Florida Department of Education
Curriculum Framework

Program Title: **Civil Engineering Technology**
Career Cluster: **Architecture and Construction**

AS	
CIP Number	1715020101
Program Type	College Credit
Standard Length	63 Credit Hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3022 - Civil Engineering Technicians
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment as surveyors, civil engineering technicians, or surveyor helpers or to provide supplemental training for persons previously or currently employed in these occupations.

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 Architecture and Construction 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 Architecture and Construction career cluster.

The content includes but is not limited to surveying, highway design, soils and foundations, photogrammetry, asphalt design, drainage and geology, concrete design, orientation to utilities, structural design, estimating, drafting, legal and ethical considerations, employability skills, leadership and human relations skills, health and safety, and supportive general education. Computer use is essential. Technical report writing, record keeping and mathematical computations are important aspects of this occupation.

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

Program Structure

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

Standards

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

01.0 Solve general, technical and engineering type problems.
02.0 Use Computer Aided Drafting (CAD) software.
03.0 Sketch, letter and generate line-work, using civil engineering and/or surveying software, to describe various objects.
04.0 Read and produce drawings involving orthographic projection, sections, pictorial and auxiliary views using adequate software (Optional: traditional drafting tools and/or sketching).
05.0 Solve fundamental engineering strength of materials problems.
06.0 Recognize the use of the various materials in the construction industry.
07.0 Utilize traditional survey equipment and/or emerging technology to collect spatial data and produce maps in order to gain a basic understanding of surveying and geomatics.
08.0 Identify the use of the various materials of selected industries.
09.0 Solve engineering graphics problems using standard techniques, reference materials and civil engineering and/or surveying software.
10.0 Analyze physical and mechanical properties of soil and concrete.
11.0 Solve basic hydraulic problems using the theory of incompressible fluids. (Optional)
12.0 Solve problems using theories learned in engineering mechanics. (Optional)
13.0 Establish grades, locate property lines and utilities, produce plots, and calculate cut and fill.
14.0 Demonstrate employability skills.
15.0 Demonstrate appropriate communication and coordination skills.

Florida Department of Education
Student Performance Standards

Program Title: **Civil Engineering Technology**
CIP Number: **1715020101**
Program Length: **63 Credit Hours**
SOC Code(s): **17-3022**

	Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:
01.0	Solve general, technical and engineering type problems--The student will be able to:
	01.01 Solve geometry problems.
	01.02 Solve algebra problems.
	01.03 Solve basic trigonometry problems.
	01.04 Given a linear graph or equation, demonstrate ability to interpolate or extrapolate.
	01.05 Read and interpret engineering related graphs.
02.0	Use Computer Aided Drafting (CAD) software--The student will be able to:
	02.01 Use civil engineering and/or surveying software programs to plot surveying/engineering problems.
	02.02 Use civil engineering and/or surveying software programs to organize coordinate data generated from data collectors (GPS based and conventional) and computers to plot topographic maps, plats, roadway alignments, parking lots, subdivisions and other appropriate civil engineering projects.
	02.03 Using civil engineering and/or surveying software, solve engineering and surveying type problems, such as plats and direction traverses with corrections.
	02.04 Use civil engineering and/or surveying software programs to draw large-scale civil drawings.
	02.05 Use civil engineering and/or surveying software programs to draw details and build a Digital Terrain Model (DTM) related to civil projects.
	02.06 Use civil engineering and/or surveying software programs to draw plans and profiles.
03.0	Sketch, letter and generate line-work, using civil engineering and/or surveying software, to describe various objects--The student will be able to:
	03.01 Prepare sketches and descriptions of real property.
	03.02 Use topographic map symbols including line-work to enhance topographic maps.

	03.03 Use proper line symbols and notes from road design standards to prepare plans and profiles.
04.0	Read and produce drawings involving orthographic projection, sections, pictorial and auxiliary views using adequate software (Optional: traditional drafting tools and/or sketching)--The student will be able to:
	04.01 Produce orthographic projections.
	04.02 Produce typical road cross section drawings.
	04.03 Produce auxiliary view drawings of utility conflicts.
05.0	Solve fundamental engineering strength of materials problems--The student will be able to:
	05.01 Calculate forces and stresses in various structural members as determined by the material(s) used.
	05.02 Calculate stress, strain, Modulus of Elasticity, strength and deformation, other material properties and thermal effect.
	05.03 Understand the appropriate engineering vocabulary and terminology.
	05.04 Understand the strengths of various engineering materials used in the design of machines and structures.
	05.05 Determine the centroid location of different cross-sectional shapes. (Optional)
	05.06 Calculate the moment of inertia. (Optional)
	05.07 Calculate shear and bending moment of beams. (Optional)
	05.08 Draw shear and bending moment diagrams. (Optional)
	05.09 Draw a stress-strain diagram. (Optional)
	05.10 Understand the use of the universal testing machine. (Optional)
06.0	Recognize the use of the various materials in the construction industry--The student will be able to:
	06.01 Understand placement and testing of storm sewer drainage pipe and gravity sewer pipe.
	06.02 Understand placement and test pressure pipe systems.
	06.03 Understand standard American Society for Testing and Materials (ASTM) international tests and compute results for the following: deformed steel bars, flat stock, standard 505, shear, compressive strength, air entrainment and volume. (Optional)
	06.04 Understand standard Rockwell hardness test. (Optional)
07.0	Utilize traditional survey equipment and/or emerging technology to collect spatial data and produce maps in order to gain a basic understanding of surveying and geomatics --The student will be able to:
	07.01 Understand the importance of surveying fundamentals, including units of measurement, significant figures, errors in observations, and coordinate geometry.

	07.02	Apply fundamental engineering skills to include the use of engineer's tape, plumb bobs, field book and calculator. (Optional)
	07.03	Utilize total station to gain an understanding of horizontal measurements (angles, azimuths, and bearings).
	07.04	Utilize automatic level to gain an understanding of vertical measurements (elevations).
	07.05	Utilize Global Positioning System (GPS) and understand how this methodology can be utilized for both horizontal and vertical measurements.
	07.06	Have a basic understanding of how the above-described methodologies have led to the development of new technology, including photogrammetry, remote sensing, and Light Detection and Ranging (LiDAR) and (Optionally), using Unmanned Aerial Vehicle's (UAV)/drones. *NOTE: FAA requires licensing to operate UAV's and drones.*
	07.07	Apply these various data collection methods to create a map (that has a specific purpose to an end user, i.e. topographic map for design purposes).
	07.08	Understand and apply the fundamentals of Geographic Information Systems (GIS). (Optional)
08.0	Identify the use of the various materials of selected industries--The student will be able to:	
	08.01	Identify and explain the uses for the following pipe types: clay, polyvinyl chloride (PVC), cast iron, reinforced concrete pipe (RCP) and pre-stressed concrete cylinder.
	08.02	Identify and explain the use of reinforcing steel and its common applications.
	08.03	Identify concrete structures.
	08.04	Identify asphalt types and uses.
	08.05	Identify corrosion preventing methods, including coatings.
09.0	Solve engineering graphics problems using standard techniques, reference materials and civil engineering and/or surveying software--The student will be able to:	
	09.01	Reference appropriate resources including the following: Location Survey Manual, Florida Department of Transportation manuals, Public Works Manuals, and the manual of standard practice for detailing reinforced concrete structure (ACI 315-99).
	09.02	Use typical design standards.
	09.03	Use civil engineering and/or surveying software for the analysis of the hydrology of small watersheds.
	09.04	Use county soil survey by soil conservation service (US Department of Agriculture assisted by Geographic Information System data).
	09.05	Prepare a topographic map of a subdivision with standard soil types.
	09.06	Using current software and the prepared soils type map, compute peak run off.
	09.07	Use GIS and available data sets to identify areas prone to flooding. (Optional)
	09.08	Use adequate and available methodologies based on GIS to identify effects of hurricanes on civil infrastructure. (i.e. present examples from HAZUS-FEMA Module hurricanes, level 1). (Optional)

10.0	Analyze physical and mechanical properties of soil and concrete--The student will be able to:
10.01	Understand the process and importance of running standard ASTM International soil test and compute results for the following:
a.	Gradation analysis
b.	Limits – liquid and plastic
c.	Modified proctor
d.	Moisture content-oven and/or speedy
e.	Nuclear density (Optional)
10.02	Make a trial batch and run a standard ASTM International concrete test and compute results for the following:
a.	Slump
b.	Air entrainment
c.	Compressive strength
11.0	Solve basic hydraulic problems using the theory of incompressible fluids (Optional)--The student will be able to:
11.01	Compute peak discharge.
11.02	Compute discharge due to developed condition of project.
11.03	Compute quantity of water and wastewater flow and size pressure pipes.
11.04	Calculate slopes to determine proper drainage of impervious surfaces and storm sewers.
11.05	Size pipes for gravity flow of storm waters.
12.0	Solve problems using theories learned in engineering mechanics (Optional)--The student will be able to:
12.01	Solve vector addition problems by the component method.
12.02	Given two coordinates, calculate length of line and reference angle.
12.03	Convert from polar to rectangular coordinates and its inverse.
12.04	Compute resultant of concurrent force systems.
12.05	Compute moments about a given point.

	12.06 Compute the resultant force from several given couples.
	12.07 Compute resultant of plane parallel force systems.
	12.08 Compute resultant of nonparallel non-concurrent force systems.
	12.09 Replace a force by a force and a couple.
	12.10 Construct free body diagrams.
	12.11 Solve concurrent coplanar force systems (two equations and two unknowns).
	12.12 Solve coplanar nonparallel force systems.
	12.13 Analyze frame and truss problems.
13.0	Establish grades, locate property lines and utilities, produce plots, and calculate cut and fill--The student will be able to:
	13.01 Calculate horizontal alignment for civil engineering structures.
	13.02 Calculate vertical alignment for civil engineering structures.
	13.03 Create maps, plats, plans and profiles, cross sections, charts and graphs.
	13.04 Calculate earthwork quantities.
	13.05 Calculate material quantities.
	13.06 Draft storm sewers, sanitary sewers, water systems, and utilities.
14.0	Demonstrate employability skills--The student will be able to:
	14.01 Conduct a job search.
	14.02 Secure information about a job.
	14.03 Identify documents that may be required when applying for a job.
	14.04 Complete a job application.
	14.05 Demonstrate competence in job interview techniques.
	14.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
	14.07 Identify acceptable work habits.

	14.08 Demonstrate knowledge of how to make job changes appropriately.
	14.09 Demonstrate acceptable employee health habits.
	14.10 Demonstrate understanding of procedures to effectively work remotely.
15.0	Demonstrate appropriate communication and coordination skills--The student will be able to:
	15.01 Write logical and understandable statements or phrases to accurately communicate in business & industry.
	15.02 Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
	15.03 Read and follow written and oral instructions.
	15.04 Answer and ask questions coherently and concisely.
	15.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	15.06 Communicate effectively with technical and non-technical audiences.
	15.07 Demonstrate the ability to coordinate between different disciplines (architectural, mechanical, structural, construction).

Additional Information

Laboratory Activities

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

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Accommodations

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

Certificate Programs

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

Field Survey Technician (0715020102) – 18 Credit Hours

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

Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:
http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml