate how to use advanced troubleshooting techniques.
28.0 Explain the information on a membrane manufacturer’s specification sheet and how to practically use this information at a plant.
29.0 Demonstrate how to operate and maintain an RO unit.
30.0 Explain why membrane water treatment is becoming common for the production of municipal drinking water.
31.0 Describe and perform appropriate water analyses.
32.0 Describe and perform appropriate sampling techniques.
33.0 Describe the theory, equipment, and operation of aeration, decarbonation, and degasification.
34.0 Describe the theory, equipment, and operation of stabilizing water.
35.0 Describe the theory, equipment, and operation of corrosion control.

36.0 Describe the characteristics and the measurement of silica contaminants.
37.0 Describe the characteristics and the measurement of organic contaminants.
38.0 Describe the characteristics and the measurement of ionic contaminants.
39.0 Describe the characteristics and the measurement of non-living particle contaminants.
40.0 Describe the characteristics and the measurement of living particle contaminants.
41.0 Explain the monitoring and troubleshooting required for media filters.
42.0 Explain the monitoring and troubleshooting required for activated carbon beds.
43.0 Explain the monitoring and troubleshooting required for membrane units.
44.0 Explain the theory, equipment, and practice of probing.
45.0 Explain the theory, equipment, and practice of profiling.
46.0 Explain the theory, equipment, and practice of membrane element replacement.
47.0 Demonstrate how to chemically clean an RO unit.
48.0 Demonstrate how to use software programs to trend membrane unit performance.
49.0 Demonstrate how to use software programs to check the scaling and fouling characteristics of a membrane unit.
50.0 Explain the theory, and describe the function, of ion exchange resin beads and resin sheets.
51.0 Explain the concept of selectivity.
52.0 Demonstrate an understanding of selectivity.
53.0 Describe the normal operation of strong acid cation (SAC) single-bed ion exchange units.
54.0 Describe and demonstrate how to regenerate an SAC single bed.
55.0 Describe the normal operation of strong base anion (SBA) single-bed ion exchange units.
56.0 Describe and demonstrate how to regenerate an SBA single bed.
57.0 Describe the normal operation of a SAC and SBA dual-bed ion exchange system.
58.0 Describe the normal operation of mixed-bed ion exchange units.
59.0 Describe how to regenerate a mixed bed.
60.0 Describe the normal operation and regeneration of electrodeionization units.
61.0 Describe the normal operation of 254 nm and 185 nm ultraviolet (UV) irradiation units.
62.0 Explain the functions of final filters.
63.0 Explain the usage of ozone in high purity water treatment systems.
64.0 Explain the problems caused by dead legs.
65.0 Identify the pieces of equipment that remove feed water contaminants.

Florida Department of Education
Student Performance Standards

Program Title: Advanced Water Treatment Technologies
Career Certificate Program Number: P150507

Course Number: EVS0355 **Occupational Completion Point: A** **Membrane Water Treatment Specialist – 306 Hours – SOC Code 51-8031**	
01.0	Identify jobs related to the advanced water treatment field – the student will be able to:
01.01	List the duties of various advanced water treatment jobs such as operator, service technician, sales rep, lab technician, instrumentation and control technician, and sales engineer.
01.02	List the personality traits that are beneficial for each job.
01.03	List potential employers in the advanced water treatment field, including semiconductor, power generation drinking water, beverage, pharmaceutical, biotech, and governmental agencies.
01.04	Describe how to contact potential employers through websites.
02.0	Identify safety hazards associated with advanced water technologies – the student will be able to:
02.01	List the tripping hazards in an advanced water treatment plant.
02.02	List the electrocution hazards in an advanced water treatment plant.
02.03	List the chemical hazards in an advanced water treatment plant.
02.04	List the fire hazards in an advanced water treatment plant.
02.05	List the cutting hazards in an advanced water treatment plant.
02.06	List the inhalation hazards in an advanced water treatment plant.
03.0	Explain the importance of each section on a Material Safety Data Sheet (MSDS) – the student will be able to:
03.01	Identify the chemical properties of the chemical.
03.02	Identify the hazards associated with the chemical.
03.03	Identify any fire hazards associated with the chemical.
03.04	Identify any firefighting procedures recommended.

	03.05 Identify the personal protection equipment and procedures required when handling the chemical.
	03.06 Identify the toxicological effects of the chemical.
04.0	Solve basic math problems common to advanced water treatment technologies – the student will be able to:
	04.01 Calculate Normalized Permeate Flow.
	04.02 Calculate Percent Salt Rejection.
	04.03 Calculate Differential Pressures.
	04.04 Calculate +/- percentages on water analysis reports.
	04.05 Calculate Net Driving Pressure.
	04.06 Calculate average pressures, salt concentrations, and osmotic pressures.
	04.07 Calculate water flux in gallons per square foot of membrane per day.
05.0	Describe how various pumps work and basic hydraulic principles – the student will be able to:
	05.01 Describe how a given example of a positive displacement pump works.
	05.02 Describe how a given example of a centrifugal pump works.
	05.03 Describe the differences between two different types of well pumps.
	05.04 List a minimum of three things to check out on an operating pump.
	05.05 Define suction head.
	05.06 Define discharge head.
	05.07 Describe a pump curve.
	05.08 Define gauge pressure versus absolute pressure.
	05.09 Discuss principles of multi-stage centrifugal pumps.
	05.10 Discuss hydraulic principles.
06.0	Identify various valves and the differences in piping materials – the student will be able to:
	06.01 Identify a globe valve.

	06.02	Identify a ball valve.
	06.03	Identify a gate valve.
	06.04	Identify a needle valve.
	06.05	Identify a butterfly valve.
	06.06	Identify a plug valve.
	06.07	Identify various actuated control valves.
	06.08	Identify PVC piping material.
	06.09	Identify carbon steel piping material.
	06.10	Identify various stainless steel piping materials.
	06.11	Identify PVDF piping material.
	06.12	Define gauges of pipe.
	06.13	Discuss the support requirements for different pipe materials (i.e. pvdf continuous, PVC short intervals, carbon steel longer intervals, etc.)
	06.14	Discuss temperature of conveyed material versus psi rating of pipe.
	06.15	Discuss head loss associated with fittings and pipe friction.
	06.16	Compare and contrast pipe sizing versus flow rate – target feet per second flow design rates
07.0	Compare and contrast the characteristics of drinking water, boiler feed water, semiconductor rinse water and pharmaceutical water – the student will be able to:	
	07.01	List the order of end-use water quality from drinking water to semiconductor rinse water.
	07.02	List the regulatory agencies and their roles in monitoring drinking water.
	07.03	Define state and federal regulations concerning drinking water
	07.04	Define the training and certification requirements for drinking water operators.
	07.05	List the contaminant limitations of 2000 PSI boiler water.
	07.06	List the contaminant limitations of purified water.
	07.07	List the contaminant limitations of water for Injection.

	07.08 List the contaminant limitations for rinse water used to make 0.18 micron semiconductor devices.
08.0	Demonstrate job interviewing skills and resume/cover letter writing skills – the student will be able to:
	08.01 Describe the job search process.
	08.02 Explain the most important characteristics of a good cover letter.
	08.03 Explain the most important characteristics of a good resume.
	08.04 Explain some of the most important considerations during a job interview.
	08.05 Explain the employer concerns that the cover letter should address.
	08.06 Explain the purpose of a cover letter.
	08.07 Explain the purpose of a resume.
	08.08 Describe how to dress for an interview.
	08.09 Describe how to act at an interview.
09.0	Describe the different types of contaminants in various feed waters – the student will be able to:
	09.01 List the different categories of source water.
	09.02 Identify the TDS classification of fresh water, brackish water, highly brackish water, and seawater.
	09.03 List common characteristics of surface water.
	09.04 List common characteristics of well water.
	09.05 List common characteristics of seawater.
	09.06 Define the six different categories of water contaminants.
	09.07 Compare and contrast the ionic, gaseous, siliceous, organic, non-living and living particulate differences between ground water and surface water.
10.0	Demonstrate how to use piping and instrumentation diagrams (P & ID) and process flow diagrams (PFD) to understand a water treatment process – the student will be able to:
	10.01 Identify the sequence of the main pieces of equipment at a water treatment plant given a PFD.
	10.02 Identify the instruments at a water treatment plant given a P & ID.
	10.03 Trace lines using a P & ID.

	10.04 Define an indicator, transmitter, and indicating controller.
	10.05 Identify flaws in given PFD.
11.0	Describe the theory, equipment, and practice of scaling-control pretreatment technologies – the student will be able to:
	11.01 Describe the theory and practice of ion exchange softeners.
	11.02 Describe the theory and practice of acid injection.
	11.03 Describe the theory and practice of scale inhibitor injection.
	11.04 Identify the one scalant that ion exchange softeners cannot handle.
	11.05 Describe the limitations of scale inhibitors.
	11.06 Describe what acid injection does to calcium carbonate scale potential.
	11.07 Describe what acid injection does for non-carbonate scale potential.
	11.08 Describe the benefits of adding caustic between two-pass RO's to remove CO2 in the 1st pass permeate (reduce loading on downstream DI trains).
12.0	Describe the theory, equipment, and practice of fouling-control pretreatment technologies – the student will be able to:
	12.01 Describe the theory and practice of clarifiers.
	12.02 Describe the theory and practice of multimedia filters.
	12.03 Describe the theory and practice of sand filters.
	12.04 Describe the theory and practice of green sand filters.
	12.05 Describe the theory and practice of bag filters.
	12.06 Describe the theory and practice of cartridge filters.
	12.07 Describe the theory and practice of coagulant injection.
	12.08 Describe the theory and practice of flocculant injection.
	12.09 Describe the theory and practice of organic scavengers.
	12.10 Describe the theory and practice of silt dispersant injection.
	12.11 Compare membrane pretreatment technologies – nanofilters, ultrafilters and microfilters (double or triple membrane systems becoming more popular).

13.0	Describe the theory, equipment, and practice of chemical attack control pretreatment technologies – the student will be able to:
	13.01 Describe the theory and practice of activated carbon beds.
	13.02 Describe the theory and practice of pH control for cellulosic membranes.
	13.03 Describe the theory and practice of sulfite ion injection.
	13.04 Describe the theory and practice of ultraviolet irradiation for removal of chlorine and ozone.
14.0	Describe the theory, equipment, and practice of chlorination and chloramination – the student will be able to:
	14.01 Describe the chemical reaction of chlorine with water.
	14.02 List free chlorine compounds.
	14.03 List the chemical reaction of chlorine and ammonia.
	14.04 Describe the relationship among free chlorine, combined chlorine, and total chlorine.
	14.05 Explain what happens to the proportion of free chlorine compounds with changes in pH.
	14.06 Describe at what pH free chlorine is most biocidal.
	14.07 Explain the reason for chloramination as opposed to breakpoint free chlorination.
	14.08 Explain the difference in the effect of free chlorine and combined chlorine with polyamide thin film membranes.
	14.09 Explain the effects of iron, copper, and cobalt in relationship with chlorine attack of polyamide thin film membranes.
	14.10 Discuss how chemicals affect CA membranes versus TFC membranes.
15.0	Identify where in a water treatment system various contaminants are removed – the student will be able to:
	15.01 Identify, given various water treatment schemes, where ionic contaminants are removed.
	15.02 Identify, given various water treatment schemes, where organic contaminants are removed.
	15.03 Identify, given various water treatment schemes, where siliceous contaminants are removed.
	15.04 Identify, given various water treatment schemes, where gaseous contaminants are removed.
	15.05 Identify, given various water treatment schemes, where non-living particulate contaminants are removed.
	15.06 Identify, given various water treatment schemes, where living particulate contaminants are removed.

16.0	Explain how reverse osmosis works – the student will be able to:
	16.01 Explain the process of osmosis.
	16.02 Define a semipermeable membrane.
	16.03 Explain the concept of applied pressure.
	16.04 Explain the concept of osmotic pressure.
	16.05 Explain the concept of net osmotic pressure.
	16.06 Explain the process of reverse osmosis.
	16.07 Explain the relationship of net driving pressure to water flux through a membrane.
	16.08 Describe how a membrane element works.
17.0	Describe the rejection capabilities of each type of membrane – the student will be able to:
	17.01 Describe how nanofiltration and reverse osmosis membrane reject ionic contaminants.
	17.02 Describe how nanofiltration and reverse osmosis membrane reject non-ionic contaminants.
	17.03 Describe the rejection capabilities of microfiltration membranes.
	17.04 Describe the rejection capabilities of ultrafiltration membranes.
	17.05 Describe the rejection capabilities of nanofiltration membranes.
	17.06 Describe the rejection capabilities of hyperfiltration membranes.
18.0	Explain how to chemically clean a membrane unit – the student will be able to:
	18.01 Describe the symptoms of a fouled membrane unit.
	18.02 Describe the symptoms of a scaled membrane unit.
	18.03 Describe the game plan required to remove scalants.
	18.04 Describe the game plan required to remove foulants.
	18.05 List generic chemicals used to remove scalants.
	18.06 List generic chemicals used to remove foulants.

	18.07 Describe air scouring during membrane CIP.
	18.08 Discuss CIP versus removal for offsite cleaning and why offsite may be more beneficial under certain fouling circumstances.
19.0	Explain how to monitor before, during, and after chemical cleaning – the student will be able to:
	19.01 Identify membrane unit performance trends that indicate the need for cleaning.
	19.02 List a minimum of six parameters that should be monitored during a chemical cleaning.
	19.03 Explain the problems that cleaning at too high or low a pH may cause.
	19.04 Explain the problems that cleaning at too high or low a temperature may cause.
	19.05 Explain the problems that cleaning at too high or low a flow rate may cause.
	19.06 Describe the data used to indicate when to end a cleaning.
	19.07 Describe the monitoring parameters that document how well a cleaning was performed.
20.0	Explain which type, or types, of membrane to use in different water treatment applications – the student will be able to:
	20.01 Identify, given a feed water analysis and end-use requirements, whether microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), and/or reverse osmosis (RO) would produce the desired end-use water.
	20.02 Describe the most important parameters for determining which membrane technology to use.
	20.03 Define the pore size of MF membranes and provide examples for both municipal and industrial applications.
	20.04 Define the pore size of UF membranes and provide examples for both municipal and industrial applications.
	20.05 Define the pore size of NF membranes and provide examples for both municipal and industrial applications.
	20.06 Define the pore size of RO membranes and provide examples for both municipal and industrial applications.
21.0	Describe the pretreatment requirements for different membrane technologies – the student will be able to:
	21.01 Describe the pretreatment requirements for MF.
	21.02 Describe the pretreatment requirements for UF.
	21.03 Describe the pretreatment requirements for NF and RO to control scaling.
	21.04 Describe the pretreatment requirements for NF and RO to control colloidal fouling.
	21.05 Describe the pretreatment requirements for NF and RO to control biofouling.

	21.06 Describe the pretreatment requirements for NF and RO to control chemical attack.
22.0	Explain why conventional water treatment has difficulty removing Cryptosporidium and Giardia cysts and which membrane technologies are effective – the student will be able to:
	22.01 Define the size of Cryptosporidium and Giardia cysts.
	22.02 Define the removal capabilities of coagulation, flocculation, sedimentation, and media filtration.
	22.03 Explain why chlorination is not effective enough for inactivation of Cryptosporidium and Giardia cysts.
	22.04 Identify which membrane technologies will effectively remove both Cryptosporidium and Giardia cysts.
23.0	Describe the three most common problems with nanofiltration and reverse osmosis membranes – the student will be able to:
	23.01 Describe the mechanisms of scaling in NF and RO units.
	23.02 Describe the mechanisms of fouling in NF and RO units.
	23.03 Describe the mechanisms of chemical attack of NF and RO membranes.
	23.04 Explain why NF membrane units may foul more than RO units.
	23.05 Describe design features that reduce the fouling of NF and RO units.
	23.06 Explain where fouling is the worst in NF and RO units.
24.0	Describe the instruments and the monitoring required to catch NF and RO problems at an early stage – the student will be able to:
	24.01 List the minimum instrumentation required for effective monitoring.
	24.02 Explain why interstage pressure gauges are required.
	24.03 Explain the need for a feed water temperature indicator.
	24.04 Explain the need for a permeate pressure gauge.
	24.05 Demonstrate the ability to collect performance data and input it into the appropriate membrane manufacturer's monitoring software programs.
	24.06 Demonstrate the ability to produce normalized permeate flow, percent salt rejection, and pressure drop performance trends.
	24.07 List the instruments required to calculate net driving pressure.
	24.08 List the instruments required to calculate normalized permeate flow.
	24.09 List the instruments required to calculate percent salt passage.

	24.10 List the instruments required to calculate percent recovery.
	24.11 List the instruments required to calculate pressure drops.
	24.12 Calculate net driving pressure given performance data from a membrane unit.
	24.13 Calculate normalized permeate flow given performance data from a membrane unit.
	24.14 Calculate percent salt rejection given performance data from a membrane unit.
	24.15 Calculate percent recovery given performance data from a membrane unit.
	24.16 Calculate pressure drops given performance data from a membrane unit.
25.0	Describe the common methods used to control scaling, fouling, and chemical attack in RO & NF units – the student will be able to:
	25.01 List a minimum of six treatment steps or design features used to control scaling.
	25.02 List a minimum of eight treatment steps or design features used to control colloidal fouling.
	25.03 List a minimum of six treatment steps or design features used to control biofouling.
	25.04 List a minimum of three treatment steps used to control chemical attack.
26.0	Explain the differences between designing membrane units for well water and designing for surface water – the student will be able to:
	26.01 Explain the concept of GFD (gallons per square foot per day) based on different source waters.
	26.02 Explain why well water will typically require less membrane than surface water.
	26.03 Describe the common characteristics of shallow well water.
	26.04 Describe the common characteristics of deep well water.
	26.05 Describe the common characteristics of surface water.
	26.06 Describe the common characteristics of seawater.
	26.07 Draw three typical treatment schemes for RO and NF units operating on well water.
	26.08 Draw three typical treatment schemes for RO and NF units operating on surface water.
27.0	Demonstrate how to use advanced troubleshooting techniques – the student will be able to:
	27.01 Identify scaling given normalized permeate flow, percent salt rejection, and pressure drop performance graphs.

	27.02 Identify fouling given normalized permeate flow, percent salt rejection, and pressure drop performance graphs.
	27.03 Identify chemical attack given normalized permeate flow, percent salt rejection, and pressure drop performance graphs.
	27.04 Determine a calcium carbonate scaling problem using membrane manufacturer's design software.
	27.05 Determine a calcium sulfate scaling problem using membrane manufacturer's design software.
	27.06 Determine a barium sulfate scaling problem using membrane manufacturer's design software.
	27.07 Determine a strontium sulfate scaling problem using membrane manufacturer's design software.
	27.08 Determine a silica scaling problem using membrane manufacturer's design software.
	27.09 Determine that a unit is fouling due to high GFD.
	27.10 Determine that a unit is fouling due to low cross flow velocities.
28.0	Explain the information on a membrane manufacturer's specification sheet and how to practically use this information at a plant – the student will be able to:
	28.01 Identify the square footage of membrane per element and explain the significance.
	28.02 Identify the test conditions of the membrane elements and explain the significance.
	28.03 Identify the allowable normal operating and chemical cleaning temperature ranges of the membrane elements and explain the significance.
	28.04 Identify the allowable normal operating and chemical cleaning pH ranges of the membrane elements and explain the significance.
	28.05 Identify whether membrane elements are fiberglass wrapped or cage wrapped and explain the significance.
	28.06 Identify heat sanitizable membrane elements and explain why and when these elements would be used.
	28.07 Identify the pressure drop limitations of membrane elements and explain the significance.
	28.08 Describe a minimum of three potentials problems that could occur when switching membrane elements.
29.0	Demonstrate how to operate and maintain an RO unit – the student will be able to:
	29.01 Load and unload membrane elements.
	29.02 Replace o-rings.
	29.03 Replace brine seals.
	29.04 Shim a unit.

29.05	Install end-cap adaptors.
29.06	Install interconnectors.
29.07	Replace cartridge filters.
29.08	Dechlorinate the feed water.
29.09	Adjust the pH of the feed water if required.
29.10	Start and stop a unit.
29.11	Adjust the percent recovery by changing the valving.
29.12	Identify an o-ring leak.
29.13	Take conductivity readings.
29.14	Perform the Silt Density Index.
29.15	Profile the unit.
29.16	Perform a probing of a pressure vessel.
29.17	Identify all components of a unit.
29.18	Identify all instruments on a unit.
30.0	Explain why membrane water treatment is becoming common for the production of municipal drinking water – the student will be able to:
30.01	Describe the hydrological cycle.
30.02	Describe the effect the human population increase has on water quality.
30.03	Describe the problem of Cryptosporidium and Giardia cysts.
30.04	Describe the problem with arsenic.
30.05	Describe the problem with disinfection by-products.
30.06	Describe the basic reasons why conventional water treatment cannot remove certain substances down to current and future regulated levels.
30.07	Describe which problems MF can control.
30.08	Describe which problems UF can control.

	30.09 Describe which problems NF can control.
	30.10 Describe which problems RO can control.
31.0	Describe and perform appropriate water analyses – the student will be able to:
	31.01 Identify the laboratory tests required for drinking water, boiler feed water, purified water, water for injection and semiconductor rinse water.
	31.02 Identify the bacteriological monitoring that must be done for drinking water, boiler feed water, purified water, water for injection and semiconductor rinse water.
	31.03 Describe how the heterotrophic plate count (HPC) enumerates bacteria.
	31.04 Describe how sulfate-reducing bacteria (SRB), iron-related bacteria (IRB), and slime-forming bacteria (SFB) are enumerated.
	31.05 Perform HPC, SRB, IRB, and SFB bacterial analysis.
32.0	Describe and perform appropriate sampling techniques – the student will be able to:
	32.01 Define good sampling techniques for microbiological analysis.
	32.02 Perform good sampling techniques for microbiological analysis.
	32.03 Define good sampling techniques for chemical analysis.
	32.04 Perform good sampling techniques for chemical analysis.
33.0	Describe the theory, equipment, and operation of aeration, decarbonation, and degasification – the student will be able to:
	33.01 Describe the theory, equipment, and operation of induced draft aeration/decarbonation.
	33.02 Describe the theory, equipment, and operation of forced draft aeration/decarbonation.
34.0	Describe the theory, equipment, and operation of stabilizing water – the student will be able to:
	34.01 List the chemicals used to stabilize drinking water.
	34.02 Describe how to measure the stability of drinking water.
	34.03 Calculate Langelier Saturation Index (LSI) using software programs.
35.0	Describe the theory, equipment, and operation of corrosion control – the student will be able to:
	35.01 Describe the process of corrosion.
	35.02 Describe the problems caused by corrosion for drinking water, boiler feed water, purified water, water for injection and semiconductor rinse water.

35.03	Identify chemicals used for corrosion control.
35.04	Describe cathodic protection.

Course Number: EVS0357 **Occupational Completion Point: B** **High Purity Water Treatment Specialist – 306 Hours – SOC Code 51-8031**	
36.0	Describe the characteristics and the measurement of silica contaminants – the student will be able to:
36.01	Describe a problem that silica compounds pose for the power generation, semiconductor, and pharmaceutical industries.
36.02	Describe a problem that silica compounds pose in ion exchange resin.
36.03	Describe a problem that silica compounds pose in nanofiltration and RO units.
36.04	Identify ionic and non-ionic forms of silica compounds.
36.05	Discuss the difference between *reactive* and *non-reactive* silica compounds.
36.06	Discuss the characteristics of colloidal silica compounds.
36.07	Describe how silica compounds are typically measured in a water sample.
37.0	Describe the characteristics and the measurement of organic contaminants – the student will be able to:
37.01	Describe a problem that organic compounds pose for the drinking water, power generation, semiconductor, and pharmaceutical industries.
37.02	Describe a problem that organic compounds pose in ion exchange resin.
37.03	Describe a problem that organic compounds pose in nanofiltration and RO units.
37.04	Describe a problem that organic compounds pose in activated carbon beds.
37.05	Identify ionic and non-ionic forms of organic compounds.
37.06	Discuss the difference between *polar* and *non-polar* organic compounds.
37.07	Discuss the characteristics of colloidal organic compounds.
37.08	Describe how organic compounds are typically measured in a water sample.
38.0	Describe the characteristics and the measurement of ionic contaminants – the student will be able to:
38.01	List six common cations.

	38.02 List six common anions.
	38.03 List four scaling cations.
	38.04 List two scaling anions.
	38.05 Discuss the acid ion.
	38.06 Discuss the caustic ion.
	38.07 List two non-scaling cations.
	38.08 List two non-scaling anions.
	38.09 Discuss the relationship of pH to ionic carbon dioxide compounds.
	38.10 Describe two instruments used to measure ionic contaminants.
39.0	Describe the characteristics and the measurement of non-living particle contaminants – the student will be able to:
	39.01 Discuss the importance of the surface charge of colloidal particles.
	39.02 Define silt, clay, and sand based upon size and chemical composition.
	39.03 Discuss ultraviolet irradiation effectiveness versus suspended solids loading.
	39.04 Discuss chemical disinfection effectiveness versus suspended solids loading.
	39.05 Discuss the fouling implications to membrane units of suspended solids loading.
	39.06 Discuss Silt Density Index measurement of suspended solids.
	39.07 Describe how a turbidimeter works.
	39.08 Describe how a laser particle counter works.
	39.09 Explain how a TSS (Total Suspended Solids) measurement is made.
40.0	Describe the characteristics and the measurement of living particle contaminants – the student will be able to:
	40.01 List five types of microbiological particles.
	40.02 Describe five ideal conditions for bacterial growth.
	40.03 Calculate the number of bacteria present after 24 hours if a bacterium begins reproducing at time zero every 20 minutes.

	40.04 List five waterborne diseases.
	40.05 Discuss the significance of gram staining.
	40.06 Describe the problem that certain gram-negative bacteria produce in the pharmaceutical/biotech industries.
	40.07 Describe how a heterotrophic bacterial count is performed.
	40.08 Discuss the significance of serial dilution.
41.0	Explain the monitoring and troubleshooting required for media filters – the student will be able to:
	41.01 Discuss the significance of pressure drop across a media bed.
	41.02 Describe the concept of channeling.
	41.03 Explain how a media filter is backwashed.
	41.04 Describe how a media bed should look when examined after backwash.
	41.05 Discuss the problems that can cause an uneven bed.
	41.06 Describe how to sample the media in a bed.
	41.07 Explain the implications of water temperature and backwashing.
	41.08 Discuss the addition of filter aid polymer to MMF to reduce SDI.
	41.09 Discuss the addition of filter aid precoat and/or body feed (using DE) to reduce SDI.
42.0	Explain the monitoring and troubleshooting required for activated carbon beds – the student will be able to:
	42.01 Discuss the significance of pressure drop across an activated carbon (AC) bed.
	42.02 Discuss the problems associated with channeling and/or exhaustion.
	42.03 Identify how to determine if an AC bed is exhausted.
	42.04 Explain the bacterial problems associated with AC beds.
	42.05 Explain how to sanitize an AC bed.
	42.06 Describe the limitations of sanitization of AC beds.
	42.07 Discuss the annual monitoring that must be done on AC beds.

43.0	Explain the monitoring and troubleshooting required for membrane units – the student will be able to:
	43.01 List the instruments that must be present in order to monitor normalized permeate flow, percent salt rejection, percent recovery, trans-membrane pressure, and differential pressures.
	43.02 Identify, given performance graphs, the status of various membrane units.
	43.03 Identify, given instrument readings, the status of various membrane units.
	43.04 Describe how to test the accuracy of pressure gauges.
	43.05 Describe how to test the accuracy of conductivity meters.
	43.06 Describe how to test the accuracy of flow meters.
	43.07 Demonstrate how to use software programs as troubleshooting tools.
44.0	Explain the theory, equipment, and practice of probing – the student will be able to:
	44.01 Describe the purpose of probing.
	44.02 Explain when to perform a probing.
	44.03 Explain the probing procedure.
	44.04 Perform a probing.
	44.05 Identify problems, given probing data.
	44.06 Demonstrate how to use software programs to supplement probing data.
45.0	Explain the theory, equipment, and practice of profiling – the student will be able to:
	45.01 Describe the purpose of profiling.
	45.02 Explain when to perform a profiling.
	45.03 Explain the profiling procedure.
	45.04 Perform a profile.
	45.05 Identify problems, given profiling data.
	45.06 Demonstrate how to use software programs to supplement profiling data.
46.0	Explain the theory, equipment, and practice of membrane element replacement – the student will be able to:

	46.01	Identify elements that need to be replaced given probing and profiling data.
	46.02	Identify elements that need to be replaced based on autopsy data.
	46.03	Explain how to remove variously located membrane elements from pressure vessels.
	46.04	Explain how to install new elements to replace variously located membrane elements in pressure vessels.
	46.05	Describe the problems that may occur when installing new elements in pressure vessels that contain used elements.
	46.06	Discuss the issues concerning replacing the lead elements.
	46.07	Discuss the issues concerning replacing the last elements.
	46.08	Identify various lubrication methods that may be employed during membrane element loading and the pros and cons of each method.
	46.09	Perform membrane element replacements.
47.0	Demonstrate how to chemically clean an RO unit – the student will be able to:	
	47.01	List two performance trends that indicate a cleaning is required.
	47.02	Explain how fouling and scaling can be distinguished prior to cleaning.
	47.03	Explain the chemical cleaning procedure.
	47.04	Perform chemical cleanings.
	47.05	Identify and correct problems during a cleaning.
	47.06	Explain what chemicals to use for different scalants and foulants.
48.0	Demonstrate how to use software programs to trend membrane unit performance – the student will be able to:	
	48.01	Describe how to download free software from the Internet.
	48.02	Demonstrate how to input the data from a complete water analysis.
	48.03	Explain how frequently performance data should be recorded and how often the data should be graphed and evaluated.
	48.04	Input operating data into the software program.
	48.05	Generate graphs using the software program.
	48.06	Evaluate performance graphs.

49.0	Demonstrate how to use software programs to check the scaling and fouling characteristics of a membrane unit – the student will be able to:
	49.01 Explain how design software can provide scaling and fouling characteristics of a membrane unit.
	49.02 Input appropriate data into membrane manufacturer's design software.
	49.03 Explain the important information generated by the design software with respect to scaling and fouling.
	49.04 Identify, given examples, poor membrane unit designs with respect to scaling and fouling control.
	49.05 Explain changes to a poor design that would result in better fouling and scaling control.
50.0	Explain the theory and describe the function of ion exchange resin beads and resin sheets – the student will be able to:
	50.01 Describe how ions diffuse into resin beads and resin sheets.
	50.02 Describe how charged functional groups within ion exchange resin attract and bond with feed water ions.
	50.03 Identify the functional group that makes a strong acid cation resin.
	50.04 Identify the functional groups that make a strong base anion resin.
	50.05 Explain the importance of resin cross linkage.
51.0	Explain the concept of selectivity – the student will be able to:
	51.01 Explain the charge-for-charge ion exchange process.
	51.02 List the selectivity order for the hydrogen, calcium, and magnesium ions concerning strong acid cation resin.
	51.03 List the selectivity order for hydroxide, silica, bicarbonate, chloride, and sulfate ions concerning strong base anion resin.
52.0	Demonstrate an understanding of selectivity – the student will be able to:
	52.01 Identify, given a list of ions, which ions can “kick off” which other ions from strong acid cation resin.
	52.02 Identify, given a list of ions, which ions can “kick off” which other ions from strong base anion resin.
53.0	Describe the normal operation of strong acid cation (SAC) single-bed ion exchange units – the student will be able to:
	53.01 Identify, given an illustration of a cutaway ion exchange single bed, the valves that must be open and closed, and the flow path through the vessel during normal operation.
	53.02 Describe, step-by-step, what happens in an SAC resin bed concerning the migration of ions.
	53.03 Identify which ion is the first to break through an SAC bed.

	53.04 Identify, given a typical feed water, what the conductivity and pH of an SAC effluent will be compared to the influent.
	53.05 Identify, given a non-typical feed water, what the conductivity and pH of an SAC effluent will be compared to the influent.
	53.06 Explain the process of “sodium leakage”.
54.0	Describe and demonstrate how to regenerate a SAC single bed – the student will be able to:
	54.01 List the most common chemical used to regenerate SAC beds and why it is most common.
	54.02 List the second most common chemical used to regenerate SAC beds and which industries typically use this chemical.
	54.03 Describe, given an illustration of a cutaway resin bed, what happens during each step of an SAC regeneration.
	54.04 Explain the purpose of each of the four steps in a SAC bed regeneration.
	54.05 Explain what to monitor during each of the steps in a SAC bed regeneration.
	54.06 Identify the performance outcome if the backwash step is too short.
	54.07 Identify the performance outcome if the backwash flow rate is too low.
	54.08 Identify the performance outcome if the backwash flow rate is too high.
	54.09 Identify the performance outcome if the acid injection step is too short.
	54.10 Identify the performance outcome if the acid injection step is too long.
	54.11 Identify the performance outcome if the rinse step is too short.
	54.12 Identify the performance outcome if the rinse step is too long.
	54.13 Explain the differences and different outcomes of co-current regeneration versus counter current regeneration.
	54.14 Perform a co-current regeneration of a laboratory size SAC bed.
55.0	Describe the normal operation of strong base anion (SBA) single-bed ion exchange units – the student will be able to:
	55.01 Identify, given an illustration of a cutaway ion exchange single bed, the valves that must be open and closed, and the flow path through the vessel during normal operation.
	55.02 Describe, step-by-step, what happens in an SBA resin bed concerning the migration of ions.
	55.03 Identify which ion is the first to break through an SBA bed.
	55.04 Identify, given a typical feed water, what the conductivity and pH of an SBA effluent will be compared to the influent.

	55.05 Identify, given a non-typical feed water, what the conductivity and pH of an SBA effluent will be compared to the influent.
	55.06 Identify, given an illustration of a cutaway SBA unit, where silica, hydroxide, chloride, sulfate, and bicarbonate ions will be located just prior to a regeneration.
	55.07 Identify, given an illustration of a cutaway SBA unit, where silica, hydroxide, chloride, sulfate, and bicarbonate ions will be located just after a regeneration.
56.0	Describe and demonstrate how to regenerate an SBA single bed – the student will be able to:
	56.01 List the most common chemical used to regenerate SBA beds.
	56.02 Describe, given an illustration of a cutaway resin bed, what happens during each step of an SBA regeneration.
	56.03 Explain the purpose of each of the four steps in an SBA bed regeneration.
	56.04 Explain what to monitor during each of the steps in an SBA bed regeneration.
	56.05 Identify the performance outcome if the backwash step is too short.
	56.06 Identify the performance outcome if the backwash flow rate is too low.
	56.07 Identify the performance outcome if the backwash flow rate is too high.
	56.08 Identify the performance outcome if the caustic injection step is too short.
	56.09 Identify the performance outcome if the caustic injection step is too long.
	56.10 Identify the performance outcome if the rinse step is too short.
	56.11 Identify the performance outcome if the rinse step is too long.
	56.12 Explain the differences and different outcomes of co-current regeneration versus counter current regeneration.
	56.13 Perform a co-current regeneration of a laboratory size SBA bed.
57.0	Describe the normal operation of a SAC and SBA dual-bed ion exchange system – the student will be able to:
	57.01 Explain, step-by-step, what happens to hydrogen, sodium, calcium, magnesium, silica, hydroxide, bicarbonate, chloride, and sulfate ions in a dual-bed system.
	57.02 Explain the impact of increased sodium leakage.
	57.03 Describe how to determine if the SAC bed exhausts first.
	57.04 Describe how to determine if the SBA bed exhausts first.
	57.05 Identify the relative pH and conductivity of the influents and effluents of each bed given a particular feed water.

	57.06 Describe what happens to the concentration of SBA effluent silica with SAC bed break through.
58.0	Describe the normal operation of mixed-bed ion exchange units – the student will be able to:
	58.01 Explain the concept of a polishing mixed bed.
	58.02 List the types of resin in a mixed bed and how they are configured.
	58.03 Explain, step-by-step, given a cutaway illustration of a mixed bed vessel, how the unit works.
	58.04 Identify which ion is the first to break through a mixed bed.
	58.05 Identify how to determine which resin is exhausted.
	58.06 Describe the correlation between conductivity and resistivity.
	58.07 Explain the instrumentation required on a mixed bed effluent if ultra-pure water is required.
59.0	Describe how to regenerate a mixed bed – the student will be able to:
	59.01 Identify the ten steps of a mixed-bed regeneration.
	59.02 Identify, given an illustration of a cutaway mixed-bed vessel, the flow path during each step of a mixed-bed regeneration.
	59.03 Describe what happens to the different resins during the backwash step.
	59.04 Explain the function of “inert resin”.
	59.05 Identify how to tell if a good backwash has occurred.
	59.06 Identify the problems associated with a poor backwash.
	59.07 Explain the consequences of the resin separation line being too high or too low.
	59.08 Describe the flow path of acid and caustic during the regenerant injection step.
	59.09 Identify the problems associated with too high or too low regenerant flow rates.
	59.10 Explain the reason why hot caustic is frequently used for a mixed-bed regeneration.
	59.11 Explain the purpose of the regenerant displacement step.
	59.12 Explain the purpose of the air mix step.
	59.13 Identify the problems that may occur if the air mix step is not effective.

	59.14 Describe “bed lock” and how it is accomplished.
	59.15 Describe the difference between the slow rinse step and the fast rinse step.
60.0	Describe the normal operation and regeneration of an electrode ionization unit – the student will be able to:
	60.01 Identify, given an illustration of an electrodeionization (EDI) unit, the anion transfer resin sheets, cation transfer resin sheets, mixed resin beads, dilute channels, concentrate channels, recirculation pump, waste line, and electrodes.
	60.02 Explain how an EDI unit works during normal operation.
	60.03 Explain how an EDI unit is regenerated continuously.
	60.04 Describe the pretreatment requirements for most EDI units.
61.0	Describe the normal operation of 254 nm and 185 nm ultraviolet (UV) irradiation units – the student will be able to:
	61.01 Describe at least three differences between low pressure and medium pressure UV systems.
	61.02 Describe at least three uses for 254 nm UV units.
	61.03 Describe the main reason for using 185 nm UV units for high purity water applications.
	61.04 Describe the difference between 254 nm and 185 nm UV lamps.
	61.05 Explain the purpose of a quartz sleeve in a low pressure UV system.
	61.06 Explain “solarization”.
	61.07 Describe how a 185 nm UV irradiation destroys organic compounds.
	61.08 Explain what happens to the conductivity or resistivity of the effluent of 254 nm and 185 nm UV units compared to the influent.
	61.09 Identify the useful life of low pressure and medium pressure UV lamps.
	61.10 Explain why UV units have stainless steel inlets and outlets even if connected to plastic pipe.
	61.11 Explain why there is always a polishing mixed bed downstream of a 185 nm UV unit in a high purity water treatment system.
	61.12 Explain why there is usually a filter downstream of a germicidal UV unit.
62.0	Explain the functions of final filters – the student will be able to:
	62.01 Explain the purpose of final filters in a high purity water treatment system.
	62.02 List at least three different types of final filter used.

	62.03 Describe at least two different ways to test the integrity of final filters.
63.0	Explain the usage of ozone in high purity water treatment systems – the student will be able to:
	63.01 Identify two potential points in a high purity water loop where ozone may be continuously injected.
	63.02 Describe at least two reasons for injecting ozone.
64.0	Explain the problems caused by dead legs – the student will be able to:
	64.01 Define a “dead leg”.
	64.02 Describe the two main problems caused by dead legs.
65.0	Identify the pieces of equipment that remove feed water contaminants – the student will be able to:
	65.01 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of particles greater than 20 microns.
	65.02 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of particles greater than 1 micron.
	65.03 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of particles greater than 0.1 micron.
	65.04 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of particles greater than 0.01 micron.
	65.05 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of calcium ions.
	65.06 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of colloidal silica.
	65.07 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of colloidal organic particles.
	65.08 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of dissolved organic compounds.
	65.09 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of dissolved ionic silica compounds.
	65.10 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of chlorine compounds ahead of an RO unit.
	65.11 Identify, given a high purity water treatment scheme, which pieces of equipment will reduce the concentration of scaling compounds ahead of an RO unit.
	65.12 Identify, given a high purity water treatment scheme, which pieces of equipment will be most prone to biofouling.
	65.13 Identify, given a high purity water treatment scheme, which pieces of equipment will be most prone to scaling.
	65.14 Identify, given a high purity water treatment scheme, which pieces of equipment will be most prone to chemical attack.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills (if applicable)

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 9, Language 9, and Reading 9. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary

education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Wastewater Treatment Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Agriculture, Food and Natural Resources**

Career Certificate Program	
Program Number	P150527
CIP Number	0715050604
Grade Level	30, 31
Standard Length	405 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	N/A
SOC Codes (all applicable)	51-8031 - Water and Wastewater Treatment Plant and System Operators
Basic Skills Level	Mathematics: N/A Language: N/A Reading: N/A

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the career Agriculture, Food and Natural Resources cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Wastewater Treatment sector of the Agriculture, Food and Natural Resources career cluster.

The content includes but is not limited to source water or influent characteristics; treatment facility unit processes and operational techniques; water quality and identification; identifying treatment goals and measuring their achievement; disinfection; process control techniques; sampling, testing, and laboratory analysis; supervision; operation maintenance and inspection of facility equipment; application of current DEP regulations and standards; facility administration and management techniques; and troubleshooting operational control problems. The emphasis is on skills that are needed for effective treatment process control and troubleshooting.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	EVS0333	Wastewater Treatment Plant Operator C	WSP OPER 7G	155 hours	51-8031
B	EVS0343	Wastewater Treatment Plant Operator B		130 hours	51-8031
C	EVS0350	Wastewater Treatment Plant Operator A		120 hours	51-8031

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify professions related to the water technology field.
02.0 Identify scientific concepts common in water and wastewater treatment.
03.0 Identify safety hazards associated with water technologies.
04.0 Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.
05.0 Solve basic math problems common to water technologies.
06.0 Define pumping and basic hydraulic principles.
07.0 Define principles of disinfection.
08.0 Define sampling techniques.
09.0 Define federal, state, and local regulations that apply to water technologies.
10.0 Demonstrate employability skills.
11.0 Identify the basic characteristics and principles of wastewater treatment.
12.0 Identify sampling techniques and interpret the results.
13.0 Describe the sources of wastewater and the types of collection systems.
14.0 Describe the process and the operational principles for the preliminary, primary, secondary, and tertiary treatment (the treatment train); effluent disposal; and solids management.
15.0 Perform treatment-process control and troubleshooting for the treatment train, effluent disposal, and solids management.
16.0 Perform equipment inspection, and identify basic maintenance for the treatment train, effluent disposal, and solids management.
17.0 Identify and correct facility operational problems.
18.0 Identify federal, state, and local regulations governing wastewater technologies.
19.0 Describe federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.
20.0 Identify the constituents of influent and its effects on the treatment process.
21.0 Identify the constituents of wastewater and select the appropriate treatment.
22.0 Demonstrate advanced sampling techniques and interpret results.
23.0 Describe process optimization for preliminary, primary, secondary, and tertiary treatment (the treatment train); effluent disposal, and solids management.
24.0 Describe advanced treatment process control for the treatment train, effluent disposal, and solids management.
25.0 Describe advanced equipment inspection and preventive maintenance for the treatment train, effluent disposal, and solids management.
26.0 Describe and correct facility operational problems.
27.0 Apply federal, state, and local regulations governing wastewater technologies.
28.0 Apply federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.
29.0 Describe energy conservation and identify ways to conserve energy in the wastewater treatment facility.
30.0 Demonstrate supervisory skills.
31.0 Discuss facility management skills.
32.0 Demonstrate methods of organization and control.
33.0 Develop a plan for cost management.
34.0 Prepare budgets and personnel assignments.
35.0 Develop standard operating procedures for the training and orientation of new employees.

36.0 Demonstrate personnel selection and discipline.
37.0 Demonstrate contingency planning.
38.0 Develop a plan for energy conservation.
39.0 Demonstrate record keeping and use of computer applications in planning.
40.0 Demonstrate process optimization for water or wastewater treatment facilities.
41.0 Interpret permits and blueprints.
42.0 Develop a laboratory plan for process control.
43.0 Employ public-relations skills in community interactions.

Florida Department of Education
Student Performance Standards

Program Title: Wastewater Treatment Technologies
Career Certificate Program Number: P150527

Course Number: EVS0333 **Occupational Completion Point: A** **Wastewater Treatment Plant Operator C – 155 Hours – SOC Code – 51-8031**	
01.0	Identify professions related to the water technology field – the student will be able to:
01.01	List duties of water technology workers such as wastewater operator, water operator, systems operator, stormwater operator, residual (bio-solids) hauler operator, cross connection operator, pretreatment operator, and meter reading/maintenance operator.
01.02	Identify the basic terms and concepts involved in processes used in these professions.
01.03	List potential employers in the water technology field: federal, municipal, county, state and private.
01.04	Identify resources to assist in finding employment in the field.
01.05	Identify professional organizations related to the water technology field.
01.06	Identify career ladder levels in the water technology field: trainee, C Level, B Level, A Level.
02.0	Identify scientific concepts common in water and wastewater treatment – the student will be able to:
02.01	Identify chemical symbols used in water and wastewater treatment.
02.02	Describe the hydrologic cycle.
02.03	Describe the basic concepts of the pH scale and its importance in the treatment process.
02.04	Identify the differences between mixtures, elements, and compounds, and organic and inorganic chemicals.
02.05	Identify principle states of matter: liquid, solid, and gas.
02.06	Identify the basic nitrogen, phosphorous, and carbon cycles.
03.0	Identify safety hazards associated with water technologies – the student will be able to:
03.01	Identify the types of hazards common to water technology facilities.
03.02	Recognize unsafe conditions and prescribe corrective measures.
03.03	Identify and safely handle hazardous chemicals common to water technology facilities.

	03.04 Recognize electrical hazards.
	03.05 Recognize fire hazards, identify types of fires, and describe appropriate extinguishing techniques.
04.0	Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials – the student will be able to:
	04.01 Identify the kinds of information presented on Material Safety Data Sheets (MSDS).
	04.02 Describe requirements for in-plant training and the accessibility of information on hazardous and toxic substances (chapter 442, F.S.).
05.0	Solve basic math problems common to water technologies – the student will be able to:
	05.01 Perform basic arithmetic problems, including addition, subtraction, multiplication, division, fractions, decimals, percentages, rounding (significant figures), graphing, etc.
	05.02 Identify metric measurements and perform conversions.
	05.03 Perform calculations that involve areas, volumes, capacities, retention times, pounds, mg/L, velocities, flow rates, pressure, and head.
06.0	Define pumping and basic hydraulic principles – the student will be able to:
	06.01 Identify types of pumps.
	06.02 Discuss application and use of different types of pumps.
	06.03 Identify components/characteristics of pumps including pump operation and basic pump curves including centrifugal pumps, positive displacement pumps, and air lift pumps.
	06.04 Identify types of pipes, valves, and fittings.
	06.05 Define cross connections.
	06.06 Identify the appropriate equipment used in the treatment processes.
07.0	Define principles of disinfection – the student will be able to:
	07.01 List the need/reasons for disinfection (list of waterborne diseases).
	07.02 Define concepts related to disinfection.
	07.03 List methods and chemicals used in disinfection.
	07.04 Define the physical properties of chlorine.
	07.05 List kinds of disinfection equipment used.
08.0	Define sampling techniques – the student will be able to:

	08.01 Define the reasons for sampling and types of samples.
	08.02 Define methods of sample collection and handling.
	08.03 Define the basic procedure for quality control and quality assurance in sampling.
	08.04 Define the chain of custody for samples.
	08.05 Perform chlorine residual analysis.
	08.06 Perform pH analysis.
09.0	Define federal, state, and local regulations that apply to water technologies – the student will be able to:
	09.01 List regulatory agencies and their roles in monitoring the water technology field.
	09.02 Define regulations associated with the appropriate federal, state or local agencies.
	09.03 Define training and certification requirements for water technology workers.
10.0	Demonstrate employability skills – the student will be able to:
	10.01 Conduct a job search.
	10.02 Secure information about a job.
	10.03 Identify documents that may be required for a job application.
	10.04 Complete a job application.
	10.05 Demonstrate competence in job-interview techniques.
	10.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
	10.07 Identify acceptable work habits.
	10.08 Demonstrate knowledge of how to make job changes appropriately.
	10.09 Demonstrate acceptable employee-health habits for the treatment facility environment.
	10.10 Identify materials and documents needed for a professional library.
	10.11 Demonstrate productive and positive customer interactions.
	10.12 Demonstrate effective interpersonal communication skills.

11.0	Identify the basic characteristics and principles of wastewater treatment – the student will be able to:
	11.01 Identify the sources of wastewater and the objectives of wastewater treatment.
	11.02 Identify terms used in wastewater treatment.
	11.03 Identify the impact of wastewater on receiving bodies of water.
	11.04 Identify biological organisms present in treatment processes.
	11.05 Identify waterborne diseases.
	11.06 Identify commonly measured wastewater parameters.
	11.07 Identify factors affecting raw wastewater.
	11.08 Correlate treatment processes to types of facility influent and solids.
12.0	Identify sampling techniques and interpret the results – the student will be able to:
	12.01 Identify the reasons for sampling and the types of samples (e.g., simple, representative, grab, composite).
	12.02 Describe methods of sample collection and handling.
	12.03 Identify specific samples (biological or chemical) and determine the significance of sample results required for process quality control, for compliance with standards, and for reporting.
	12.04 Identify representative sampling points.
	12.05 Identify the significance of the flow measurement on process control.
13.0	Describe the sources of wastewater and the types of collection systems – the student will be able to:
	13.01 Describe the types of wastewater collection systems.
	13.02 Identify flow variations and conditions that affect plant treatment, including infiltration, inflow, and lift stations.
	13.03 Identify methods to detect and correct infiltration.
	13.04 Identify dissolved gases in wastewater and the effect of their presence/absence on treatment.
14.0	Describe the process and the operational principles for the preliminary, primary, secondary, and tertiary treatment (the treatment train); effluent disposal; and solids management – the student will be able to:
	14.01 Describe concepts related to preliminary and primary treatment.
	14.02 Describe the types of preliminary treatment equipment, the way they function, and the relationship of each to the treatment train.

	14.03	Describe the types of primary treatment equipment, the way they function, and the relationship of each to the treatment train.
	14.04	Describe concepts related to secondary treatment, including attached growth processes, suspended growth processes, aeration, and clarification.
	14.05	Describe the types of secondary treatment equipment, the way they function, and the relationship of each to the treatment train.
	14.06	Describe concepts related to tertiary treatment processes, including sand filtration, nitrification/denitrification, oxic/anoxic, activated carbon, and artificial wetlands.
	14.07	Describe the types of tertiary treatment equipment, the way they function, and the relationship of each to the treatment train.
	14.08	Describe concepts related to disinfection and effluent disposal, including surface water, reuse reclamation, deep well, and ocean outfall.
	14.09	Describe the types of disinfection and the types of effluent-disposal equipment, the way they function, and the relationship of each to the system.
	14.10	Describe concepts related to solids management, including thickening, aerobic and anaerobic digestion, stabilization, de-watering, and reuse.
	14.11	Describe the types of solids-management equipment, the way they function, and the relationship of each to the system.
15.0	Perform treatment-process control and troubleshooting for the treatment train, effluent disposal, and solids management – the student will be able to:	
	15.01	Describe the grit-removal process and the operational efficiency of each step.
	15.02	Describe the laboratory tests performed on influent.
	15.03	Describe the primary-clarifier removal efficiencies, including settleable solids, suspended solids, total solids, BOD, and bacteria.
	15.04	Describe sampling points, frequency of sampling, and the laboratory tests and results that are used for the proper operation of the primary clarifier.
	15.05	Select and plot on a trend chart the parameters for primary clarification.
	15.06	Use the operational data required to evaluate the performance of secondary-treatment processes, including attached growth, suspended growth, aeration, and clarification.
	15.07	Describe sampling points, the frequency of sampling, and the laboratory tests and results used for proper operation of the secondary-treatment processes.
	15.08	Select and plot on a trend chart the parameters for secondary clarification.
	15.09	Describe how nitrification affects secondary processes and clarification.
	15.10	Describe how denitrification affects secondary processes and clarification.
	15.11	Use operational data to evaluate the performance of sand filtration.
	15.12	Describe sampling points, the frequency of sampling, and the laboratory tests and results used for checking the proper operation of sand filtration. Select and plot on a trend chart the parameters for sand filtration.

	15.13	Use operational data to evaluate the nitrification/denitrification process.
	15.14	Use operational data to evaluate the performance of effluent-disposal processes, including disinfection and dechlorination.
	15.15	Describe sampling points, the frequency of sampling, and the laboratory tests used for checking the proper operation of effluent disposal.
	15.16	Select and plot on a trend chart the parameters for effluent disposal.
	15.17	Describe various methods of effluent disinfection including UV, chlorination, and ozonation.
	15.18	Describe the chemical and physical properties of chlorine, and describe the reactions of chlorine with water, ammonia compounds, and sulfides.
	15.19	Describe the safe storage and handling of chlorine, including the use of testing compounds.
	15.20	Explain the points of application of chlorine in wastewater treatment.
	15.21	Describe the methods of dechlorination.
	15.22	Describe the methods commonly used to dispose of wastewater effluents, including reuse applications.
	15.23	Describe the laboratory tests commonly used on the reuse of effluent.
	15.24	Describe the types of sludge and their characteristics.
	15.25	Use operational data to evaluate the performance of solids management, including sludge thickening, digestion, de-watering, and disposal processes.
	15.26	Describe sampling points, the frequency of sampling, and the laboratory tests and results used for checking the proper operation of solids management and for compliance with Chapter 62-640 F.A.C.
16.0	Perform equipment inspection, and identify basic maintenance for the treatment train, effluent disposal, and solids management—The student will be able to:	
	16.01	Identify the appropriate equipment used in the treatment train, effluent disposal, and solids management.
	16.02	Describe a preliminary site inspection of the equipment used in the treatment train, effluent disposal, and solids management.
	16.03	Identify the maintenance needs of equipment used in the treatment train, effluent disposal, and solids management, including safe procedures for maintenance.
	16.04	Describe proper record keeping for preventive and corrective maintenance.
	16.05	Describe preventive and corrective maintenance procedures for equipment used in the treatment process, effluent disposal, and solids management.
17.0	Identify and correct facility operational problems – the student will be able to:	
	17.01	Describe common facility operational problems in the treatment train, effluent disposal, and solids management.

	17.02 Describe methods to evaluate operational problems in preliminary, primary, secondary, and tertiary treatment, effluent disposal, and solids management.
	17.03 Select appropriate corrective actions for common problems in preliminary, primary, secondary, and tertiary treatment, effluent disposal, and solids management.
	17.04 Describe the methods for monitoring results of corrective action taken for common problems in preliminary, primary, secondary, and tertiary treatment, effluent disposal, and solids management.
18.0	Identify appropriate federal, state, and local regulations – the student will be able to:
	18.01 Identify federal, state and local regulations that apply to the operation of a wastewater-treatment facility.
	18.02 Describe the operator's duties and responsibilities, certification requirements, testing, renewal, staffing, and facility classification (sections of Chapter 62-602 F.A.C.).
	18.03 Explain and describe the contents of an operating permit.
	18.04 Identify state regulations that apply to procedures such as reclaimed water, reuse, and residuals management.
19.0	Describe federal, state, and local laws for the handling, storage, and use of toxic and hazardous materials – the student will be able to:
	19.01 Identify the kinds of information presented on the MSDS.
	19.02 Describe requirements for in-plant training and the accessibility of information on hazardous and toxic substances (Chapter 442, F.S.).
	19.03 Identify the reporting requirements as specified in SARA Title III and Chapter 252, F.S.
	19.04 Describe the responsibilities toward the community as specified in SARA Title III and Chapter 252, F.S.

Course Number: EVS0343 **Occupational Completion Point: B** **Wastewater Treatment Plant Operator B – 130 Hours – SOC Code – 51-8031**	
20.0	Identify the constituents of influent and its effects on the treatment process – the student will be able to:
	20.01 Explain the significance of dissolved gases in the influent and the effects of dissolved gases on treatments.
	20.02 Explain the sources of infiltration and inflow, and discuss the effects of infiltration and inflow on treatment processes.
	20.03 Explain the effect of lift-station performance on the overall treatment process.
	20.04 Describe solutions for lift-station problems, such as surging flows, septic conditions, and power outages.
21.0	Identify the constituents of wastewater, and select the appropriate treatment – the student will be able to:
	21.01 Identify the specific physical, chemical, and biological characteristics of wastewater.

	21.02 Describe respiration, gas production, aerobic and anaerobic conditions, different methods of effluent disposal, and solids management.
	21.03 Identify levels of wastewater treatment and limits on facility discharges.
22.0	Demonstrate advanced sampling techniques and interpret the results – the student will be able to:
	22.01 Develop standard operating procedures for taking samples for process quality control, for compliance with standards, and for reporting requirements.
	22.02 Identify microorganisms present in wastewater, and discuss the significance of changes in their populations.
	22.03 Demonstrate laboratory quality-control/quality-assurance procedures and required documentation.
	22.04 Demonstrate the reasons for measuring the flows of treated and untreated wastewater, and the effects of those flows on process control.
23.0	Describe process optimization for preliminary, primary, secondary, and tertiary treatment (the treatment train); effluent disposal; and solids management – the student will be able to:
	23.01 Interpret laboratory data commonly obtained on incoming wastewater to monitor the efficiency of the selected treatment.
	23.02 Describe possible adjustments to achieve process optimization for handling influent.
	23.03 Interpret laboratory data commonly obtained on wastewater during primary treatment to monitor the efficiency of the selected treatment.
	23.04 Describe possible adjustments to achieve process optimization for handling primary treatment.
	23.05 Interpret laboratory data commonly obtained on wastewater during secondary treatment to monitor the efficiency of the selected treatment.
	23.06 Describe possible adjustments to achieve process optimization for secondary treatment.
	23.07 Interpret laboratory data commonly obtained on wastewater during tertiary treatment to monitor the efficiency of the selected treatment.
	23.08 Describe possible adjustments to achieve process optimization for tertiary treatment.
	23.09 Interpret laboratory data commonly obtained on reclaimed water during disinfection and disposal to monitor the efficiency of the selected treatment.
	23.10 Describe possible adjustments to achieve process optimization for disinfection and disposal processes.
	23.11 Interpret laboratory data commonly obtained during solids management, including solids-content tests, to monitor the efficiency of the selected treatment.
	23.12 Describe possible adjustments to achieve process optimization in solids management.
	23.13 Describe options for solids disposal, based on the analysis of constituents, including all accountability records, and the costs.
24.0	Describe advanced treatment process control for the treatment train, effluent disposal, and solids management – the student will be able to:

	24.01 Describe concepts related to advanced laboratory tests taken in the secondary-treatment processes.
	24.02 Describe concepts related to advanced laboratory tests taken in advanced or tertiary treatment.
	24.03 Describe concepts related to advanced laboratory tests for disinfection, effluent disposal, and solids management.
25.0	Describe advanced equipment inspection and preventive maintenance for the treatment train, effluent disposal, and solids management – the student will be able to:
	25.01 Describe a preventive maintenance plan for a specific piece of equipment and/or unit process.
	25.02 Describe trends analysis used in preventive maintenance planning.
	25.03 Describe the monitoring of facility equipment operation and usage with remote sensing equipment.
26.0	Describe and correct facility operational problems – the student will be able to:
	26.01 Describe troubleshooting techniques to locate operational problems.
	26.02 Select appropriate corrective actions for advanced operational problems.
	26.03 Describe advanced methods of monitoring results of corrective actions taken.
	26.04 Describe actions that should be taken to prevent recurrence of identified advanced operational problems.
27.0	Apply federal, state, and local regulations governing wastewater technologies – the student will be able to:
	27.01 Describe supervisory tasks related to duties, responsibilities, certification requirements, testing, renewal, staffing, and facility classification (Chapter 62-602 F.A.C.).
	27.02 Apply rules concerning samples and analyses at wastewater-treatment facilities (Chapter 62-601, F.A.C.).
	27.03 Complete the DEP monthly operating report (MOR) Form correctly.
	27.04 Complete a National Pollution Discharge Elimination System (NPDES) MOR form.
	27.05 Follow DEP rules that apply to procedures such as reclaiming and reusing water and managing residuals.
	27.06 Follow federal rules that apply to the operation of a wastewater-treatment facility.
28.0	Apply federal, state, and local laws for the handling, storage, and use of toxic and hazardous materials – the student will be able to:
	28.01 Identify the kinds of information presented on the MSDS.
	28.02 Demonstrate requirements for in-plant training and the accessibility of information on hazardous and toxic substances (Chapter 442, F.S.).
	28.03 Identify the reporting requirements as specified in SARA Title III and Chapter 252, F.S.

	28.04 Describe the responsibilities toward the community as specified in SARA Title III and Chapter 252, F.S.
29.0	Describe energy conservation, and demonstrate ways to conserve energy in the wastewater-treatment facility – the student will be able to:
	29.01 Identify the causes of energy loss.
	29.02 Rank various pieces of equipment in order of energy consumption.
	29.03 Demonstrate procedures for performing an energy survey.
	29.04 Demonstrate methods to conserve energy, such as equipment and process adjustments.
30.0	Demonstrate supervisory skills – the student will be able to:
	30.01 Identify supervisory skills and various leadership styles.
	30.02 Delegate responsibility and assign tasks to employees.
	30.03 Follow the proper procedure for handling employee grievances.
	30.04 Follow the proper procedure for disciplining employees.
	30.05 Follow staffing guidelines in planning.
	30.06 Conduct an orientation of a new employee, and follow the training program.
	30.07 Evaluate employees objectively.
	30.08 Identify emergency situations and respond appropriately.
	30.09 Identify the components of the budgeting process.
	30.10 Demonstrate inventory control procedures.
	30.11 Explain the importance of ethics in supervision.
	30.12 Identify the role of the supervisor in a facility safety program.
	30.13 Identify the role of the supervisor in customer relations

Course Number: EVS0350 **Occupational Completion Point: C** **Wastewater Treatment Plant Operator A– 120 Hours – SOC Code – 51-8031**	
31.0	Discuss facility-management skills – the student will be able to:

	31.01 Describe the principles of management and supervision.
	31.02 Describe concepts related to management and supervision.
32.0	Demonstrate methods of organization and control – the student will be able to:
	32.01 Demonstrate organizational methods.
	32.02 Develop an organizational chart.
	32.03 Develop a staffing pattern.
	32.04 Identify formal and informal lines of communication.
33.0	Develop a plan for cost management – the student will be able to:
	33.01 Identify the costs of operation such as personnel, inventory, operations, energy consumption, and equipment maintenance.
	33.02 Perform cost surveys.
	33.03 Develop a plan for efficient operations.
	33.04 Explain system-efficiency balance.
34.0	Prepare budgets and personnel assignments – the student will be able to:
	34.01 Identify budget activities and categories of expense accounts related to water- or wastewater-treatment facilities.
	34.02 Identify techniques of budget control.
	34.03 Prepare a budget, including long-range projections.
	34.04 Prepare a staffing schedule, including the appropriate levels of staff for all required shifts.
35.0	Develop standard operating procedures for the training and orientation of new employees – the student will be able to:
	35.01 Develop a written plan for an in-house orientation program for new employees.
	35.02 Identify information that a supervisor should give new employees, including leave procedures, insurance procedures, safety procedures, chain of command, etc.
	35.03 Develop a written plan for an in-house training program that includes safety measures and hazardous or toxic materials in the work place.
	35.04 Develop a written plan for a cross-training program in facility operations.
36.0	Demonstrate personnel selection and discipline – the student will be able to:

	36.01 Identify appropriate interviewing and hiring practices.
	36.02 Develop a job description.
	36.03 Identify control factors that are important in an organizational plan and that set limits on delegated authority.
	36.04 Identify appropriate actions of the supervisor, the employee, etc., in a grievance procedure.
	36.05 Identify characteristics important to the role of a supervisor.
	36.06 Determine requirements for a new position.
	36.07 Advertise for the position, including the job description, job responsibilities, education requirements, and job conditions.
	36.08 Analyze job applications to select qualified candidates to interview.
	36.09 Conduct interviews.
	36.10 Notify interviewees of the results, and conduct follow-up activities.
	36.11 Use appropriate human-relations and communication skills.
	36.12 Train, evaluate, and discipline employees objectively.
	36.13 Identify appropriate actions of a supervisor in evaluating personnel performance.
37.0	Demonstrate contingency planning – the student will be able to:
	37.01 Analyze potential emergency situations that can occur in a facility.
	37.02 Develop a plan for handling problems caused by emergency situations, including what equipment would be used and what sampling would be needed.
	37.03 Develop procedures for responding to customer complaints.
	37.04 Develop procedures to ensure employee safety.
	37.05 Develop procedures to ensure continuous operations, including preventive maintenance, alternative procedures, etc.
38.0	Develop a plan for energy conservation – the student will be able to:
	38.01 Describe concepts related to energy conservation.
	38.02 Identify energy-conservation measures.
39.0	Demonstrate record-keeping and use of computer applications in planning – the student will be able to:

	39.01 Develop a plan for inventory control.
	39.02 Develop a plan for an analysis of operation and maintenance (O & M) logs and for the optimum operation of equipment.
	39.03 Identify the various types of facility automation.
	39.04 Review available hardware and software, based on record-keeping needs.
40.0	Demonstrate process optimization for water or wastewater treatment facilities – the student will be able to:
	40.01 Develop a plan for process control to achieve efficient, energy-saving, cost-effective operation.
	40.02 Develop a plan for testing and analyzing the treatment operations for use in long-range facility operations.
	40.03 Develop a plan for the systematic troubleshooting of operational problems.
	40.04 Develop a plan for documenting operations and problems in order to anticipate and avoid potential problems.
41.0	Interpret permits and blueprints – the student will be able to:
	41.01 Read and interpret blueprints for water and wastewater facilities.
	41.02 Read the facility construction and operating permits, and relate permit requirements to facility operations.
42.0	Develop a laboratory plan for process control – the student will be able to:
	42.01 Identify laboratory equipment for process control.
	42.02 Develop a plan for equipment calibration and maintenance.
	42.03 Develop a laboratory-staffing plan.
	42.04 Determine whether in-house laboratory operations are cost-effective.
	42.05 Review procedures for quality assurance/quality control in a facility laboratory.
	42.06 Review procedures for obtaining certification for a facility laboratory.
	42.07 Develop a sampling/analysis schedule for effective process control.
43.0	Employ public-relations skills in community interactions – the student will be able to:
	43.01 Plan facility tours for the public.
	43.02 Demonstrate how to handle press and public inquiries appropriately.

43.03 Demonstrate how to inform the public if a potential emergency situation arises.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.