

## Curriculum Standard for Science and Math: Environmental Science Technology

**Career Cluster:** Science, Technology, Engineering, and Math \*\*

**Cluster Description:** Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services, and research and development services.

**Pathway:** Science and Mathematics

**Effective Term:** Fall 2013 (2013\*03)

### Program Majors Under Pathway

Program Major / Classification of Instruction Programs (CIP) Code	CIP Code	Credential Level(s) Offered	Program Major Code
Environmental Management Technology	03.0101	AAS/Diploma/Certificate	A20230
Environmental Science Technology	03.0103	AAS/Diploma/Certificate	A20140
Invasive Species Management Technology	03.0204	AAS/Diploma/Certificate	A20240

### Pathway Description:

The Environmental Science Technology curriculum is designed to prepare individuals for employment in environmental testing, consulting, remediation, and related industries. Major emphasis is placed on biological and chemical evaluation of societal impact and sustainable management of the environment. Coursework includes optional emphasis in invasive species treatment, and management of the environment.

Coursework includes computer applications, biology, chemistry, industrial safety, water quality, environmental health, and waste management. Coursework specific for Invasive Species includes assessment, management, identification, and control of both invasive plants and animals and GIS/GPS. Coursework specific for Environmental Management includes land resource management, field sampling and analysis, environmental health pathogens, and rural watershed protection.

Graduates are prepared for employment opportunities with numerous positions within the industry. Employment opportunities include, but not limited to, the following: Chemical and Biological Analysis, Water and Wastewater Treatment, EPA Compliance, Hazardous Material Handling, Contaminated Site Assessment and Remediation, Federal, State, and Local land management agencies, Private conservation organizations, Environmental Regulatory Compliance and Enforcement.

*Program Major Description: Choose one of the following 4<sup>th</sup> paragraphs to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each **Program Major**:*

**Environmental Management Technology:** A general program that focuses on the studies and activities relating to the natural environment and its conservation, use, and improvement. Potential course work includes instruction in subjects such as climate, air, soil, water, land, fish and wildlife, and plant resources; in the basic principles of environmental science and natural resources management; and the recreational and economic uses of renewable and nonrenewable natural resources.

**Environmental Science Technology:** A program that focuses on environment-related issues using scientific, social scientific, or humanistic approaches or a combination. Potential course work includes instruction in the basic principles of ecology and environmental science and related subjects such as policy, politics, law, economics, social aspects, planning, pollution control, natural resources, and the interactions of human beings and nature.

**Invasive Species Management Technology:** A program that focuses on the application of economic concepts and methods to the analysis of issues such as air and water pollution, land use planning, waste disposal, invasive species and pest control, conservation policies, and related environmental problems. Potential course work includes instruction in cost-benefit analysis, environmental impact assessment, evaluation and assessment of alternative resource management strategies, policy evaluation and monitoring, and descriptive and analytic tools for studying how environmental developments affect the economic system.

\*Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.

Approved by the State Board of Community Colleges on August 16, 2012; Editorial Revision 9/6/12; Editorial Revision 12/14/12; Editorial Revision 08/21/13; Editorial Revision 07/01/14; Prefix Addition 08/01/15.

**I. General Education Academic Core**

[Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 1D SBCCC 400.97 (3)]: Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.

**Science and Math: Environmental Science**

<b>Recommended General Education Academic Core</b>	<b>AAS</b>	<b>Diploma</b>	<b>Certificate</b>
<b>Minimum General Education Hours Required:</b>	<b>15 SHC</b>	<b>6 SHC</b>	<b>0 SHC</b>
<p><i>Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs.</i></p> <p><i>*Recommended certificate and diploma level curriculum courses. These courses may <u>not</u> be included in associate degree programs.</i></p> <p><b>Communication:</b></p> <ul style="list-style-type: none"> <li>*COM 101 Workplace Communication 3 SHC</li> <li>COM 110 Introduction to Communication 3 SHC</li> <li>COM 120 Intro Interpersonal Com 3 SHC</li> <li>COM 231 Public Speaking 3 SHC</li> <li>*ENG 101 Applied Communications I 3 SHC</li> <li>*ENG 102 Applied Communications II 3 SHC</li> <li>ENG 110 Freshman Composition 3 SHC</li> <li>ENG 111 Expository Writing 3 SHC</li> <li>ENG 112 Argument-Based Research 3 SHC</li> <li>ENG 114 Prof Research &amp; Reporting 3 SHC</li> <li>ENG 115 Oral Communication 3 SHC</li> <li>ENG 116 Technical Report Writing 3 SHC</li> </ul> <p><b>Humanities/Fine Arts:</b></p> <ul style="list-style-type: none"> <li>*HUM 101 Values in the Workplace 2 SHC</li> <li>HUM 110 Technology and Society 3 SHC</li> <li>HUM 115 Critical Thinking 3 SHC</li> <li>HUM 230 Leadership Development 3 SHC</li> <li>PHI 230 Introduction to Logic 3 SHC</li> <li>PHI 240 Introduction to Ethics 3 SHC</li> </ul> <p><b>Social /Behavioral Sciences:</b></p> <ul style="list-style-type: none"> <li>ECO 151 Survey of Economics 3 SHC</li> <li>ECO 251 Prin of Microeconomics 3 SHC</li> <li>GEO 110 Introduction to Geography 3 SHC</li> <li>GEO 111 World Regional Geography 3 SHC</li> <li>*PSY 101 Applied Psychology 3 SHC</li> <li>*PSY 102 Human Relations 2 SHC</li> <li>PSY 118 Interpersonal Psychology 3 SHC</li> <li>PSY 135 Group Processes 3 SHC</li> <li>PSY 150 General Psychology 3 SHC</li> <li>*SOC 105 Social Relationships 3 SHC</li> <li>SOC 210 Introduction to Sociology 3 SHC</li> <li>SOC 215 Group Processes 3 SHC</li> </ul> <p><b>Natural Sciences/Mathematics:</b></p> <ul style="list-style-type: none"> <li>BIO 140 Environmental Biology 3 SHC</li> <li>BIO 160 Introductory Life Science 3 SHC</li> <li>*MAT 101 Applied Mathematics I 3 SHC</li> <li>MAT 110 Mathematical Measurement 3 SHC</li> <li>MAT 115 Mathematical Models 3 SHC</li> <li>MAT 120 Geometry and Trigonometry 3 SHC</li> <li>MAT 121 Algebra/Trigonometry I 3 SHC</li> <li>MAT 140 Survey of Mathematics 3 SHC</li> <li>MAT 151 Statistics I 3 SHC</li> <li>MAT 155 Statistical Analysis 3 SHC</li> <li>PHY 110 Conceptual Physics 3 SHC</li> <li>PHY 121 Applied Physics I 4 SHC</li> </ul>	<b>6 SHC</b>	<b>3-6 SHC</b>	<b>Optional</b>
	<b>3 SHC</b>	<b>0-3 SHC</b>	<b>Optional</b>
	<b>3 SHC</b>	<b>0-3 SHC</b>	<b>Optional</b>
	<b>3 SHC</b>	<b>0-3 SHC</b>	<b>Optional</b>

**II. Major Hours.** AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work-based learning may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

- A. Technical Core.** The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.
- B. Program Major(s).** The Program Major must include a minimum of 12 semester hours credit from required subjects and/or courses. The Program Major is in addition to the technical core.
- C. Other Major Hours.** Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from each prefix listed, with the exception of prefixes listed in the core.

<b>Science and Math: Environmental Science Technology</b>	<b>AAS</b>	<b>Diploma</b>	<b>Certificate</b>
<b>Minimum Major Hours Required:</b>	<b>49 SHC</b>	<b>30 SHC</b>	<b>12 SHC</b>
<p><b>A. Technical Core:</b></p> <p>*ENV 218 Environmental Health 3 SHC</p> <p>*Biology. Choose one:            BIO110 Principles of Biology 4 SHC            BIO111 General Biology I 4 SHC</p> <p>*Chemistry. Choose one:            CHM131 Introduction to Chemistry 3 SHC            CHM151 General Chemistry I 4 SHC</p> <p>*Science. Choose one:            BIO 140 Environmental Biology 3 SHC            ENV 110 Environmental Science 3 SHC</p> <p>Water Quality. Choose one:            ENV214 Water Quality 4 SHC            WAT110 Basic Water Trmt 3 SHC</p> <p><b>B. Program Major(s):</b></p> <p><b>Environmental Management</b></p> <p>+ENV 224 Land Resource Management 4 SHC            +ENV 240 Field Sampling &amp; Analysis 3 SHC            +ENV 250 Rural Watershed Protection 4 SHC            +ENV 255 Envir/Public Hth.Pathogen 4 SHC</p> <p><i>Courses required for the Environmental Management diploma are designated with +</i></p>	<b>28-36 SHC</b>	<b>15-29 SHC</b>	

**B. Program Majors (Continued)**

**Environmental Science Technology**

Waste Management. Choose one:

ENV 210 Management of Waste	4 SHC
BIO 240 Waste Management	3 SHC

\* Safety. Choose one:

ISC 112 Industrial Safety	2 SHC
ISC 121 Environmental Health & Safety	3 SHC
EHS 114 OSHA Regulations	4 SHC

*Select additional courses from the BIO, ENV, EHS, or ISC prefix for a minimum of 12 SHC for the Environmental Science Technology AAS program:*

*Courses required for the Environmental Science Technology Diploma are designated with \**

**Invasive Species Management**

GIS 110 Survey of GIS/GPS	1 SHC
IVS 110 Intro to Invasive Species	3 SHC
#IVS 210 Inv Species Mgmt Strat	3 SHC
#IVS 211 Inv Species Mgmt Programs	3 SHC
#IVS 260 State License Exam Prep	1 SHC

# Select one set:

IVS 220 Inv Plant Survey Methods	4 SHC
IVS 221 Inv Plant Control Methods	3 SHC
<i>or</i>	
IVS 230 Aq Nuisance Survey Meth	4 SHC
IVS 231 Aq Nuisance Control Meth	3 SHC
<i>or</i>	
IVS 240 Insct/Dis Survey Methods	4 SHC
IVS 241 Insct/Dis Control Methods	3 SHC
<i>or</i>	
IVS 250 Inj Wildlife Survey Meth	4 SHC
IVS 251 Inj Wildlife Control Meth	3 SHC

*Courses required for the Invasive Species Management Diploma are designated with #*

**C. Other Major Hours.**

**To be selected from the following prefixes:**

AGR, ALT, ANS, ARC, AST, BIO, BPM, BTC, BUS, CHM, CIS, CIV, CMT, CSC, CST, CTS, DFT, EGR, EHS, ELC, ELN, ENV, ETR, FOR, FWL, GEL, GEO, GIS, HOR, HYD, ISC, IVS, LAR, LID, MAT, MSC, PHS, PHY, PTC, SRV, SST, VEN, WAT, WBL, WLD, and ZAS.

*Up to two semester hour credits may be selected from ACA.*

*Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, ITA, JPN, LAT, POR, RUS and SPA.*

### III. Other Required Hours

*A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.*

### IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

- A. Interpersonal Skills and Teamwork** – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.
- B. Communication** – The ability to effectively exchange ideas and information with others through oral, written, or visual means.
- C. Integrity and Professionalism** – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.
- D. Problem-solving** – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.
- E. Initiative and Dependability** – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.
- F. Information processing** – The ability to acquire, evaluate, organize, manage, and interpret information.
- G. Adaptability and Lifelong Learning** – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.
- H. Entrepreneurship** – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

*\*An **Employability Skills Resource Toolkit** has been developed by NC-NET for the competencies listed above.*

*Additional information is located at: <http://www.nc-net.info/employability.php>*

*\*\*The North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: [http://www.nc-net.info/NC\\_career\\_clusters\\_guide.php](http://www.nc-net.info/NC_career_clusters_guide.php) or <http://www.careertech.org>.*

*Summary of Required Semester Hour Credits (SHC) for each credential:*

	<b>AAS</b>	<b>Diploma</b>	<b>Certificate</b>
Minimum General Education Hours	15	6	0
Minimum Major Hours	49	30	12
Other Required Hours	0-7	0-4	0-1
<b>Total Semester Hours Credit (SHC)</b>	<b>64-76</b>	<b>36-48</b>	<b>12-18</b>