

**Curriculum Standard for Engineering and Technology:
Civil Engineering and Geomatics Technologies**

Career Cluster: Science, Technology, Engineering, Mathematics**

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

Pathway: Engineering and Technology

Effective Term: Spring 2017 (2017*01)

Program Majors Under Pathway

Program Major / Classification of Instruction Programs (CIP) Code	Credential Level(s) Offered	Program Major Code
Civil Engineering Technology	CIP Code: 15.0201	AAS/Diploma/Certificate
Environmental Engineering Technology	CIP Code: 15.0507	AAS/Diploma/Certificate
Geomatics Technology	CIP Code: 15.1102	AAS/Diploma/Certificate

Pathway Description: These curriculums are designed to prepare students through the study and application of principles from mathematics, natural sciences, and technology and applied processes based on these subjects.

Course work includes mathematics, natural sciences, engineering sciences and technology.

Graduates should qualify to obtain occupations such as technical service providers, materials and technologies testing services, engineering technicians, construction technicians and managers, industrial and technology managers, or research technicians.

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

Civil Engineering Technology: A course of study that prepares students to use basic engineering principles and technical skills to carry out planning, documenting and supervising tasks in sustainable land development and public works and facilities projects. Includes instruction in the communication and computational skills required for materials testing, structural testing, field and laboratory testing, site analysis, estimating, project management, plan preparation, hydraulics, environmental technology, and surveying. Graduates should qualify for technician-level jobs with both public and private engineering, construction, and surveying agencies.

Environmental Engineering Technology: A course of study that prepares students to use mathematical and scientific principles to modify, test, and operate equipment and devices used in the prevention, control and remediation of environmental problems and development of environmental remediation devices. Includes instruction in environmental safety principles, environmental standards, testing and sampling procedures, laboratory techniques, instrumentation calibration, safety and protection procedures, equipment maintenance, and report preparation.

Geomatics Technology: A course of study that prepares students to use mathematical and scientific principles for the delineation, determination, planning and positioning of land tracts, boundaries, contours and features applying principles of route surveying, construction surveying, photogrammetry, mapping, global positioning systems, geographical information systems, and other kinds of property description and measurement to create related maps, charts and reports. Includes instruction in applied geodesy, computer graphics, photointerpretation, plane and geodetic surveying, mensuration, traversing, survey equipment operation and maintenance, instrument calibration, and basic cartography. Graduates should qualify for jobs as survey party chief, instrument person, surveying technician, highway surveyor, mapper, GPS technician, and CAD operator. Graduates will be prepared to pursue the requirements necessary to become a Registered Land Surveyor in North Carolina.

I. General Education Academic Core

[Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 1D SBCCC 400.10]: 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.

Engineering and Technology: Civil Engineering and Geomatics Technologies

General Education Academic Core	AAS	Diploma	Certificate
Minimum General Education Hours Required:	15 SHC	6 SHC	0 SHC
<p>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.</p> <p>*Recommended certificate and diploma level curriculum courses. These courses may <u>not</u> be included in associate degree programs.</p> <p>Communications:</p> <ul style="list-style-type: none"> * COM 101 Workplace Communication 3 SHC COM 110 Introduction to Communication 3 SHC COM 120 Intro Interpersonal Com 3 SHC COM 231 Public Speaking 3 SHC * ENG 101 Applied Communications I 3 SHC * ENG 102 Applied Communications II 3 SHC ENG 110 Freshman Composition 3 SHC ENG 111 Expository Writing 3 SHC ENG 114 Professional Research & Reporting 3 SHC ENG 116 Technical Report Writing 3 SHC <p>Humanities/Fine Arts:</p> <ul style="list-style-type: none"> * HUM 101 Values in the Workplace 2 SHC HUM 110 Technology and Society 3 SHC HUM 115 Critical Thinking 3 SHC HUM 230 Leadership Development 3 SHC PHI 230 Introduction to Logic 3 SHC PHI 240 Introduction to Ethics 3 SHC <p>Social/Behavioral Sciences:</p> <ul style="list-style-type: none"> ECO 151 Survey of Economics 3 SHC ECO 251 Prin of Microeconomics 3 SHC GEO 110 Introduction to Geography 3 SHC GEO 111 World Regional Geography 3 SHC GEO 131 Physical Geography I 4 SHC * PSY 101 Applied Psychology 3 SHC * PSY 102 Human Relations 2 SHC PSY 118 Interpersonal Psychology 3 SHC PSY 135 Group Processes 3 SHC PSY 150 General Psychology 3 SHC * SOC 105 Social Relationships 3 SHC SOC 210 Introduction to Sociology 3 SHC SOC 215 Group Processes 3 SHC <p>Natural Sciences/Mathematics:</p> <ul style="list-style-type: none"> MAT 110 Math Measurement & Literacy 3 SHC MAT 121 Algebra/Trigonometry I 3 SHC MAT 143 Quantitative Literacy 3 SHC MAT 152 Statistical Methods I 4 SHC MAT 171 Precalculus Algebra 4 SHC MAT 223 Applied Calculus 3 SHC MAT 271 Calculus I 4 SHC 	<p>6 SHC</p> <p>3 SHC</p> <p>3 SHC</p> <p>3 SHC</p>	<p>3-6 SHC</p> <p>0-3 SHC</p> <p>0-3 SHC</p> <p>0-3 SHC</p>	<p>Optional</p> <p>Optional</p> <p>Optional</p> <p>Optional</p>

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 any prefix listed, with the exception of prefixes listed in the core.

Engineering and Technology: Civil Engineering and Geomatics Technologies	AAS	Diploma	Certificate
Minimum Major Hours Required:	49 SHC	30 SHC	12 SHC
<p>A. Technical Core:</p> <p>CEG 211 Hydrology & Erosion Control 3 SHC SRV 110 Surveying I 4 SHC</p> <p>Introduction to Engineering Technology <i>Choose one:</i> CEG 115 Intro to Tech & Sustainability 3 SHC EGR 115 Intro to Technology 3 SHC</p> <p>Computer Aided Drafting <i>Choose one:</i> CEG 151 CAD for Engineering Technology 3 SHC DFT 151 CAD I 3 SHC EGR 120 Eng and Design Graphics 3 SHC</p> <p>Spatial Data Collection and Mapping <i>Choose one:</i> CEG 111 Intro to GIS and GNSS 4 SHC <i>OR</i> GIS 111 Introduction to GIS 3 SHC <i>AND</i> GIS 112 Introduction to GPS 3 SHC</p> <p>B. Program Major(s): <i>For AAS Degree select one program major plus additional courses from the prefixes listed within the same program major for a minimum of (12) semester hours of credits.</i></p> <p>Civil Engineering Technology CEG 212 Introduction to Environmental Tech 3 SHC CEG 210 Construction Mtls & Methods 3 SHC CIV 111 Soils and Foundations 4 SHC SRV 111 Surveying II 4 SHC</p>	32-34 SHC		

<i>Choose one:</i>						
EGR	250	Statics & Strength of Materials	5 SHC			
EGR	251	Statics	3 SHC			
MEC	210	Applied Mechanics	3 SHC			
<i>Choose one course or one set from the following (3-6 shc):</i>						
CEG	235	Project Management & Estimating	3 SHC or			
CIV	230	Construction Estimating	3 SHC			
<i>AND</i>			3 SHC			
CIV	240	Project Management	3 SHC or			
CST	242	Planning/Estimating II	4 SHC			
Geomatics Technology						
CEG	230	Subdivision Planning & Design	3 SHC			
SRV	111	Surveying II	4 SHC			
SRV	210	Surveying III	4 SHC			
SRV	220	Surveying Law	3 SHC			
SRV	240	Topo/Site Surveying	4 SHC			
Environmental Engineering Technology						
CEG	212	Intro to Environmental Tech	3 SHC			
CEG	230	Subdivision Planning & Design	3 SHC			
CHM	151	General Chemistry I	4 SHC			
CIV	111	Soils and Foundations	4 SHC			
ENG	226	Environmental Law	3 SHC			
<i>Choose one:</i>						
EGR	250	Statics & Strength of Materials	5 SHC			
EGR	251	Statics	3 SHC			
MEC	210	Applied Mechanics	3 SHC			

C. Other Major Hours. To be selected from the following prefixes: ALT, BIO, BPR, CEG, CHM, CIS, CIV, CSC, CST, CTI, DBA, DFT, EGR, ENV, FOR, GIS, ISC, LID, MAT, MEC, PHY, SRV, SST WBL and WEB

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 or <http://www.careertech.org>.

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

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