

**2012 – 2013**

**Florida Department of Education  
Curriculum Framework**

**Program Title:** Environmental Water Technology  
**Program Type:** Career Preparatory  
**Career Cluster:** Agriculture, Food & Natural Resources

| <b>Secondary – Career Preparatory</b>        |   |
|--|---|
| Program Number                               | 8007100   |
| CIP Number                                   | 0715050608  |
| Grade Level                                  | 9-12, 30, 31  |
| Standard Length                              | 3 credits   |
| Teacher Certification                        | ENV WAT TEC 7G  |
| CTSO   |   |
| SOC Codes (all applicable)                   | 51-8031   |
| Facility Code                                | 203 <a href="http://www.fldoe.org/edfacil/sref.asp">http://www.fldoe.org/edfacil/sref.asp</a> (State Requirements for Educational Facilities) |
| Targeted Occupation List                     | <a href="http://www.labormarketinfo.com/wec/TargetOccupationList.htm">http://www.labormarketinfo.com/wec/TargetOccupationList.htm</a>         |
| Perkins Technical Skill Attainment Inventory | <a href="http://www.fldoe.org/workforce/perkins/perkins_resources.asp">http://www.fldoe.org/workforce/perkins/perkins_resources.asp</a>       |
| Industry Certifications                      | <a href="http://www.fldoe.org/workforce/fcpea/default.asp">http://www.fldoe.org/workforce/fcpea/default.asp</a>                               |
| Statewide Articulation                       | <a href="http://www.fldoe.org/workforce/dwdframe/artic_frame.asp">http://www.fldoe.org/workforce/dwdframe/artic_frame.asp</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 Agriculture, Food & 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 & Natural Resources career cluster.

The content includes but is not limited to applications of water resource management, application of safety procedures, record keeping and sampling, wetland management, reclamation treatment techniques, solid waste disposal, storm water management, hazardous material storage, government water technology regulations, filtrations, sedimentation, fluoridation process, and perform maintenance and inspections on equipment..

## Program Structure

This program is a planned sequence of instruction consisting of three courses and one occupational completion point.

The following table illustrates the secondary program structure:

| OCP | Course Number | Course Title                                   | Length   | SOC Code | Level |
|-----|---------------|--|----------|----------|-------|
| A   | 8007110       | Introduction to Environmental Water Technology | 1 credit | 51-8031  | 2     |
|     | 8007120       | Intermediate Environmental Water Technology    | 1 credit |          | 2     |
|     | 8007130       | Advanced Environmental Water Technology        | 1 credit |          | 2     |

## Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

## Special Notes

### Academic Alignment

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment resulted from a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. The table below contains the results of the alignment efforts. Data shown in the table includes the number of academic standards in the CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course. The following academic courses were included in the alignment (see code for use in table).

| Academic Subject Area | Academic Course   |
|-----------------------|---|
| Math                  | Algebra 1 (ALG1)<br>Algebra 2 (ALG2)<br>Geometry (GEO)  |
| Science               | Anatomy/Physiology Honors (APH)<br>Astronomy Solar/Galactic Honors (ASGH)<br>Biology 1 (BIO1)<br>Chemistry 1 (CHM1)<br>Earth-Space Science (ESS)<br>Genetics (GEN)<br>Marine Science 1 Honors (MS1H)<br>Physical Science (PS)<br>Physics 1 (PHY1) |

| Course   | Math         |            |            | Science     |              |              |              |              |              |              |              |              |
|--|--------------|------------|------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|  | ALG1         | ALG2       | GEO        | APH         | ASGH         | BIO1         | CHM1         | ESS          | GEN          | MS1H         | PS           | PHY1         |
| Introduction to Environmental Water Technology | 6/36<br>17%  | 2/41<br>5% | 2/45<br>4% | 9/53<br>17% | 13/52<br>25% | 22/56<br>39% | 25/55<br>46% | 21/58<br>36% | 13/35<br>37% | 26/42<br>62% | 26/56<br>46% | 16/53<br>30% |
| Intermediate Environmental Water Technology    | 13/36<br>36% | 3/41<br>7% | 2/45<br>4% | 3/53<br>6%  | 12/52<br>23% | 13/56<br>23% | 27/55<br>49% | 15/58<br>29% | 3/35<br>9%   | 28/42<br>66% | 23/56<br>41% | 18/53<br>34% |
| Advanced Environmental Water Technology        | **           | **         | **         | **          | **           | **           | **           | **           | **           | **           | **           | **           |

\*\* Alignment pending

# Alignment attempted, but no correlation to academic course.

### **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.

### **Essential Skills**

Essential skills identified by the Division of Career and Adult Education have been integrated into the standards and benchmarks of this program. These skills represent the general knowledge and skills considered by industry to be essential for success in careers across all career clusters. Students preparing for a career served by this program at any level should be able to demonstrate these skills in the context of this program. A complete list of Essential Skills and links to instructional resources in support of these Essential Skills are published on the CTE Essential Skills page of the FL-DOE website ([http://www.fldoe.org/workforce/dwdframe/essential\\_skills.asp](http://www.fldoe.org/workforce/dwdframe/essential_skills.asp)).

### **Accommodations**

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's IEP or 504 plan or postsecondary student's accommodations' plan 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 postsecondary service provider. 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.

In addition to accommodations, some secondary students with disabilities (students with an Individual Educational Plan (IEP) served in Exceptional Student Education or ESE) will need modifications to meet their needs. Modifications change the outcomes or what the student is

expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note postsecondary curriculum cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number (for eligible students with disabilities).

### **Articulation**

For details on articulation agreements which correlate to programs and industry certifications refer to [http://www.fldoe.org/workforce/dwdframe/artic\\_frame.asp](http://www.fldoe.org/workforce/dwdframe/artic_frame.asp).

### **Bright Futures/Gold Seal Scholarship**

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at [https://www.osfaffelp.org/bfiehs/fnbpcm02\\_CCTMain.aspx](https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx).

### **Fine Arts/Practical Arts Credit**

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation. A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (<http://www.fldoe.org/articulation/CCD/default.asp>).

### **Standards**

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

- 01.0 Identify the historical, social, cultural and potential applications of water resource management.
- 02.0 Describe and discuss hydrology.
- 03.0 Practice safety skills and procedures.
- 04.0 Demonstrate record keeping and sampling procedures.
- 05.0 Describe and discuss geologic principles of water resources.
- 06.0 Manage wetlands.
- 07.0 Identify career opportunities and organizational dynamics.
- 08.0 Apply scientific and technological principles.
- 09.0 Describe water reclamation treatment techniques.
- 10.0 Collect and dispose of solid waste.
- 11.0 Explain water treatment techniques.
- 12.0 Discuss and manage stormwater systems.
- 13.0 Describe water distribution.

- 14.0 Demonstrate the management and environmentally sound use of water resources.
- 15.0 Maintain water treatment equipment and facilities.
- 16.0 Demonstrate language arts knowledge and skills.
- 17.0 Demonstrate mathematics knowledge and skills.
- 18.0 Demonstrate science knowledge and skills.
- 19.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
- 20.0 Solve problems using critical thinking skills, creativity and innovation.
- 21.0 Discuss related standards and regulations.
- 22.0 Conduct site assessment.
- 23.0 Practice safety skills and procedures.
- 24.0 Manage data and physical resources.
- 25.0 Use Geographic Informational (GIS) and Global Positioning (GPS) Systems.
- 26.0 Control incidents.
- 27.0 Prepare a plan.
- 28.0 Perform remediation.
- 29.0 Collect and dispose of solid waste.
- 30.0 Identify continuing education needs and opportunities.
- 31.0 Conduct recordkeeping and sampling procedures.
- 32.0 Review stormwater permit procedures.
- 33.0 Demonstrate the use of industry appropriate tools, equipment, and instruments
- 34.0 Demonstrate industry specific mathematical calculations.
- 35.0 Demonstrate industry specific science skills and techniques.
- 36.0 Identify career opportunities and organizational dynamics in water resources.
- 37.0 Demonstrate water treatment techniques.
- 38.0 Discuss an Industrial Pretreatment Program/Inspection.
- 39.0 Discuss comprehensive quality assurance plan.
- 40.0 Use information technology tools.
- 41.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
- 42.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
- 43.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
- 44.0 Describe the importance of professional ethics and legal responsibilities
- 45.0 Explain the importance of employability skill and entrepreneurship skills.
- 46.0 Demonstrate personal money-management concepts, procedures, and strategies.
- 47.0 Identify professions related to the water technology field.
- 48.0 Identify scientific concepts common in water and wastewater treatment.
- 49.0 Identify safety hazards associated with water technologies.
- 50.0 Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials.
- 51.0 Solve basic math problems common to water technologies.
- 52.0 Define pumping and basic hydraulic principles.
- 53.0 Define principles of disinfection.
- 54.0 Define sampling techniques.
- 55.0 Define federal, state, and local regulations that apply to water technologies.
- 56.0 Demonstrate employability skills.
- 57.0 Identify sampling techniques and explain the significance of the steps.

- 58.0 Identify chemical, biological, and physical constituents of water entering the water treatment facility or distribution systems.
- 59.0 Describe the principles, operational and troubleshooting practices of the aeration process.
- 60.0 Describe the principles, operational and troubleshooting practices of the mixing, coagulation, and flocculation processes.
- 61.0 Describe the principles, operational and troubleshooting practices of the sedimentation process.
- 62.0 Describe the principles, operational and troubleshooting practices of the filtration process.
- 63.0 Describe the principles, operational and troubleshooting practices of the water-softening process.
- 64.0 Describe the principles, operational and troubleshooting practices of the stabilization process.
- 65.0 Describe the principles, operational and troubleshooting practices of the corrosion control process.
- 66.0 Describe the principles, operational and troubleshooting practices of the disinfection process.
- 67.0 Describe the principles, operational and troubleshooting practices for the control and treatment of trihalomethanes.
- 68.0 Describe the principles, operational and troubleshooting practices of the iron and manganese removal processes.
- 69.0 Describe the principles, operational and troubleshooting practices for taste and odor control.
- 70.0 Describe the principles, operational and troubleshooting practices of the demineralization processes.
- 71.0 Describe the principles, operational and troubleshooting practices of the fluoridation process.
- 72.0 Identify facility operational problems.
- 73.0 Describe basic hydraulics and pumping operations.
- 74.0 Identify appropriate federal, state, and local regulations for the operation and maintenance of a public potable water facility.
- 75.0 Perform equipment inspection, and identify basic maintenance for the treatment train, treatment residuals disposal, and solids management.

2012 – 2013

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Introduction to Environmental Water Technology  
**Course Number:** 8007110  
**Course Credit:** 1

**Course Description:**

This course is designed to develop competencies in the area of hydrology, safety skills and procedures, geological principles of water resources, management of wetlands, storm water systems, environmental water resources, equipment and facility maintenance, scientific and research concepts; principles of leadership; and employability, and human relations skills. Laboratory-based activities are an integral part of this course. These include the safe use and application of appropriate technology, scientific testing and observation equipment.

| Math             |             | Science            |              |                                  |              |  |              |
|------------------|-------------|--------------------|--------------|----------------------------------|--------------|--|--------------|
| <b>Algebra 1</b> | 6/36<br>17% | <b>Biology 1</b>   | 22/56<br>39% | <b>Anatomy/Physiology Honors</b> | 9/53<br>17%  | <b>Astronomy Solar/Galactic Honors</b> | 13/52<br>25% |
| <b>Algebra 2</b> | 2/41<br>5%  | <b>Chemistry 1</b> | 25/55<br>46% | <b>Genetics</b>                  | 13/35<br>37% | <b>Marine Science 1 Honors</b>         | 26/42<br>62% |
| <b>Geometry</b>  | 2/45<br>4%  | <b>Physics 1</b>   | 16/53<br>30% | <b>Earth-Space Science</b>       | 21/58<br>36% | <b>Physical Science</b>                | 26/56<br>46% |

\*\* Alignment pending

# Alignment attempted, but no correlation to academic course.

01.0 Identify the historical, social, cultural and potential applications of water resource management--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
 SC.912.E.7.8; HE.912.C.1.3; SC.912.L.15.8, 13; SC.912.L.16.4, 7, 8, 9, 10,  
 SC.912.L.17.1, 8, 11, 16, 19, 20; SC.912.L.18.12; SC.912.N.1.1

- 01.01 Explain the developmental progression of water resource management.
- 01.02 Research emerging problems and issues with water resource management.
- 01.03 Explain the global importance of water conservation.
- 01.04 Explain international issues affecting water resources and water quality.
- 01.05 Compare practices that either enhance or hinder water quality.
- 01.06 Differentiate between point and non-point sources of pollution.
- 01.07 Identify diseases and illnesses associated with water borne pathogens.
- 01.08 Explain methods to control and eradicate diseases and illnesses associated with water borne pathogens.
- 01.09 Explain the significance genetic factors, environmental factors and pathogenic agents to health from the perspective of both individual and public health.
- 01.10 Analyze how population size is affected by water quantity and quality.

- 01.11 Evaluate the cost and benefits of renewable and nonrenewable resources such as water, energy, fossil fuels, flora and fauna.
- 01.12 Predict the impact of individuals on water quality and quantity and how human lifestyles affect sustainability.
- 01.13 Discuss the special properties of water that contribute to earth's suitability as an environment for life.

02.0 Describe and discuss hydrology--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards: SC.912.E.5.2, 4; SC.912.E.6.2, 3, 4, 5; SC.912.E.7.1, 3; SC.912.L.17.16; SC.912.P.8.1, 5, 7

- 02.01 Define basic hydrological terms.
- 02.02 Explain surface water systems.
- 02.03 Explain ground water systems.
- 02.04 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
- 02.05 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
- 02.06 Identify alternative sources of water.
- 02.07 Identify soil conditions as they relate to water quality.
- 02.08 Research and explain saltwater intrusion.
- 02.09 Identify and discuss water wells and water reservoirs.

03.0 Practice safety skills and procedures--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards: SC.912.P.8.5, 7, 11

- 03.01 Demonstrate proper safety precautions and use of common laboratory, testing, and personal protective equipment.
- 03.02 Identify and utilize safe work practices.
- 03.03 Identify physical, chemical, biological, and zoological hazards.
- 03.04 Extract and utilize pertinent information from a container label and/or Material Safety Data Sheet (MSDS) following Environmental Protection Agency (EPA), Worker Protection Standard, Occupational Safety and Health Agency (OSHA), and Hazard Communication (HAZCOM) regulations.
- 03.05 Determine, review, and follow regulations.
- 03.06 Develop and maintain appropriate safety records.
- 03.07 Identify and describe "on the job" hazards and risks including fire/explosive, lead asbestos, weather hazards and emergency response preparedness
- 03.08 Perform lifting activities safely.
- 03.09 Identify ladder safety and fall protection.
- 03.10 Become certified in first aid/CPR and describe First Responder responsibilities.

04.0 Demonstrate record keeping and sampling procedures--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards: SC.912.N.1.1, 4, 6; SC.912.P.8.8, 11;

- 04.01 Define sampling objectives, protocol and Chain of Custody.
- 04.02 Operate, calibrate, and maintain sampling equipment.
- 04.03 Develop sampling strategy.
- 04.04 Perform applicable field measurements including pH, dissolved oxygen, temperature, chlorine residual, and turbidity.
- 04.05 Appropriately preserve, document, and dispose of samples.
- 04.06 Identify cross-contamination and other risks associated with sampling.
- 04.07 Describe, plan, and utilize quality assurance practices.
- 04.08 Submit samples for analysis.
- 04.09 Perform periodic follow-up sampling.
- 04.10 Identify permit requirements and procedures.
- 04.11 Define and follow federal, state and local sampling guidelines.

05.0 Describe and discuss geologic principles of water resources--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.F.3.15; SC.912.E.6.1, 2, 4; SC.912.L.17.13; SC.912.P.8.6, 7, 8, 11

- 05.01 Explain the geological history of Florida.
- 05.02 Create a soil profile and describe the associated components.
- 05.03 Evaluate soil profiles, land-capability classes, and soil conservation practices.
- 05.04 Interpret legal descriptions of land.
- 05.05 Identify mapping and surveying techniques and equipment.
- 05.06 Analyze local mineral resources.
- 05.07 Describe lithological descriptions of local units/formations.
- 05.08 Describe Florida aquifer system.
- 05.09 Discuss basic groundwater chemistry.
- 05.10 Describe local geology related problems.

06.0 Manage wetlands--student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.E.5.4; SC.912.L.14.35; SC.912.L.17.4, 8, 16, 19, 20;

- 06.01 Identify ecosystems.
- 06.02 Discuss the structure and function of wetlands.
- 06.03 Define limits of wetlands.
- 06.04 Discuss habitat value.
- 06.05 Identify fauna and flora.
- 06.06 Determine desirable vs. nuisance plant and animal species.
- 06.07 Describe changes in ecosystems resulting from seasonal variations, climate change, environmental impacts, and succession.
- 06.08 Explain the general distribution of life in aquatic systems as a function of effluent discharge, stormwater runoff and drought.

07.0 Identify career opportunities and organizational dynamics--The student will be able to:

- 07.01 Describe the nature and origin of career opportunities in water, water reclamation and environmental industries.
- 07.02 Compare supervisory and administrative responsibilities.

- 07.03 Identify organizational structures.
- 07.04 Identify team building communication skills.
- 07.05 Identify problem-solving techniques.
- 07.06 Identify employee responsibility/benefits.
- 07.07 Identify legal aspects of personnel relations.
- 07.08 Communicate effectively in verbal, written, and nonverbal modes.
- 07.09 Recognize and demonstrate good listening skills.
- 07.10 Conduct small informal and formal group meetings.
- 07.11 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
- 07.12 Recognize and demonstrate effective communications skills in the workplace.
- 07.13 Identify related associated professional associations.
- 07.14 List and describe the careers associated with water treatment, distribution, and management.
- 07.15 Determine the educational requirements and experience needed to enter and advance in water, water reclamation and environmental occupations.

08.0 Apply scientific and technological principles--The student will be able to:

- 08.01 Employ scientific measurement skills.
- 08.02 Demonstrate safe and effective use of common laboratory equipment.
- 08.03 Implement the scientific method and science process skills through the design and completion of a research project.
- 08.04 Interpret, analyze, and report data.
- 08.05 Evaluate advances in biotechnology and its impact on water resources.
- 08.06 Compare and contrast structure and function of various types of microscopes.

09.0 Describe reclaimed water treatment techniques--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:

SC.912.L.17.16, 19, 20; SC.912.L.18.6, 8;

- 09.01 Understand pretreatment, primary, secondary, and tertiary treatment processes of wastewater.
- 09.02 Describe disposal options.
- 09.03 Identify septic tanks types and functions.
- 09.04 Apply principles of nutrients, water and waste management to environmental problems.

10.0 Collect and dispose of solid waste--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:

SC.912.17.16, 19, 20

- 10.01 Describe history of solid waste disposal.
- 10.02 Identify types of waste.
- 10.03 Identify household hazardous waste collection and disposal programs.
- 10.04 Research and evaluate solid waste disposal options. (landfill, incineration, and composting, etc.)

11.0 Explain water treatment techniques--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.E.6.5; SC.912.L.17.16, 19, 20; SC.912.L.18.6, 8; SC.912.P.8.2;

- 11.01 Describe drinking water treatments.
- 11.02 Identify and describe the desirable water qualities.
- 11.03 Explain how changes in water quality affect life cycles.
- 11.04 Explain, monitor, and maintain freshwater/salt water quality standards.
- 11.05 Calculate volume in circular, rectangular and irregular shaped water structures.
- 11.06 List and explain sources of pollution and methods of preventing and/or correcting these pollution problems.

12.0 Discuss and manage stormwater systems--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.E.6.2; SC.912.L.17.16, 19, 20;

- 12.01 Determine boundaries of watersheds.
- 12.02 Identify runoff coefficients.
- 12.03 Identify the relationship between construction sites and stormwater systems.
- 12.04 Research rules and regulations in regards to stormwater systems.
- 12.05 Contact local municipalities to determine stormwater regulations.
- 12.06 Research current construction trends and methods of stormwater systems.
- 12.07 Define topography and its effects on stormwater.
- 12.08 Discuss the affects that uncollected stormwater has on lakes, rivers, ponds and wetlands.

13.0 Describe water distribution--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.P.12.11

- 13.01 Identify the need for backflow prevention and cross connections controls.
- 13.02 Identify necessary equipment for water distribution purposes e.g.; pumps, motors, valves, storage tanks, pipes and fittings.
- 13.03 Read and maintain meters.
- 13.04 Identify maintenance requirements for fire hydrants, pipes, and valves.
- 13.05 Identify proper procedures for operation and maintenance of lift stations.
- 13.06 Discuss importance of period flushing of water distribution systems.

14.0 Demonstrate the management and environmentally sound use of water resources--The student will be able to:

- 14.01 Determine quality of groundwater and surface water.
- 14.02 Identify solids and dissolved solids found in water.
- 14.03 Identify primary and secondary contaminants.
- 14.04 Identify unregulated organic compounds.

15.0 Maintain water treatment equipment and facilities--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1; SC.912.P.10.4, 5, 7;

- 15.01 Research water treatment equipment and facility components.
- 15.02 Identify appropriate temperatures and other external conditions.
- 15.03 Identify the effect of weather conditions and changes.
- 15.04 Describe appropriate flow rates and tank levels.
- 15.05 Create a checklist and/or policies of necessary procedures to handle daily conditions, hazards and/or malfunctions.
- 15.06 Describe maintenance procedures and techniques of filters, pipes, generators, meters, motors, valves, instruments, injectors, storage basins etc.

16.0 Demonstrate language arts knowledge and skills--The students will be able to: AF2.0

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1; SC.912.N.3.5

- 16.01 Locate, comprehend and evaluate key elements of oral and written information.  
AF2.4
- 16.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary. AF2.5
- 16.03 Present information formally and informally for specific purposes and audiences.  
AF2.9

17.0 Demonstrate mathematics knowledge and skills--The students will be able to: AF3.0

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.3.5; MA.912.A.1.4, 5; MA.912.A.2.2, 6, 7, 13; MA.912.A.3.2, 3;  
MA.912.A.10.1, 2; MA.912.D.4.1; MA.912.G.8.2; MA.912.G.8.3; MA.912.S.1.2;  
MA.912.S.3.2, 3;

- 17.01 Demonstrate knowledge of arithmetic operations. AF3.2
- 17.02 Analyze and apply data and measurements to solve problems and interpret documents. AF3.4
- 17.03 Construct charts/tables/graphs using functions and data. AF3.5

18.0 Demonstrate science knowledge and skills--The students will be able to: AF4.0

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1, 2, 3, 4, 4, 6, 7; MA.912.A.2.1; MA.912.A.3.1; MA.912.A.10.1, 2;  
MA.912.S.1.1, 2; MA.912.S.2.1; MA.912.S.3.2, 3;

- 18.01 Discuss the role of creativity in constructing scientific questions, methods and explanations. AF4.1
- 18.02 Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.  
AF4.3

19.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1; MA.912.G8.2, 3; MA.912.A.2.1, 2; MA.912.A.10.1;

- 19.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. CM1.0
- 19.02 Locate, organize and reference written information from various sources. CM3.0
- 19.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences. CM5.0
- 19.04 Interpret verbal and nonverbal cues/behaviors that enhance communication. CM6.0
- 19.05 Apply active listening skills to obtain and clarify information. CM7.0
- 19.06 Develop and interpret tables and charts to support written and oral communications. CM8.0
- 19.07 Exhibit public relations skills that aid in achieving customer satisfaction. CM10.0

20.0 Solve problems using critical thinking skills, creativity and innovation--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.A.10.1, 2; SC.912.N.1.1, 4, 5, 6, 7; SC.912.N.2.1, 2, 4, 5; SC.912.N.3.5;  
SC.912.N.4.1; MA.912.A.2.2, 13; MA.912.A.10.1; MA.912.S.2.1; MA.912.S.3.1;

- 20.01 Employ critical thinking skills independently and in teams to solve problems and make decisions. PS1.0
- 20.02 Employ critical thinking and interpersonal skills to resolve conflicts. PS2.0
- 20.03 Identify and document workplace performance goals and monitor progress toward those goals. PS3.0
- 20.04 Conduct technical research to gather information necessary for decision-making. PS4.0

2012 - 2013

**Florida Department of Education  
Student Performance Standards**

**Course Title:** Intermediate Environmental Water Technology  
**Course Number:** 8007120  
**Course Credit:** 1

**Course Description:**

This course is designed to develop competencies in the area of standards and regulations, site assessments, safety, managing data and physical resources, prepare a plan, perform remediation, collect and dispose of solid waste, record keeping and sampling procedures, career opportunities, leadership, teamwork, and money management concepts. Laboratory-based activities are an integral part of this course. These include the safe use and application of appropriate technology, scientific testing and observation equipment.

| Math             |              | Science            |              |                                  |              |  |              |
|------------------|--------------|--------------------|--------------|----------------------------------|--------------|--|--------------|
| <b>Algebra 1</b> | 13/36<br>36% | <b>Biology 1</b>   | 13/56<br>23% | <b>Anatomy/Physiology Honors</b> | 3/53<br>6%   | <b>Astronomy Solar/Galactic Honors</b> | 12/52<br>23% |
| <b>Algebra 2</b> | 3/41<br>7%   | <b>Chemistry 1</b> | 27/55<br>49% | <b>Genetics</b>                  | 3/35<br>9%   | <b>Marine Science 1 Honors</b>         | 28/42<br>66% |
| <b>Geometry</b>  | 2/45<br>4%   | <b>Physics 1</b>   | 18/53<br>34% | <b>Earth-Space Science</b>       | 15/58<br>29% | <b>Physical Science</b>                | 23/56<br>41% |

21.0 Discuss related standards and regulations--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
 SC.912.N.1, 2, 3, 4

- 21.01 Explain the importance and impacts of local, state, and federal regulations and required documentation.
- 21.02 Describe the Florida Administrative Code's (F.A.C.) impact on environmental issues.
- 21.03 Discuss the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).
- 21.04 Identify local, state, and national regulatory agencies and discuss their roles in relation to state and federal laws and statutes.
- 21.05 Research how rules and laws are made and mandated.
- 21.06 Describe permitting procedures.
- 21.07 Identify regulation resources.
- 21.08 Describe various licensing procedures.
- 21.09 Research governmental regulation authorities associated with Florida's water sources.
- 21.10 Describe National Pollution Discharge Elimination System (NPDES).
- 21.11 Identify appropriate agencies and their functions
- 21.12 Describe the role of environmental protection.

- 21.13 Create, evaluate and present a well-head protection plan.
- 21.14 Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

22.0 Conduct site assessment--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.L.17.20; SC.912.N.1.1;

- 22.01 Identify the purposes of site assessment.
- 22.02 Describe required documentation.
- 22.03 Interpret blueprints
- 22.04 Demonstrate map reading
- 22.05 Obtain physical and performance measurements.
- 22.06 Assess needed equipment and processes.

23.0 Practice safety skills and procedures--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.4.2

- 23.01 Identify safety procedures for: wells, pumps, electrical equipment, motor vehicles, buildings, and other necessary equipment.
- 23.02 Handle compressed gasses, solids, and liquids safely.
- 23.03 Summarize "Right of Access" law.
- 23.04 Summarize "Confined Space" regulations.
- 23.05 Identify Zero Tolerance policies.
- 23.06 Identify employee limitations.
- 23.07 Identify appropriate decontamination procedures.
- 23.08 Identify principles of toxicology.
- 23.09 Identify routes of exposure.
- 23.10 Identify respirator safety procedures.
- 23.11 Discuss history of hazardous materials and hazardous categories.
- 23.12 Discuss common chemical compatibility.
- 23.13 Describe and discuss OSHA concepts.
- 23.14 Describe and discuss the Vulnerability Assessment process.

24.0 Manage data and physical resources--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1, 2, 3, 4, 5, 6, 7

- 24.01 Utilize word processing, databases, computer graphics, statistics programs, spreadsheets, Internet, and security.
- 24.02 Identify possible funding sources.
- 24.03 Prepare budgets and purchase orders.
- 24.04 Prepare a time management plan.
- 24.05 Utilize information databases.
- 24.06 Locate and interpret printed reference materials.
- 24.07 Describe network opportunities.
- 24.08 Maintain necessary/required record keeping practices and procedures.

- 24.09 Keep inventory, time sheets, and equipment maintenance logs.
- 24.10 Identify suppliers and technical resources.

25.0 Use Geographic Informational (GIS) and Global Positioning (GPS) Systems--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1

- 25.01 Define GIS and its function.
- 25.02 Use GIS software.
- 25.03 Learn GIS applications.
- 25.04 Develop a GIS model.
- 25.05 Define GPS and its function.
- 25.06 Collect GPS data and load on GIS.
- 25.07 Research and identify other remote sensing tools.
- 25.08 Identify and plot points on a map.

26.0 Control incidents--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.G.1.4; MA.912.A.3.11; SC.912.N.1.1

- 26.01 Identify and describe reasons for controlling incidents.
- 26.02 Describe levels of response.
- 26.03 Determine and use proper chain of command.
- 26.04 Determine methods of control.
- 26.05 Demonstrate site access restriction methods.
- 26.06 Identify appropriate authorities to be notified.
- 26.07 Place equipment appropriately.
- 26.08 Orient zones.
- 26.09 Identify possible geographic hazards.
- 26.10 Identify media protocol and procedures for communicating with the public.
- 26.11 Prepare a press release for a mock incident.
- 26.12 Identify abnormal event management processes utilizing the National Information Management System (NIMS).

27.0 Prepare a plan--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1

- 27.01 Describe the need for and the types of pre-planning.
- 27.02 Identify and select necessary agency involvement.
- 27.03 Identify possible contamination zones.
- 27.04 Review contingency plans
- 27.05 Create contingency plans for hurricanes, tornadoes, floods, fires, and/or nuclear accidents (emergency response plan).
- 27.06 Discuss Superfund Amendments Reauthorization Act (SARA) also known as the Emergency Planning and Community Right-to-Know Act (EPCRA) regulations.
- 27.07 Create plan for deployment.

27.08 Conduct mock disaster activities.

28.0 Perform remediation--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.L.17.16

- 28.01 Research appropriate cleaning methods.
- 28.02 Create a plan for a disaster clean up including needed materials and equipment.
- 28.03 Understand entry and closure methods.
- 28.04 Identify contamination removal procedures.
- 28.05 Design a site/system cleanliness verification procedure.
- 28.06 Identify tear down and demobilization procedures.

29.0 Collect and dispose of solid waste--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.S.3.2; SC.912.L.17.20

- 29.01 Describe history of solid waste disposal.
- 29.02 Identify types of waste.
- 29.03 Research and evaluate solid waste disposal options. (Landfill, incineration, and composting, etc.)

30.0 Identify continuing education needs and opportunities--The student will be able to:

- 30.01 Determine continuing education needs/goals.
- 30.02 Identify available educational and financial resources.
- 30.03 Identify appropriate professional associations and attend meetings where applicable.
- 30.04 Read and review trade journals.

31.0 Conduct recordkeeping and sampling procedures--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1, 2

- 31.01 Demonstrate sampling, testing and recordkeeping.
- 31.02 Collect and analyze water samples: grab, composite and representative.
- 31.03 Record data into identified database program.
- 31.04 Interpret lab results.
- 31.05 Evaluate data.
- 31.06 Measure well volumes.
- 31.07 Describe organism sampling techniques.

32.0 Review stormwater permit procedures--The student will be able to:

- 32.01 Research and demonstrate Best Management Practices (BMP), Standard Operating Procedures (SOP) and Preventive Maintains (PM).
- 32.02 Describe proper ditch, pond, culvert, and manhole inspection techniques.
- 32.03 Evaluate a storm cleanup and prevention plan.

- 32.04 Discuss pollutants, illegal dumping and discharge and demonstrate appropriate handling procedures.
- 32.05 Describe the importance of outfall structures, inlets, and treatment systems.
- 32.06 Describe the procedures to clean and televise pipes.
- 32.07 Describe the importance of ditch banks and right of ways.
- 32.08 Maintain, repair and replace pipe sections.

33.0 Demonstrate the use of industry appropriate tools, equipment, and instruments--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.P.10.2, 3, 10

- 33.01 Select and demonstrate proper use of industry appropriate tools, equipment, and instruments.
- 33.02 Demonstrate various physical science principles as applied in selected mechanical applications (e.g. levers, pulleys, hydraulics, and internal combustion).
- 33.03 Service and maintain industry appropriate equipment, instruments, facilities, and supplies.

34.0 Demonstrate industry specific mathematical calculations--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.A.2.13; MA.912.A.3.1, 2; MA.912.A.5.1, 4; MA.912.A.10.1; MA.912.G.7.5, 7;  
SC.912.E.5.6; SC.912.N.1.1; SC.912.P.8.9; SC.912.P.10.5; SC.912.P.12.2, 3

- 34.01 Calculate area and volume.
- 34.02 Convert temperature.
- 34.03 Calculate velocities and flow rates.
- 34.04 Calculate detention time.
- 34.05 Calculate parts per million/pounds.
- 34.06 Calculate chemical concentrations.
- 34.07 Utilize conversion factors.
- 34.08 Calculate ratios and percentages.
- 34.09 Calculate water, brake and motor horsepower for chemical pumps.
- 34.10 Calculate force.
- 34.11 Calculate sedimentation and loading rates.
- 34.12 Use calculations to determine activated sludge characteristics.
- 34.13 Use calculations to determine sludge digestion characteristics.
- 34.14 Use a variety of problem-solving strategies such as drawing a diagram, making a chart, guessing-and-checking, solving a simpler problem, writing an equation working backwards, and creating a table.

35.0 Demonstrate industry specific science skills and techniques--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.L.18.12; SC.912.P.8.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11; SC.912.P.10.7

- 35.01 Differentiate between chemical and physical properties of solids, dissolved solids, gases and liquids.

- 35.02 Identify chemical symbols on the periodic table and explain their relationships.
  - 35.03 Interpret formula representations of molecules and compounds in water treatment.
  - 35.04 Characterize chemical reactions in water treatment processes for example redox, acid base, synthesis and single and double replacement reactions.
  - 35.05 Utilize the mole concept and the law of conservation of mass to calculate quantities of chemicals precipitating in reactions occurring in water treatment processes.
  - 35.06 Describe the properties of the water molecule.
  - 35.07 Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH in environmental processes.
  - 35.08 Distinguish between endothermic and exothermic chemical processes in environmental systems.
- 36.0 Identify career opportunities and organizational dynamics in water resources--The student will be able to:
- 36.01 Research and create a presentation about occupations in water resources.
  - 36.02 Determine the educational requirements and experience needed to enter and advance in water resource occupations
  - 36.03 Prepare a resume.
- 37.0 Demonstrate water treatment techniques--The student will be able to:
- This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1
- 37.01 Determine soil types, land slope, and other factors to consider in choosing a location for a manmade pond.
  - 37.02 Identify/explain environmentally safe methods of wastewater disposal.
  - 37.03 Identify and consult agencies regulating water quality standards in order to prevent compliance problems.
  - 37.04 Observe different stages of construction of ponds.
- 38.0 Discuss an industrial pretreatment program/inspection--The student will be able to:
- This standard supports the following Next Generation Sunshine State Standards:  
SC.912.L.18.11; SC.912.N.1.1
- 38.01 Utilize spot location program.
  - 38.02 Survey business and industry water consumption and discharge.
  - 38.03 Conduct pretreatment sampling.
  - 38.04 Analyze data and document reports.
  - 38.05 Design monitoring plan.
  - 38.06 Monitor sites.
- 39.0 Discuss comprehensive quality assurance plan--The student will be able to:
- This standard supports the following Next Generation Sunshine State Standards:  
MA.912.P.1.1

- 39.01 Discuss quality assurance rules.
- 39.02 Develop and follow standard operating procedures.
- 39.03 Describe preventative maintenance techniques.
- 39.04 Describe cleaning/decontamination techniques.
- 39.05 Determine accuracy and precision of sampling techniques.
- 39.06 Discuss need for corrective action.
- 39.07 Document Quality Assurance per regulatory agencies.

40.0 Use information technology tools--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
MA.912.A.3.11, 12;

- 40.01 Use Personal Information Management (PIM) applications to increase workplace efficiency. IT1.0
- 40.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. IT2.0
- 40.03 Employ computer operations applications to access, create, manage, integrate, and store information. IT3.0
- 40.04 Employ collaborative/groupware applications to facilitate group work. IT4.0

41.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.E.7.7, 9; SC.912.L.17.11; SC.912.N.1.1, 4; SC.912.N.2.2; MA.912.A.10.1; MA.912.A.8.1, 7;

- 41.01 Describe the nature and types of business organizations. SY1.0
- 41.02 Explain the effect of key organizational systems on performance and quality.
- 41.03 List and describe quality control systems and/or practices common to the workplace. SY2.0
- 41.04 Explain the impact of the global economy on business organizations.

42.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.E.5.10; SC.912.E.6.4; SC.912.E.7.8; SC.912.N.1.1, 4, 7;

- 42.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments. SHE1.0
- 42.02 Explain emergency procedures to follow in response to workplace accidents.
- 42.03 Create a disaster and/or emergency response plan. SHE2.0

43.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives--The student will be able to:

This standard supports the following Next Generation Sunshine State Standards:

SC.912.N.1.1, 2, 3, 4, 5, 6, 7;

43.01 Employ leadership skills to accomplish organizational goals and objectives.  
LT1.0

43.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. LT3.0

43.03 Conduct and participate in meetings to accomplish work tasks. LT4.0

43.04 Employ mentoring skills to inspire and teach others. LT5.0

44.0 Describe the importance of professional ethics and legal responsibilities--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.3, 4, 7; SC.912.N.2.2, 4, 5

44.01 Evaluate and justify decisions based on ethical reasoning. ELR1.0

44.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. ELR1.1

44.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace. ELR1.2

44.04 Interpret and explain written organizational policies and procedures. ELR2.0

45.0 Explain the importance of employability skill and entrepreneurship skills--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1; SC.912.N.2.4, 5;

45.01 Identify and demonstrate positive work behaviors needed to be employable.  
ECD1.0

45.02 Develop personal career plan that includes goals, objectives, and strategies.  
ECD2.0

45.03 Examine licensing, certification, and industry credentialing requirements.  
ECD3.0

45.04 Maintain a career portfolio to document knowledge, skills, and experience.  
ECD5.0

45.05 Evaluate and compare employment opportunities that match career goals.  
ECD6.0

45.06 Identify and exhibit traits for retaining employment. ECD7.0

45.07 Identify opportunities and research requirements for career advancement.  
ECD8.0

45.08 Research the benefits of ongoing professional development. ECD9.0

45.09 Examine and describe entrepreneurship opportunities as a career planning option. ECD10.0

46.0 Demonstrate personal money-management concepts, procedures, and strategies--The students will be able to:

This standard supports the following Next Generation Sunshine State Standards:  
SC.912.N.1.1, 5, 6, 7; SC.912.N.2.1, 2, 4, 5; SC.912.N.3.5; MA.912.A.1.1, 2, 3, 4, 5, 7, 13; MA.912.A.3.11, MA.912.A.10.1, 2, 3; MA.912.D.7.2; MA.912.F.3.6, 14; MA.912.F.4.1, 2, 3, 8, 10, 11, 12, 14; LA.910.3.1.3

- 46.01 Identify and describe the services and legal responsibilities of financial institutions. FL2.0
- 46.02 Describe the effect of money management on personal and career goals. FL3.0
- 46.03 Develop a personal budget and financial goals. FL3.1
- 46.04 Complete financial instruments for making deposits and withdrawals. FL3.2
- 46.05 Maintain financial records. FL3.3
- 46.06 Read and reconcile financial statements. FL3.4
- 46.07 Research, compare and contrast investment opportunities.

2012 – 2013

**Florida Department of Education  
Student Performance Standards**

**Course Title:**           **Advanced Environmental Water Technology**  
**Course Number:**       **8007130**  
**Course Credit:**         **1**

**Course Description:**

This course is designed to develop competencies in the area of career opportunities, scientific concepts in water treatment, safety hazards, government regulations, facility operational principles, and equipment inspections. Laboratory-based activities are an integral part of this course. These include the safe use and application of appropriate technology, scientific testing and observation equipment.

| Math      |    | Science     |    |                           |    |                                 |    |
|-----------|----|-------------|----|---------------------------|----|---------------------------------|----|
| Algebra 1 | ** | Biology 1   | ** | Anatomy/Physiology Honors | ** | Astronomy Solar/Galactic Honors | ** |
| Algebra 2 | ** | Chemistry 1 | ** | Genetics                  | ** | Marine Science 1 Honors         | ** |
| Geometry  | ** | Physics 1   | ** | Earth-Space Science       | ** | Physical Science                | ** |

\*\* Alignment pending

# Alignment attempted, but no correlation to academic course.

47.0 Identify professions related to the water technology field--The student will be able to:

- 47.01 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.
- 47.02 Identify the basic terms and concepts involved in processes used in these professions.
- 47.03 List potential employers in the water technology field: federal, municipal, county, state and private.
- 47.04 Identify resources to assist in finding employment in the field.
- 47.05 Identify professional organizations related to the water technology field.
- 47.06 Identify career ladder levels in the water technology field: trainee, C Level, B Level, A Level.

48.0 Identify scientific concepts common in water and wastewater treatment--The student will be able to:

- 48.01 Identify chemical symbols used in water and wastewater treatment.
- 48.02 Describe the hydrologic cycle.
- 48.03 Describe the basic concepts of the pH scale and its importance in the treatment process.
- 48.04 Identify the differences between mixtures, elements, and compounds, and organic and inorganic chemicals.
- 48.05 Identify principle states of matter: liquid, solid, and gas.

- 48.06 Identify the basic nitrogen, phosphorous, and carbon cycles.
- 49.0 Identify safety hazards associated with water technologies--The student will be able to:
  - 49.01 Identify the types of hazards common to water technology facilities.
  - 49.02 Recognize unsafe conditions and prescribe corrective measures.
  - 49.03 Identify and safely handle hazardous chemicals common to water technology facilities.
  - 49.04 Recognize electrical hazards.
  - 49.05 Recognize fire hazards, identify types of fires, and describe appropriate extinguishing techniques.
- 50.0 Identify federal, state, and local regulations for the handling, storage, and use of toxic and hazardous materials--The student will be able to:
  - 50.01 Identify the kinds of information presented on Material Safety Data Sheets.
  - 50.02 Describe requirements for in-plant training and the accessibility of information on hazardous and toxic substances (chapter 442, F.S.).
- 51.0 Solve basic math problems common to water technologies--The student will be able to:
  - 51.01 Perform basic arithmetic problems, including addition, subtraction, multiplication, division, fractions, decimals, percentages, rounding (significant figures), graphing, etc.
  - 51.02 Identify metric measurements and perform conversions.
  - 51.03 Perform calculations that involve areas, volumes, capacities, retention times, pounds, mg/L, velocities, flow rates, pressure, and head.
- 52.0 Define pumping and basic hydraulic principles--The student will be able to:
  - 52.01 Identify types of pumps.
  - 52.02 Discuss application and use of different types of pumps.
  - 52.03 Identify components/characteristics of pumps including pump operation and basic pump curves including centrifugal pumps, positive displacement pumps, and air lift pumps.
  - 52.04 Identify types of pipes, valves, and fittings.
  - 52.05 Define cross connections.
  - 52.06 Identify the appropriate equipment used in the treatment processes.
- 53.0 Define principles of disinfection--The student will be able to:
  - 53.01 List the need/reasons for disinfection (list of waterborne diseases).
  - 53.02 Define concepts related to disinfection.
  - 53.03 List methods and chemicals used in disinfection.
  - 53.04 Define the physical properties of chlorine.
  - 53.05 List kinds of disinfection equipment used.
- 54.0 Define sampling techniques--The student will be able to:
  - 54.01 Define the reasons for sampling and types of samples.
  - 54.02 Define methods of sample collection and handling.

- 54.03 Define the basic procedure for quality control and quality assurance in sampling.
  - 54.04 Define the chain of custody for samples.
  - 54.05 Perform chlorine residual analysis.
  - 54.06 Perform pH analysis.
- 55.0 Define federal, state, and local regulations that apply to water technologies--The student will be able to:
- 55.01 List regulatory agencies and their roles in monitoring the water technology field.
  - 55.02 Define regulations associated with the appropriate federal, state or local agencies.
  - 55.03 Define training and certification requirements for water technology workers.
- 56.0 Demonstrate employability skills--The student will be able to:
- 56.01 Conduct a job search.
  - 56.02 Secure information about a job.
  - 56.03 Identify documents that may be required for a job application.
  - 56.04 Complete a job application.
  - 56.05 Demonstrate competence in job-interview techniques.
  - 56.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
  - 56.07 Identify acceptable work habits.
  - 56.08 Demonstrate knowledge of how to make job changes appropriately.
  - 56.09 Demonstrate acceptable employee-health habits for the treatment facility environment.
  - 56.10 Identify materials and documents needed for a professional library.
  - 56.11 Demonstrate productive and positive customer interactions.
  - 56.12 Demonstrate effective interpersonal communication skills.
- 57.0 Identify sampling techniques and explain the significance of the steps--The student will be able to:
- 57.01 Identify the laboratory tests that are commonly performed by operators in Florida water-treatment facilities, including those required by the Safe Drinking Water Regulation.
  - 57.02 Define pathogenic organisms, including bacteria, protozoa, and virus, and describe their disease associations.
  - 57.03 Describe the laboratory test performed for the presence of bacteria.
  - 57.04 Describe the correct procedure for obtaining a bacteriological sample.
  - 57.05 Describe correct sample collection procedures for inorganic and organic analyses.
  - 57.06 Describe the laboratory quality-control checks and required documentation.
  - 57.07 Identify the chain of custody for a sample.
- 58.0 Identify chemical, biological, and physical constituents of water entering the water treatment facility or distribution systems--The student will be able to:
- 58.01 Determine which constituents are inherent to groundwater and/or surface water.
  - 58.02 Describe the relationship between turbidity and the microbiological quality of water.

- 58.03 Describe the uses of chemical analysis in water-treatment operations.
- 58.04 Identify symbols and common names for elements and chemical compounds.
- 58.05 Select the primary constituents to be measured and the most commonly used units of measurement for each.
- 58.06 Explain the importance of water treatment for the control of coliform bacteria and algae.
- 59.0 Describe the principles, operational and troubleshooting practices of the aeration process--The student will be able to:
- 59.01 Describe the aeration and air stripping processes and explain how they differ.
- 59.02 Identify the types of aeration systems.
- 59.03 Identify the benefits of aeration.
- 59.04 Describe the components of an air-stripping system.
- 59.05 Troubleshoot aeration and air stripping processes.
- 60.0 Describe the principles, operational and troubleshooting practices of the mixing, coagulation, and flocculation processes--The student will be able to:
- 60.01 Define concepts such as turbidity, color, coagulation, and flocculation.
- 60.02 Define the difference between sweep and enhanced coagulation.
- 60.03 Identify the kinds of equipment used in the coagulation process.
- 60.04 Identify coagulant chemicals used in water-treatment facilities.
- 60.05 Identify the steps of coagulation, in order.
- 60.06 Identify the specific sampling locations for process control in a coagulation process.
- 60.07 Identify factors that would contribute to poor floc formation.
- 60.08 Compute the feed rate in pounds per day (lbs/d) when the chemical coagulant (mg/l) and flow rate (MGD) are known.
- 60.09 Compute the dosage (mg/l) of coagulant when the rate of flow (MGD) and the feed rate (lbs/day) of the chemical coagulant are known.
- 60.10 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.
- 60.11 Describe troubleshooting techniques for basic mixing, coagulation, and flocculation processes.
- 61.0 Describe the principles, operational and troubleshooting practices of the sedimentation process--The student will be able to:
- 61.01 Describe an upflow clarifier and basin sedimentation.
- 61.02 Identify factors that affect efficient sedimentation.
- 61.03 Identify the measures that would be effective in preventing or controlling algae growth on surfaces of coagulation and sedimentation basins.
- 61.04 Identify methods of sludge removal from sedimentation basins.
- 61.05 Describe troubleshooting techniques for sedimentation and upflow clarifier processes.
- 62.0 Describe the principles, operational and troubleshooting practices of the filtration process--The student will be able to:

- 62.01 Explain concepts related to filtration, including types of filters, filter-system components, and the steps for normal filtration operations.
  - 62.02 Explain common problems of filtering systems, including head loss, mud balls, and filter media loss.
  - 62.03 Determine when to backwash a filter.
  - 62.04 Identify the steps for backwashing a filter.
  - 62.05 Describe troubleshooting techniques for filtration processes.
- 63.0 Describe the principles, operational and troubleshooting practices of the water-softening process--The student will be able to:
- 63.01 Describe the two types of hardness.
  - 63.02 Identify the appropriate chemical(s) to use in chemical-precipitation softening processes for the two kinds of hardness.
  - 63.03 Describe alkalinity and its components.
  - 63.04 Identify treatment processes used for water softening.
  - 63.05 Calculate the distribution of bicarbonate, carbonate, and/or hydroxide ions when given the total alkalinity and phenolphthalein alkalinity.
  - 63.06 Describe selective carbonate removal.
  - 63.07 Identify the important zones of an upflow clarifier unit.
  - 63.08 Describe the lime soda ash softening process, including its control.
  - 63.09 Compute lime demand from raw-water analyses.
  - 63.10 Describe the reasons for recarbonation.
  - 63.11 Compute carbon dioxide demands for recarbonation.
  - 63.12 Compute hardness removal when the ion-exchange capacity is known.
  - 63.13 Describe troubleshooting techniques for water-softening processes.
- 64.0 Describe the principles, operational and troubleshooting practices of the stabilization process--The student will be able to:
- 64.01 Identify the chemicals used in stabilization.
  - 64.02 Identify two stabilization indices.
  - 64.03 Determine water stability, using the Langelier index and the marble test.
  - 64.04 Troubleshoot stabilization processes.
- 65.0 Describe the principles, operational and troubleshooting practices of the corrosion control process--The student will be able to:
- 65.01 Identify the factors that influence corrosion.
  - 65.02 Describe the problems that can be created by corrosive waters.
  - 65.03 Describe the basic concepts related to electrolysis.
  - 65.04 Define electrochemical reaction.
  - 65.05 Identify the chemicals used in corrosion control.
  - 65.06 Describe the conditions for calcium carbonate film formation.
  - 65.07 Define cathode film formation.
  - 65.08 Define cathodic protection and describe its application in water-treatment facilities.
  - 65.09 Describe troubleshooting techniques for corrosion-control processes.
- 66.0 Describe the principles, operational and troubleshooting practices of the disinfection process--The student will be able to:

- 66.01 Identify the chemicals used in primary disinfection.
  - 66.02 Identify commonly used chlorinators and hypochlorinators.
  - 66.03 Determine the maximum amount of chlorine gas (in pounds) that may be taken from a cylinder in a 24-hour period.
  - 66.04 Identify proper maintenance procedures for equipment chlorination.
  - 66.05 Identify terminology related to chlorination and disinfection.
  - 66.06 Identify common safety problems or emergency situations that might occur during chlorination.
  - 66.07 Identify the properties of chlorine and describe its use in water treatment.
  - 66.08 Explain the points at which chlorine is applied most effectively in water treatment.
  - 66.09 Compute the feed rate (lbs/d) when given the rate of flow (MGD) and dosage of chlorine (mg/1).
  - 66.10 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.
  - 66.11 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.
  - 66.12 Compute the feed rate needed to treat a given amount of water when given a chlorine demand and the desired chlorine residual.
  - 66.13 Describe troubleshooting techniques for disinfection processes.
- 67.0 Describe the principles, operational and troubleshooting practices for the control and treatment of trihalomethanes--The student will be able to:
- 67.01 Describe the formation of total trihalomethanes (TTHM).
  - 67.02 Identify the specific procedure for collecting samples to determine trihalomethane levels.
  - 67.03 Compute the quarterly average and the annual TTHM measurements when sample results are given.
  - 67.04 Identify processes that remove trihalomethane precursors.
  - 67.05 Identify processes that remove trihalomethanes after they are formed.
  - 67.06 Identify the benefits of alternate disinfectants.
  - 67.07 Describe chloramination as a control of TTHM.
  - 67.08 Describe troubleshooting techniques for the control and treatment of trihalomethanes.
- 68.0 Describe the principles, operational and troubleshooting practices of the iron and manganese removal processes--The student will be able to:
- 68.01 Explain the occurrence of iron and manganese in source water and in treated water.
  - 68.02 Describe the importance of controlling iron and manganese.
  - 68.03 Describe sample-collection and analysis procedures for iron and manganese.
  - 68.04 Describe remedial processes for controlling iron and manganese.
  - 68.05 Compute the potassium permanganate dosage for a known concentration of iron and manganese in the water being treated.
  - 68.06 Describe troubleshooting techniques for iron and manganese-removal processes.

69.0 Describe the principles, operational and troubleshooting practices for taste and odor control--The student will be able to:

- 69.01 Identify common types of complaints about water quality.
- 69.02 Identify causes of tastes and odors.
- 69.03 Describe how microbial growths affect tastes and odors.
- 69.04 Describe how eutrophication contributes to surface-water tastes and odors.
- 69.05 Describe a cross-connection.
- 69.06 Identify the chemicals used in the control and treatment of tastes and odors.
- 69.07 Describe the Threshold Odor Number (TON) test.
- 69.08 Determine the TON when dilution volumes and positive samples are given.
- 69.09 Describe troubleshooting techniques for taste and odor control.

70.0 Describe the principles, operational and troubleshooting practices of the demineralization processes--The student will be able to:

- 70.01 Define concepts related to demineralization, such as reverse osmosis (RO), flux, feedwater, permeate, and salinity.
- 70.02 Describe the structure, composition, and performance of an RO membrane.
- 70.03 Describe feedwater impurities, physical parameters, and conditions potentially harmful to the RO process.
- 70.04 Identify items included in a typical RO-facility-operation checklist.
- 70.05 Describe the common causes of membrane damage.
- 70.06 Describe the procedure for membrane cleaning.
- 70.07 Compute the percent of recovery when product flow and feed flow are known.
- 70.08 Compute the percent of mineral rejection when total dissolved solids are known for the feedwater and product water.
- 70.09 Describe the basic concepts of electrodialysis (ED), such as the cathode and anode relationship and the removal of typical inorganic salts.
- 70.10 Describe the most common problem of ED operation in a facility.
- 70.11 Explain how the cation membrane and the anion membrane differ.
- 70.12 Describe the multi-compartment unit used in the ED process.
- 70.13 Describe ED operating procedures in detail.
- 70.14 Describe the two most common chemical solutions used to flush ED stack membranes.
- 70.15 Describe troubleshooting techniques for demineralization processes.

71.0 Describe the principles, operational and troubleshooting practices of the fluoridation process--The student will be able to:

- 71.01 Define the basic concepts related to fluoridation, including its purpose and the kinds of chemicals used.
- 71.02 Identify the properties of fluoride and describe its use.
- 71.03 Identify the types of equipment used in fluoridation.
- 71.04 Describe proper maintenance procedures for fluoridation equipment.
- 71.05 Describe potential safety problems or emergency situations in the fluoridation process, and ways to avoid them.
- 71.06 Compute the feed rate of chemicals used in the fluoridation process.
- 71.07 Describe troubleshooting techniques for the fluoridation processes.

- 72.0 Identify facility operational problems--The student will be able to:
- 72.01 Respond to customer questions about taste or odor in the water.
  - 72.02 Respond to customer questions about red water or rust stains.
  - 72.03 Identify the probable cause(s) for a sudden change in chlorine demand; take corrective action.
- 73.0 Describe basic hydraulics and pumping operations--The student will be able to:
- 73.01 Describe the relationship between the system head and pressure, and make conversions between them.
  - 73.02 Describe three types of head, i.e., pressure, suction, and atmospheric.
  - 73.03 Describe proper operation of centrifugal and displacement pumps.
  - 73.04 Describe causes and methods that are effective in preventing "water hammer."
  - 73.05 Troubleshoot pump operations.
- 74.0 Identify appropriate federal, state, and local regulations for the operation and maintenance of a public potable water facility.--The student will be able to:
- 74.01 Complete the Drinking Water Bacteriological Analysis Form correctly.
  - 74.02 Complete the DEP daily operation report (DOR) form correctly.
  - 74.03 Complete the DEP monthly operation report (MOR) form correctly.
  - 74.04 Identify the DEP requirements for the operation of standby and emergency equipment.
  - 74.05 Identify the DEP requirements for microbiological monitoring and analyses.
  - 74.06 Identify the DEP requirements for sampling and testing.
- 75.0 Perform equipment inspection, and identify basic maintenance for the treatment train, treatment residuals disposal, and solids management--The student will be able to:
- 75.01 Identify the appropriate equipment used in the treatment train, treatment residuals disposal, and solids management.
  - 75.02 Describe a preliminary site inspection of the equipment used in the treatment train, treatment residuals disposal, and solids management.
  - 75.03 Identify the maintenance needs of equipment used in the treatment train, treatment residuals disposal, and solids management, including safe procedures for maintenance.
  - 75.04 Describe proper record keeping for preventive and corrective maintenance.
  - 75.05 Describe preventive and corrective maintenance procedures for equipment used in the treatment process, treatment residuals disposal, and solids management.